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

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

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

The educational program is carried on through offices in each of the 95 counties of the state. Educational emphasis includes work in four major program areas: agricultural 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
Gary Schneider, Assistant Dean

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

MASTER OF SCIENCE PROGRAMS

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

Both majors and minors are available in Agricultural Economics, Agricultural Engineering, Agricultural Extension, Agricultural Mechanization, Animal Science, Entomology and Plant Pathology, Food Technology and Science, Ornamental Horticulture and Landscape Design, and Plant and Soil Science. Majors only are available in Forestry and Wildlife and Fisheries Science, and minors are available in General Agriculture and Rural Sociology. The minor in General Agriculture requires 18 hours of course work. A complete listing of majors is shown on pages 6-7.

DOCTORAL PROGRAMS

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

Departments of Instruction

Agricultural Economics and Rural Sociology

MAJOR DEGREES

Agricultural Economics M.S., Ph.D.

Professors:
J. A. Martin (head), Ph.D. Minnesota;
M. B. Badenhop, Ph.D. Purdue; J. R. Broker, Ph.D. Florida; C. L. Cielan, Ph.D. Wisconsin;
L. Dubov, Ph.D. California (Berkeley); L. H. Keller, Ph.D. Kentucky; T. H. Kindt, Ph.D. Kentucky;
F. O. Leuthold, Ph.D. Wisconsin; D. L. McLemore, Ph.D. Clemson; B. R. McManus, Ph.D. Purdue;
S. D. Mundy, Ph.D. Tennessee; C. B. Sappington, Ph.D. Illinois.

Associate Professors:
C. M. Cuskaden, Ph.D. Michigan State; R. H. Orr, Ph.D. Illinois; W. M. Park, Ph.D. Virginia

Polytechnic Institute; R. T. Todd; J. D. Tennessee.

Assistant Professor:
D. M. Markley, Ph.D. Virginia Polytechnic Institute.

The Department of Agricultural Economics and Rural Sociology offers programs of graduate study leading to the Ph.D. and M.S. The doctoral program includes concentrations in agricultural marketing and price analysis, agricultural policy, farm management and production economics, natural resource economics, and rural development. The M.S. program may be completed under a thesis or non-thesis option and may include a concentration in Rural Sociology for the M.S. program with a major in Agricultural Economics. For more information, contact the Department Head.

THE MASTER'S PROGRAM

Thesis Option: A minimum of 45 hours of graduate coursework is required. In the agricultural economics emphasis, 18 hours of agricultural economics and 18 hours of economic theory and 6 hours of quantitative methods are required. In the rural sociology emphasis, 6 hours of sociological theory and 3 hours of statistics are required. Each student must successfully complete a final oral examination.

Non-Thesis Option: A minimum of 48 hours of graduate coursework is required. Minimum coursework in theory, quantitative methods and statistics are the same as for the thesis option. Each student must successfully complete both written and oral comprehensive exams.

THE DOCTORAL PROGRAM

A minimum of 108 hours of graduate coursework and a minor are required. A minor of 12 hours of dissertation research, but excluding any master's research credit, is required. A minimum of 15 hours of economic theory, 9 hours of quantitative methods and 21 hours in agricultural economics and resource economics are required. Comprehensive exams consist of four written exams and one oral exam. The written exams are in general agricultural economics, economic theory, quantitative methods and the area of concentration. Provisions exist for waiving the economic theory exam with a sufficient academic record in specific economic theory courses.

Agricultural Economics

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

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

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

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

4310 Agricultural Finance (3) Nature and source of capital; credit problems of farmers; kinds and sources of farm credit. Prereq: Agriculture 1110 or Economics 5110, or consent of instructor. Prereq: Agriculture 1110 and Economics 2120. W

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

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

4610 Management of Farm Supply and Marketing

Firms (3) Operation of firms selling farm supplies and marketing agricultural products. Emphasis on accounting data and economic theories for decision-making. Prereq: Agriculture 1110 and Economics 2120.

4630 Advanced Agricultural Marketing (3) Economies of market location and perfect market model; spatial equilibrium analysis; production and market location and transfer costs; processing and storage; transfer costs; maximizing returns, institutions and market flow; measuring efficiency. Prereq: 3120 or 3220 or consent of instructor. W

5000 Thesis (1-15) P/NP. 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 Agricultural Production Economics II (3) Theoretical and empirical concepts of agricultural allocation problems under various knowledge situations with emphasis on uncertainty. Aggregate external effects of decisions made by individual agriculture firms. Decision theory with application to agriculture. Prereq: 4140 or equivalent. W

5210 Seminar: Agricultural Policy (3) Sp

5220 Research Methodology (3) Nature of scientific method, logic, philosophy, assumptions, potential and limitations of science, methodological problems of social sciences, established research priorities. Prereq: Consent of instructor. W

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) Analysis of structure, conduct, and performance of agricultural marketing system; application of price theory concepts to real-world industries; methods used to examine industry conduct and performance. Prereq: Economics 3110 or consent of instructor.

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

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

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

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

5820 Agricultural Price Analysis (3) Application of various research methods to analysis of price structures; specification and estimation of price determination models and interpretation of results. Prereq: 4260 and 5610 or Statistics 4310 or consent of instructor.

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

6120 Seminar in Agricultural Economics (3) Topics selected from the areas of economics of production, consumption or distribution of agriculture and related industries, and public policy concerns with agriculture and related industries. A
Graduate programs leading to the degrees of Master of Science and Doctor of Philosophy within the major in Agricultural Engineering are available to graduates of a recognized curriculum in engineering, mathematics, or one of the physical or biological sciences. A graduate program leading to the Master of Science degree in Agricultural Mechanization is available to graduates in a recognized curriculum in agriculture or other related fields. Each applicant will be advised about any prerequisite work required for entering a program. The student's program of study must be approved by his/her advisory committee and must comply with the requirements of The Graduate School.

A departmental application and three completed Graduate School rating forms are required in addition to the Graduate School application.

THE MASTER'S PROGRAMS

The Master's programs in Agricultural Engineering and Agricultural Mechanization can be entirely in the major subject or may include subject matter areas related to the major. A minor in another subject area requires 18 credit hours. Both programs require a thesis and the final oral exam covers coursework and the thesis.

THE DOCTORAL PROGRAM

Program concentrations for the doctoral program include agricultural power and machinery, soil and water conservation, agricultural structures and electric power and processing. The program of each candidate consists of a major and supporting studies in one or more additional areas. The major consists of a minimum of 24 quarter hours exclusive of research and dissertation. A minimum of 24 hours must be taken outside the Department of Agricultural Engineering. Supporting courses are required in biological, physical and engineering sciences and mathematics fundamentals related to the candidate's program.

A comprehensive examination (written and oral) will be given when the student has completed all or nearly all of the prescribed coursework. The comprehensive exam must be passed prior to admission to candidacy. A final oral examination on the student's dissertation will be given after completion of the dissertation and all course requirements.

Agricultural Engineering

4230 Selected Topics in Agricultural Engineering

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

5000 Thesis (1-15) NP only. E

5240 Environmental Control in Agricultural Structures (3) Analysis of specific instrumentation needs in agriculture and systems research and policy formulation; analysis of current processes of animal and plant life; basis for development of design and function of rural life; rural social values, attitudes, and norms as they influence the family, formal and informal groups, population shifts, and changing farm technology. Prereq: 3420 or consent of instructor. A

4640 Instrumentation in Agricultural Systems (3) Analysis of specific instrumentation needs in agriculture and systems research and policy formulation; analysis of current processes of animal and plant life; basis for development of design and function of rural life; rural social values, attitudes, and norms as they influence the family, formal and informal groups, population shifts, and changing farm technology. Prereq: 3420 or consent of instructor. A

5410 Agricultural Waste Utilization and Disposal (3) Design and development of agricultural waste disposal systems. Prereq: 3640 or consent of instructor. 1 hr and 2 labs. Sp

5240 Environmental Control in Agricultural Structures (3) Analysis of specific instrumentation needs in agriculture and systems research and policy formulation; analysis of current processes of animal and plant life; basis for development of design and function of rural life; rural social values, attitudes, and norms as they influence the family, formal and informal groups, population shifts, and changing farm technology. Prereq: 3420 or consent of instructor. A

4640 Instrumentation in Agricultural Systems (3) Analysis of specific instrumentation needs in agriculture and systems research and policy formulation; analysis of current processes of animal and plant life; basis for development of design and function of rural life; rural social values, attitudes, and norms as they influence the family, formal and informal groups, population shifts, and changing farm technology. Prereq: 3420 or consent of instructor. A

4230 Selected Topics 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 water conservation to natural land. Prereq: 3610 or consent of instructor. 1 hr and 2 labs. W

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

4630 Design of Processing and Materials Handling Systems (3) Development of systems and components for integrated agricultural processing concerning mass and energy balances, product characteristics, equipment specifications, storage, handling and economic merit. Prereq: 3630. 1 hr and 2 labs. F
ment, and repair of single cylinder engines. 2 hrs and 1 lab. W

4110 Equipment and Techniques for application of Agricultural Chemicals (3) Equipment for application of liquid, solid, and gaseous chemicals; system components; operational characteristics; safety considerations; calibration; selection and management; materials handling and disposal methods. 2 hrs and 1 lab. Sp

4210 Agricultural Machinery and Tractors (4) Agricultural machinery and power units; adaptation to agricultural practices; field efficiencies, capabilities; adjustment and servicing. Prereq: Mathematics 1550. 3 hrs and 1 lab. W

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

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

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

5410 Agricultural Machinery Systems Analysis (3) Analysis of current 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

5610 Selected Topics in Agricultural Mechanization (3) Lecture, group discussion, and individual study on specialized agricultural mechanization developments. May be repeated. Maximum 9 hrs. F

Agricultural Extension Education

MAJOR DEGREE

Agricultural Extension M.S.

Professors: Lewis H. Dickson (Acting Head), Ed.D. Cornell; C. E. Carter, Jr., Ph.D. Ohio State.

The Department of Agricultural Extension Education offers the Master of Science degree with a major in Agricultural Extension. For further information, contact the Department Head.

THE MASTER’S PROGRAM

1. A thesis is required for the Master’s program. Prior to research for the thesis, the student is required to develop a detailed written research plan. Registration for a minimum of 9 hours of Thesis 5000 is required.

2. In addition to the thesis requirement, a minimum of 36 hours of graduate coursework is required. This work must be approved by the student’s committee and not more than 15 hours of the minimum 45 can be below the 5000 level. The committee may require additional coursework if the student’s progress or background indicates such need. Students may select from a wide variety of offerings in communications, economics, sociology, psychology, statistics and research methodology, supervision and administration as well as technical subject matter fields or agriculture and home economics.

3. An oral examination covering the thesis and coursework is required.

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

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

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

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

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

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

5230 Evaluation in Programs of Agricultural Extension (3) Principles, instruments, and techniques of identifying, gathering, analyzing and using data to appraise planning and teaching and to determine progress of clientele. Prereq: 5210 or consent of instructor. W, A

5310 History, Philosophy and Objectives (3) Historical and philosophical foundation of informal adult education in American agriculture form the agricultural societies (1785 to present), Key figures, issues, legislative movements, farmer organizations and programs. Emphasis on agricultural extension service, its origin, legislation and growth and nature of present day objectives and programs. Prereq: 3110 or consent of instructor. W, A

5320 Volunteer Leadership in Agricultural Extension Programs (3) Theory, principles and procedures in developing volunteer leadership for small groups in rural communities through agricultural extension programs. Emphasis on analysis of place and importance of volunteer leader function, techniques of effective leadership in small groups and methods of developing volunteer leadership in agricultural extension work. Prereq: 3110 or consent of instructor. W, A

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

Agriculture

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

Animal Science

MAJOR DEGREE

Animal Science M.S., Ph.D.

Professors: D. O. Richardson, (Head), Ph.D. Ohio State; K. M. Barth, Ph.D. Rutgers; C. M. Bell, Ph.D. Oklahoma State; J. K. Bleiher (emeritus), Ph.D. Ohio State; C. C. Chamberlain (Emeritus), Ph.D. Iowa State; B. H. Erickson, Ph.D. Kansas State; O. G. Hall (Dean), Ph.D. Iowa State; S. L. Hansard (Emeritus), Ph.D. Florida; E. R. Lidvall, M. S. Tennessee; T. P. McDonell, Ph.D. Tennessee; J. B. McLaren, Ph.D. Auburn; G. M. Merriman (Emeritus), D.V.M. Michigan State; J. K. Miller, Ph.D. Georgia State; R. D. Waclawski, Ph.D. Wisconsin; R. T. Murphy, (Emeritus), Ph.D. Wisconsin; H. V. Sheline, Ph.D. Illinois; R. T. Shrader, Ph.D. Iowa State; R. T. Tugwell (Emeritus), Ph.D. Indiana State.


Assistant Professors: G. A. Baumbach, Ph.D. Florida; B. R. Bell, Ph.D. North Carolina State; W. Cullen, Ph.D. Minnesota; J. D. Goddy, M.S., Ph.D. Mifflin;

R. N. Heitmann, Ph.D. Mains; S. P. Oliver, Ph.D. Ohio State; T. W. Schultz, Ph.D. Tennessee;

J. D. Smalling, Ph.D. Texas A & M.

The Department of Animal Science offers graduate programs leading to the degrees of Master of Science and Doctor of Philosophy with a major in Animal Science. At the M.S. level, the department offers areas of specialization in nutrition, breeding and genetics, physiology and management with orientation towards beef cattle, dairy cattle, swine and poultry. Since the department is also a part of the College of Veterinary Medicine, the areas of anatomy, general physiology and histology are also available. The Ph.D. program offers concentrations in animal nutrition, animal breeding and animal physiology and animal anatomy.

THE MASTER'S PROGRAM

For admission to the M.S. program, a student must have a satisfactory grade point average in a completed undergraduate major in one of the animal sciences or closely related area, and must show promise that he/she can successfully pursue a Master of Science program. Prerequisite courses may be used if the student has insufficient undergraduate background or less than satisfactory grade point average.

The program requires the writing of a thesis based on original research and the completion of a minimum of 36 hours of graduate coursework, at least two-thirds of which must be taken at UTK in courses numbered at or above the 5000 level. Included in the course requirement are 3 hours of Animal Science 5510 (Seminar) and 2 hours of Agriculture 5120 (Teaching Internship). The remainder of the coursework will be selected jointly by the student and the major professor depending on the student's area of specialization and professional objectives.

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

THE DOCTORAL PROGRAM

The doctoral program requires a minimum of 72 quarter hours of coursework and a minimum of 36 quarter hours of Doctoral Research and Dissertation (Animal Science 6000). Additional requirements are:

1. A minimum of 24 quarter hours in related fields outside of animal science.

2. At least 36 quarter hours credit at the 5000 and 6000 level, exclusive of Doctoral Research and Dissertation. Of these, a minimum of 9 hours must be at the 6000 level.

3. Three seminars carrying 1 credit hour (Animal Science 910) not related to the dissertation research: and one seminar each on the student's M.S. thesis research, on his/ her dissertation research proposal and on the student's completed thesis.

4. A minimum of 2 hours of Agriculture 5120 (Teaching Internship) in addition to that required on the M.S. level.
tive functions. Prereq: 5344, 5510, 5520 or consent of instructor. Sp, A.

6240 Physiology of the Heart (4) Cardiac physiology, ultrastructural, biochemical, and physical effects. Latest techniques to assess myocardial function. Prereq: 5510-20, and upper division course in cell physiology and consent of instructor. 3 hrs and 1 lab.

6311 Advanced Topics in Animal Nutrition (1-6) Recent advances and concepts, research techniques, current problems. May be repeated. Maximum 6 hrs. E

6322 Advanced Animal Nutrition (3) Chemical forms, digestion, absorption, intermediary metabolism, deficiencies, excesses and interaction of nutrients. Energy, proteins; vitamins; and minerals. Prereq: 5333 or 5344; and Biochemistry 4120 or Nutrition 5110; or consent of instructor. May be repeated. Maximum 16 hours. F, Sp

6411 Advanced Topics in Animal Breeding (1-6) Recent advances and concepts, research techniques, current problems. May be repeated. Maximum 6 hrs. E

6420 Animal Breeding Research Methods and Interpretation (3) Obtaining valid estimates of genetic parameters in animal breeding studies; least squares adjustment of data; partition of variance; phenotypic, genetic, and environmental correlations; repeatability; heritability; and selection indexes. Prereq: 5410 and 5710. W, A

6910 Seminar (1) Animal nutrition, breeding, physiology and products. May be repeated. Maximum 6 hrs. F, W, Sp

Entomology and Plant Pathology

MAJOR

DEGREE

Entomology and Plant Pathology

M.S.


Associate Professor: E. C. Bernard, Ph.D. Georgia.

Assistant Professors: J. F. Grant, Ph.D. Clemson; B. B. Reddick, Ph.D. Clemson; M. T. Windham, Ph.D. North Carolina State.

The Department of Entomology and Plant Pathology offers concentrations in economic entomology and plant pathology. Students in economic entomology may further specialize in the research areas of crop entomology, medical and veterinary entomology, insect biology, insect pest management, and biological control. Students in plant pathology may further specialize in the research areas of fungal diseases, soil-borne diseases, nematology, and virology. For further information, contact the Department Head.

ADMISSION REQUIREMENTS

The department requires completion of three rating forms from academic or professional persons, a written statement of interest in entomology or plant pathology, and career goals. It is required that applicants for the Master's program have completed (1) general botany or biology, 12 quarter hours; (2) advanced biological sciences, 12 quarter hours; (3) general inorganic chemistry, 9-12 quarter hours; organic chemistry, 4 quarter hours minimum.

DEGREE REQUIREMENTS

Completion of a satisfactory thesis is required. A minimum of 45 quarter hours of gradate credit in courses approved by the student's faculty advisor. Completion of 8 hours for a thesis is required including at least 18 hours of graduate credit in the major exclusive of Thesis 5000. If the student elects a minor, there must be no fewer than 9 nor more than 18 hours of graduate credit in the minor field. Presentation of three acceptable seminars for 1 hour credit each is required prior to completion of program. An oral final exam must be completed to the satisfaction of the committee after the thesis is completed.

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 3160. 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. F, A

4140 Forest Pathology (3) Symptomatology, etiology, epidemiology, and control of forest tree diseases, including wood decay and other diseases important to urban and forest forestry. Prereq: 3130 or Forestry 3060. 2 hrs and 1 lab. F

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

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

5120 Insect Diagnostic Clinic (3) Identification of insects and insect damage to crops, livestock and residences. Obtaining of insects and damaged specimens; diagnostic characteristics and control measures. Prereq: 3210 or Zoology 3130. Su, A

5130 Plant Pathogenic Fungi (4) Morphology, taxonomy, biology, and genetics of plant pathogenic fungi. Isolation and identification of plant pathogenic fungi will be emphasized. Prereq: 3130 or consent of instructor. 2 hrs and 2 labs. W

5210 Plant Parasitic Nematodes (4) Morphology, physiology, taxonomy, and ecology of plant parasitic nematodes. Emphasis on host-parasite relationships. Prereq: 8 hrs biological science or consent of instructor. (Same as Zoology 5210.) 2 hrs and 2 labs. W, A

5220 Plant Disease Control (3) Basic principles and techniques of pest control. Prereq: 3210 or equivalent course in applied entomology. 2 hrs and 1 lab. F, A

5260 Plant Virology (4) Symptomatology, etiology, and epidemiology of virus infection; structure, morphology, replication, transcription, purification, characterization, and classification of plant viruses; serology; plant pathogenic viros, mycoplasmas and spiroplasmas. Prereq: 3130 or consent of instructor. 2 hrs and 2 labs. W, A

5280 Field Crop and Vegetable Insects (3) Taxonomy, biology, and control of insects affecting field and vegetable crops. Prereq: 3210 or equivalent course in applied entomology. 2 hrs and 1 lab. F, A

5300 Special Problems in Entomology (1-6) Comprehensive individual study of current problems. May be repeated. Maximum 9 hrs. E

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

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

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

Food Technology and Science

MAJOR

DEGREES

Food Technology and Science

M.S., Ph.D.

Professors: H. O. Jaynes (Head), Ph.D. Illinois; J. L. Collins, Ph.D. Maryland; S. L. Melton, Ph.D. Tennessee; J. T. Miles (Emeritus), Ph.D. Wisconsin; W. D. Overcast (Emeritus), Ph.D. Iowa State

Associate Professors: P. M. Davidson, Ph.D. Washington State; J. B. DeMott, Ph.D. Michigan State; A. Draughon, Ph.D. D.D. Loveland, Ph.D. Kansas State; J. R. Mount, Ph.D. Ohio State; M. J. Reimann, Ph.D. Kansas State.

The Department of Food Technology and Science offers the Master of Science, degree, and Doctor of Philosophy degree with concentrations in food products, food chemistry and food microbiology. Various commodity interests (dairy, meats, fruits, and vegetables) can be emphasized in all three concentrations by judicious selection of courses and research areas for the dissertation. The option of a minor in a collateral area is available. For detailed information, contact the Department Head.

For admission the student must have a B.S. degree in food technology, food science, or a closely related agricultural or basic science discipline. Graduate school rating forms or letters of recommendation from at least three people familiar with the prospective student's academic ability are required.

THE MASTER'S PROGRAM

A. A thesis is required for the Master's program. Prior to research for the thesis, the student must complete a detailed written research plan. Registration for a minimum of 9 hours of Thesis 5000 is required.

In addition to the thesis requirement, a minimum of 36 hours of graduate coursework is required. This work must be approved by the student's committee and not more than 15 hours of the minimum 45 can be below the 5000 level. The committee may require additional coursework if the student's progress or background indicates such need.

The student is required to include 3 hours of 5100 Seminar, in their program and are expected to develop and write this course and participate in discussions each quarter enrolled. Completion of 5240 or equivalent is also required.

An oral examination covering the thesis and coursework is required.

THE DOCTORAL PROGRAM

1. Satisfactory completion of a Master's degree in the field or of a special qualifying examination is required for admission.
Scores on the GRE aptitude test are also required.

2. A minimum of 168 quarter hours credit beyond the Bachelor's degree, exclusive of the credit for the Master's thesis, is required. Of this number, 36 quarter hours must be in 6000, Doctoral Research and Dissertation.

3. At least 36 quarter hours at the 5000 and 6000 level are required exclusive of Doctoral Research and Dissertation. At least 9 of the 36 hours must be in 6000-level courses.

4. A minimum of 9 hours of courses for graduate credit must be taken outside the Department of Food Technology and Science.

5. All candidates will complete the following courses or their equivalent: 5420, 5530, 5310; Animal Science 5710, 5720; and Nutrition and Food Sciences 5100. All candidates must complete three hours in 6010 and 6410.

6. Each candidate will be required to pass both written and oral comprehensive examinations prior to admission to candidacy. A final oral examination is required which includes a defense of the dissertation and subject matter that the student's committee considers desirable.

5020 Dairy Products I (4) Procurement, processing and distribution of fluid milk. Manufacture of frozen and condensed dairy products. 3 hrs and 1 lab. W

3840 Meat Science (3) Processing methods, carcass characteristics of meat animals; slaughter, cutting, selection, curing, freezing and cookery. 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 special dairy products. Prereq: Nutrition and Food Sciences 3150 or consent of instructor.

4130 Food Chemistry I (3) Minerals, fats, oils, and vitamins in food as affected by processing and storage. Prereq: Nutrition and Food Sciences 3150 or equivalent. 2 hrs and 1 lab. Sp

4140 Food Chemistry II (3) Reactions of proteins, carbohydrates, and fats; colorants in food materials. Protein structure, food enzymology and browning reactions. Effects of storage and processing on the chemical changes that may occur. 3 hrs and 1 lab. W

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

4210 Food Additives (3) Substances used in food manufacturing with emphasis on properties and functions. Prereq: Nutrition and Food Sciences 3140 or equivalent. F

4310 Food Packaging (3) Characteristics and application of materials and containers to packaging requirements and methods of packaging foods. Prereq: 3200. 2 hrs and 1 lab.

4400 Food Processing II (3) Design of food quality assurance programs with emphasis on sanitation. Application of general analytical techniques, regulations and unit operations to quality control in food industry. Prereq: 3819. 3 hrs and 2 labs.

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

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

4810 Food Microbiology I (4) Standard methods for examination, culture, and identification of bacteria associated with food processing, food spoilage, and food poisoning. Prereq: 3810. 2 hrs and 2 labs. W

4840 Meat Products Manufacturing (3) Prepared meat products with emphasis on meat inspection, processing, packaging and merchandising. Prereq: 3840. F, A

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

5100 Seminar I (1-3) 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 and Food Sciences 3140 or equivalent. 2 hrs and 1 lab. SP, A

5130 Food Enzymology (3) Commercial and native enzymes in manufacturing, processing, and spoilage of food. Prereq: Nutrition and Food Sciences 3150 or equivalent. 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: 4510. 2 hrs and 1 lab. W, A

5150 Fats and Oils (3) Application of scientific principles to commercial technology of fats and oils. Prereq: 4150. 2 hrs and 1 lab. W, A

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

5310 Food Products Development (3) Fundamentals of food science, application of research, and science to food product development. Prereq: 4510. 5-10 hrs. E

5320 Food Thermobiology (3) Fundamentals of food processing techniques as related to rate of destruction of microorganisms and to rate of loss of food quality through changes induced by processing. Prereq: 4200. Prereq: 4510. 2 hrs and 1 lab. F

5500 Meat Technology (3) Physical and chemical properties of meats, including burning, browning, and frying of meat. Prereq: Nutrition and Food Sciences 5100 or consent of instructor. SP, A

5510 Meat Technology (3) Physical and chemical changes that occur during conversion of muscle to meat; the influence these changes have on quality and composition; meat packaging, preservation, and quality control. Prereq: 3840. 2 hrs and 1 lab. Sp, A

5530 Advanced Food Microbiology (3) Identification of desirable and undesirable microorganisms in food products and relationship to food manufacturing operations. Isolation and characterization of microorganisms from food products and plant equipment. Prereq: 4810 or Microbiology 3810. 3 labs. Sp

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

6010 Advanced Topics in Food Technology and Science (1-3) Selected readings, discussions and presenters of current topics; topics to be announced in advance. May be repeated. Maximum 6 hrs. S/NC only. F, W, Sp

6410 Advanced Food Processing (3) Role of processing treatments in modification of food properties; texture, color, and flavor characteristics. Prereq: 5120, 5140, and Food Science 5510 or consent of instructor. Sp, A

6810 Food Toxicology (3) Basic and applied concepts in food toxicology: toxicological aspects of processed foods. Mode of action, prevention, and control of food toxicants. Prereq: 4140, 5310, 5530 or consent of instructor.

Forestry, Wildlife and Fisheries

MAJORS

DEGREES

Forestry

M.S.

Wildlife and Fisheries Science

M.S.

Graduate study leading to the Master of Science degree in Forestry and Wildlife and Fisheries Science is offered by the Department of Forestry, Wildlife, and Fisheries. The Master of Business Administration, with a concentration in Forest Industries Management, is available for qualified students. This degree program is offered by the College of Business Administration with participation by the Department of Forestry, Wildlife, and Fisheries.

The Doctor of Philosophy with a major in Ecology can be achieved through arrangements with the University's Graduate Program in Ecology.

THE MASTER'S PROGRAMS

Both a thesis and non-thesis option are available for the major in Forestry; a thesis is required in Wildlife and Fisheries Science. For admission the student must have a Bachelor's degree from an accredited institution in forestry, wildlife and fisheries or another natural resource area.

Applicants must also have taken the GRE exam. Graduate School rating forms or letters of recommendation from three individuals familiar with the applicants academic ability are required. The department head has the authority to approve an application which must be submitted at the time of application to The Graduate School.

Thesis Option:

1. Prior to research for the thesis, the student is required to develop a detailed written research proposal. Registration for a minimum of 9 hours of Thesis 5000 is required.

2. A graduate committee of no fewer than 3 faculty members must be selected by the student in the 6th quarter of residence. In addition to the thesis requirement, a minimum of 36 hours of graduate coursework is required.
This work must be approved by the student's committee and no more than 15 hours of the minimum 45 can be below the 5000 level. The committee may require additional coursework if the student's progress or background indicates such need.

3. Four or more times are required to include Forestry or Wildlife and Fisheries 5310, Seminar, in their programs. This is required of each graduate student in residence Winter Quarter.

4. An oral examination covering the thesis and coursework is required.

Non-Thesis Option (Forestry only):
1. Fifty hours of graduate coursework of which 25 hours must be at the 5000 level or above is required.
2. An advisory committee of no fewer than 3 faculty members will be selected. At least one member in addition to the major professor will be from the department. The committee will meet and schedule the student's program during the first quarter in residence.
3. Three hours of Forestry 5011 is required.
4. Twelve hours of coursework in the department must be at the 5000 level or above, exclusive of Forestry 5011.
5. Final comprehensive written and oral examinations shall be taken upon completion of no fewer than 42 hours of approved study.

Forestry

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

3240 Forests and Trees of Eastern North America (4) Botany and genetics of major families and associations of North America east of Great Plains; ecology, silviculture, and management of trees and shrubs. Identification, nonmammalian and non-ruminant herbivores, soil and climate variables as they control species and population structure; silvicultural laws. Prereq: 8 hrs basic biology of botany. 2 hrs and 1 lab. F

3210 Forest Measurements and Biometry (4) Measurement of individuals in animal and plant populations; basic population ecology; sampling of forest populations; growth and potential production. Prereq: Plant and Soil Science 3610, 3 hrs and 1 lab. W

3210 Wood Technology (2) Fundamental structure, properties and uses of wood. Prereq: 3040 and 3050. (3050 may be taken concurrently.) 2 hrs and 2 labs. W

3212 Wood Identification (2) Macro and micro identification of important commercial softwoods, hardwoods, and foreign woods. Will include student use of microscopes, stereo microscopes, and an interactive wood identification program on University computing system. W

3220 Forest Products and Utilization (3) Harvesting, processing, marketing factors in stand conversion, intermediate and harvest cuts. Prereq: 3120. Sp

3220 Principles of Silviculture (3) Influence of site factors on reproduction, growth, development, and succession of forest vegetation; classification of forest structures; silvicultural laws. Prereq: 3020, 3040, Plant and Soil Science 2130. W

4002 Utilization (3) Wood-using industries; processing forest products—sawmills, mill-log kerf grading; pulpwood operations, flooring plants, treating plants; plant layout; flow diagrams. Prereq: 3120 or consent of instructor. Sp

4003 Field Methods of Timber Inventory (4) Field measurement of timber inventory; identifying and sampling trees, determining appropriate sample design for specific purposes; trees and stand growth; site evaluation; field problems. Prereq: 3110 and Agriculture Mechanization 3140. Sp

4004 Forest Practice (3) Management of forest lands by public and private organizations; "multiple-use" concept as it influences management decisions; impact of public participation in management decisions; management prescriptions. Prereq: 3260, 4006. S/NC only. Sp

4006 Silvicultural Methods (4) Methods and application of intermediate and regeneration cuttings; site preparation, planting and seeding, modifications of cutting methods to obtain desired goods and benefits. Prereq: 3060, 3220, 4002, 4003. Sp

4200 Forest Watershed Management (3) Water as a resource; role of forests in the hydrologic cycle; control of water quantity, quality and regimen; watershed planning. Prereq: 3260 or consent of instructor. Two overnight field trips. W

4210 Forestry Organization and Administration (3) Planning, organizing, and leadership concepts and cases; problem analysis and decision making in forest resources management. Prereq: Consent of instructor. 2 hrs and 2 labs. W

4220 Forest Resource Management (3) Decisionmaking principles, forestry as integration of resource uses. Models of forestry as system; concepts of forest finance and valuation; taxation of forest firm. Prereq: 4150. W

4230 Forest-Resource Management Plans (4) Field problems and case studies in forest-resource management; the forest as a system; management of forest enterprises as a producer of timber, recreational services, watershed services, and wildlife; producing multiple services; preparation of a complete plan based on optimizing forest uses. Prereq: 4210. Sp

4240 Interpreting Forest Resources (3) Principles and techniques of interpreting forest resources; importance of natural meaning in interpretation of management of forest resources. Prereq: 3240 or equivalent. 2 hrs and 1 lab. Sp

4230 Forest Policy (3) History of forestry in United States with emphasis on development of forest resources policies; current policies influencing development and management of forest resources; brief survey of policy implications of forest resource organizations in public and private sectors. Prereq: 4004. W

4340 Aerial Photography in Forest-Resource Management (3) Use of conventional aerial photographs for measurement of forest trees; timber cruising; determination of timber, lumber, pulp and paper, wood composites, and the effect of forest management on the commercial drying practices. Relationship of wood moisture content to attack by wood destroying organisms. Methods and applications of wood moisture content techniques. Prereq: 3120, Mathematics 1851, Physics 1220, or consent of instructor. 3 hrs and 1 lab.

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

4430 Regional Silviculture of the United States (3) Factors that influence silviculture management of important tree species in North America. Importance of forests and forest management to a region; climate, geography, soils; climate and weather conditions; sites and site types, ecoregions, biomes; and land use characteristics of the more important species. Prereq: 4006 or consent of instructor. W

4440 Forest Recreation (3) Forest lands as a recreation resource; the interrelationships of forest recreation and marketing; development and management of forest recreation areas; socioeconomic and political determinants of recreation development and management; and market structure for various sectors; timber, lumber, pulp and paper, wood composites, and the effect of forest management on the commercial drying practices. Relationship of wood moisture content to attack by wood destroying organisms. Methods and applications of wood moisture content techniques. Prereq: 3120, Mathematics 1851, Physics 1220, or consent of instructor. 3 hrs and 1 lab.

4450 Wood Composites and Gluing (4) Fundamentals of plywood and composite product manufacturing. Wood adhesive technology. Application of gluing to manufacturing processes of plywood and composite products. 3 hrs and 1 lab. W

4540 Wood Drying and Preservation (4) Concepts of wood drying including wood-moisture relations, specific gravity, moisture content, density, and shrinkage. Common drying practices. Relationship of wood moisture content to attack by wood destroying organisms. Methods and applications of wood moisture content techniques. Prereq: 3120, Mathematics 1851, Physics 1220, or consent of instructor. 3 hrs and 1 lab.

4550 Forest Composites and Gluing (4) Fundamentals of plywood and composite product manufacturing. Wood adhesive technology. Application of gluing to manufacturing processes of plywood and composite products. 3 hrs and 1 lab. W

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 have 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 Problem Analysis in Forest Resources (3) Problem identification, analysis and solution in forest resources management. Identify, analyze, and prepare written reports on a problem. Topic and report 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. E

5110 Special Problems in Forestry (1-15) May be repeated. Maximum 99 hrs. E

5220 Seminar in Forest Tree Biology (3) Growth, reproduction, and physiology of forest trees; forest ecology; variability and taxonomics of forest trees. Prereq: 3220 or Botany 4310. F, A

5230 Seminar in Forest Management (3) Newly developed systems in forest management; recreation management (3) Use of conventional aerial photographs for measurement of forest trees; timber cruising; determination of timber, lumber, pulp and paper, wood composites, and the effect of forest management on the commercial drying practices. Relationship of wood moisture content to attack by wood destroying organisms. Methods and applications of wood moisture content techniques. Prereq: 3120, Mathematics 1851, Physics 1220, or consent of instructor. 3 hrs and 1 lab.

5240 Seminar in Forest Genetics (3) Population genetics and speciation, variation patterns and heritability in forest trees; genetic differences are determined by different breeding methods; planning and conducting forest genetics research. Prereq: 4420, Biology 3110, and consent of instructor. W, A

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

5280 Industrial Forestry (3) Structure and analysis of wood-using firms and industries. Forest taxation, land tenure and wood procurement alternatives. Development and application of forestry planning models. Prereq: 4230 or consent of instructor. W

5270 Topics in Forest Industries Management (3) Current problems in industrial forestry. Executives from public and private business sector (concerted with forest industries) shall discuss recent topics. Prereq: 4230 or consent of instructor. F

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

5810 Cyto genetics (4) Same as Botany 5810. *Graduate credit for non-forestry and non-wildlife and non-forestry majors only.

Wildlife and Fisheries Science

3320 Wildlife Management (3) Lives and ecological relationships of wild animals; biological, social, and economic aspects of their management. 2 hrs and 1 lab. F

4450 Game Mammals (4) Classification, identification, distribution, natural history, and management principles of game mammals in North America. Prereq: 3320 or 1 yr of zoology. 2 hrs and 2 labs. F

4460 Game Birds (4) Biology, classification, identification, distribution and management of game birds in North America. Prereq: 3320 or 1 yr of zoology. 3 hrs and 1 lab plus one weekend field trip. W

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

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

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

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

5210 Seminar in Wildlife Conservation (3) Current studies, problems and issues in wildlife agencies and organizations and their programs. Prereq: 3320 or consent of instructor. W, A

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

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

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

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

5500 Advanced Topics in Fishery Science (3) Recent advances and concepts, research techniques and analysis of current problems. Prereq: 4520 or consent of instructor. May be repeated. Maximum 6 hrs. Sp, A

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

Ornamental Horticulture and Landscape Design

MAJOR

Ornamental Horticulture and Landscape Design M.S.


The Department of Ornamental Horticulture and Landscape Design offers the Master of Science degree with specialization in floricultural science and technology, nursery science and technology, or turf science and technology. Various science and technology interest such as micropropagation, innovative ornamental plant production systems and computer aided maintenance and production management systems can be emphasized in the program. The emphasis of specialization by judicious selection of courses and research objectives for the thesis.

For admission the student must have a B.S. degree in ornamental horticulture, horticulture, plant science or closely related agricultural or basic science discipline and must have the undergraduate transcript evaluated by the department for prerequisite requirements, if any. Graduate research assistantships are available on a competitive basis. For further information, contact the Department Head.

THE MASTER'S PROGRAM

1. A thesis is required for the M.S. program. Prior to research for the thesis, a proposal must be approved by the Master's committee. Registration for a minimum of 9 hours of Thesis 5000 is required.

2. In addition to the thesis requirement, a minimum of 36 hours of graduate credit is required. Not more than 15 hours of the minimum 45 hours can be below the 5000 level. The academic program must be approved by the Master's committee which may require additional course work if the student's progress or background indicates such need.

3. All students are required to include 3 hours of 5500, Seminar, in their program and are expected to attend this course and participate in discussions each quarter enrolled.

4. An oral examination covering the thesis and coursework is required.

3030 Plant Propagation (3) Physiology, methodolo- gies, and environment requirements for propagation. Prereq. 8 hrs of biological science. 2 hrs and 1 lab. F

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

3620 Intermediate Landscape Design (4) Application of skills acquired in 3610 to variety of landscape projects. Refinedment of graphic skills. History of land- scape design related to contemporary applications. Technical aspects of planting design and implemen- tation. Use of plant materials in the design of small and moderate scale landscape situations. Prereq: 3610, 3810 or equivalent. 1 hr and 2-3 hr labs. F, W

3630 Landscape Construction and Contracting (4) Construction methods, materials and practices of land- scape installation and contracting. Site layout procedures, earthwork and drainage, landscape construc- tion materials: installation design drawings and small scale projects. Landscape con- tracts, specifications and bidding procedures. Prereq: 3310, 3610; Agricultural Mechanization 2130 recom- mended. 1 hr and 2-3 hr labs. Sp

4150 Nursery Production (4) Modern methods of producing liners, field and container grown woody ornamental plants. History and evolution of nursery industry and modern production practices in woody ornamental plants. Prereq: 3610, 3610; Plant and Soil Science 2130. 2 hrs and 2 labs. F, Sp

4160 Nursery Management (3) Modern management methods for wholesale and retail nurseries, garden centers, and landscape contracts. Prereq: 3310. 2 hrs and 1 lab. W

4180 Park Design (4) Design criteria for parks and outdoors recreation systems. Park site selection, analy- sis, planning and management as related to needs and natural and economic resources. Evaluation of aesthetic and functional quality of parks and their impact on environmental quality of rural and suburban communities. Prereq: 3610. 2 hrs and 2 labs. Sp

4190 Advanced Landscape Design (4) Comprehensi- ve application of landscape design skills and knowledge through development of landscape design projects. Computer graphics, plant tissue for microscopic examination, paraffin and plastic embedding, microtomy and mounting of sections and blocks. Prereq: 3610. 2 hrs and 1 lab. W

4220 Advanced Turfgrass Management (4) Princi- pal studies of turfgrass culture: adaptation to climate, soil and site conditions, nutrient and water management, conquest of pest infestations and control measures. Prereq: 3130. 3 hrs and 1 lab. W

4320 Specialty Floriculture (3) Specific practices in production on minor cut flower and potted plant crops. Production methods for scheduling flowering or veg- etative growth of specialty florist crops in controlled environments. Prereq: 3410. 2 hrs and 1 lab. W

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

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

5100 Special Problems in Ornamental Horticulture and Landscape Design (1-5) May be repeated. Maximum 15 hrs. F

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 nutriti- onal, chemical, and mechanical maintenance. Financing, equipment, labor management, and public relations. Prereq: 4220 and consent of instructor. 2 hrs and 2 labs. Sp

5410 Histological Microtechnique (4) Preparation of plant tissue for microscopic examination, paraffin and plastic embedding, microtomy and mounting of sec- tions, dyes and staining schedules and photography. Prereq.: General biology or botany; general and organ- ic chemistry; and consent of instructor. 2 hrs and 2 labs. W

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

5610 Advanced Nursery Production (4) Preparation and use of growing media for ornamental plants; nutrition of ornamental plants including diagnosis, prevention and control of mineral deficiencies; develop- ment of fortifications of fungi for container and field grown ornamentals. Prereq: 4150, Plant and Soil Science 3110; Botany 3210. 3 hrs and 1 lab. W

*Graduate credit for non-majors only.
Plant and Soil Science

MAJOR DEGREES
Plant and Soil Science M.S., Ph.D.


Associate Professors: F. L. Allen, Ph.D. Minnesota; D. E. Dayton, Ph.D. North Carolina State; R. M. Hayes, Ph.D. Illinois; W. A. Kruiger, Ph.D. Illinois; D. A. Lettkce, Ph.D. Michigan State; G. M. Lessman, Ph.D. Michigan State; R. J. Lewis Ph.D. North Carolina State; V. H. Reich Ph.D. Iowa State; C. E. Sams, Ph.D. Michigan State; D. D. Tyler, Ph.D. Kentucky; D. R. West, Ph.D. Nebraska; J. D. Wills, Ph.D. Auburn.

Assistant Professors: J. G. Gravey, Ph.D. Purdue; G. N. Rhodes, Jr., Ph.D. North Carolina State.

The Department of Plant and Soil Science offers graduate programs leading to the Master of Science and Doctor of Philosophy degrees. Concentrations for the doctoral program are offered in soils, plant breeding and genetics, and crop physiology and ecology.

For further information, contact the Chairman of the Admissions Committee.

THE MASTER'S PROGRAM

A thesis is required for this M.S. program. Registration for a minimum of 9 hours of 5000 level courses is required. An oral examination covering the thesis and coursework is required.

THE DOCTORAL PROGRAM

A minimum of 108 quarter hours beyond the Bachelor's degree, exclusive of credit for the Master's thesis, is required. A minimum of 39 quarter hours must be completed in courses numbered above 5000 exclusive of Doctoral Research and Dissertation, of which 9 must be in courses numbered above 6000.

• 5310 Design and Interpretation of Experiments (4) Experimental design and procedures; field plot techniques; analysis and interpretation of data from agricultural experiments; linear models and contrasts; regression analysis; complete block designs and Latin squares; treatment arrangements; combined analyses. Prereq: 3610 or equivalent; a computer science course or UTCC SAS short course. W

• 5340 Soil Physics (4) Physical and chemical relationships among soil, liquid, and gaseous phases of soil system and their relation to density, moisture, aeration, and plant growth. Prereq: 2130, soil thermodynamics; physically characterize a soil. Prereq: 4110 or consent of instructor. 3 hrs and 1 lab. W, A

• 5370 Advanced Soil Fertility (3) Concepts of soil chemistry as they relate to nutrient absorption by plant roots; interaction of these concepts to soil fertility; plant analysis and soil management. Prereq: 4110. W, A

• 5350 Advanced Soil Chemistry (3) Structural properties of soil minerals determining physicochemical reactions, ion exchange. Donnan Equilibrium, double layer theory. Prereq: 4110 or consent of instructor. Sp.

• 5600 Seminar (1) May be repeated. Maximum 3 hrs. F, W

• 5710 Advanced Plant Genetics (3) Mutation systems: controlling elements, induced mutations, genome organization, polyploidy, tetrasonic inheritance, extrachromosomal inheritance, cytoplasmic systems, and genetic engineering of higher plants. Prereq: Basic genetics or consent of instructor. F, A

• 5720 Quantitative Genetics (3) Genetic constitution of populations and changes in gene frequency; recognition and measurement of continuous variation; estimation of variable components and genetic advance under different breeding procedures. Prereq: Biology 3110 or equivalent; 3610 or equivalent. W, A

• 5750 Advanced Plant Breeding (4) Developing breeding programs: objectives; historical and theoretical development of concepts of components of variation, heritability, selection intensity, methods of selection, linkage in relation to selection, genotype by environment interaction, and genetic resistance and vulnerability to pests. Prereq: 4129, 5310 or concurrent registration, or consent of instructor. 3 hrs and 1 lab. W, A

• 5760 Advanced Plant Breeding II (4) Concepts and utilization of heterosis, inbreeding, stability parameters, selection indices, methods of selection, and germplasm resources in breeding program for improvement of plant species. Prereq: 5750 or consent of instructor. 3 hrs and 1 lab. Sp. A

• 5810 Advanced Crop Climatology and Ecology (4) Quantification of climatic and meteorological factors affecting plant growth; world climates, crop distribution and productivity, and their interaction; general and specific relations among environmental factors, crop organisms and agricultural systems. Prereq: 3610 or equivalent; 4410, or Botany 3210 or 4310. 3 hrs and 1 lab. F, A

• 5820 Advanced Crop Physiology (4) Photosynthetic efficiency in field and relationships with evapotranspiration, Harding development and tolerance for field stresses: drought, cold, heat, flooding, Photoperiodism, flowering, and seed production. Nitrogen-fixing relations of bacteria with legumes and grasses. Prereq: 4410. 3 hrs and 1 lab. W, A

• 5840 Postharvest Physiology (3) Preharvest and postharvest factors affecting quality of stored fruits and vegetables. Synthetic and degradation processes in maturation and ripening of plants. Indices of plant maturation and quality. Handling and storage techniques for fruits and vegetables. Prereq: 4410. F, A


• 5855 Plant Growth Regulation and Control (1) Laboratory course in plant growth, regulation and
control under field, greenhouse, laboratory and storage environments. Prereq or coreq: 5840, 5850, or 5860. May be repeated. Maximum 4 hrs. E

5860 Growth Control with Chemicals (3) Character, theories of action and use of plant growth regulators with special emphasis on practical aspects of use for controlling plant growth, development and metabolism to increase efficiency and production of agricultural and horticultural crops. Special consideration to current commercial uses. Prereq: Botany 5210 or equivalent. W. A

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

6100 Topics in Soil Sciences (1-3) Student needs and interests determine course content. Thermodynamics of soil solutions, clay structure and surface chemistry, soil mineralogy, plant mineral nutrition, soil microbiology, water movement and use by plants, soil structure, soil thermal properties, interaction in the soil-plant environment. May be repeated. Maximum 9 hrs. E

6200 Topics in Plant Breeding and Genetics (1-3) Student needs and interests determine course content. Genotypes by environment interactions, estimation of quantitative parameters, mutations, chromosome dynamics, polyploidy, genetic engineering, interspecific hybridization, linkage, screening methods, genome organization. May be repeated. Maximum 9 hrs. E

6300 Topics in Crop Physiology and Ecology (1-3) Student needs and interests determine course content. Microclimatology of agroecosystems, crop dormancy and responses to stress, physiology of crop growth and reproduction, Interactions of physiology and germplasm in crop production, theory and application of quantitative methods in crop physiology and ecology research. May be repeated. Maximum 9 hrs. E

6410 Experimental Designs (3) Principles of balanced and unbalanced designs used in agricultural research: use of linear models, dummy variables, simple and multivariate linear models, response surface analysis, multiple regression, heterogeneity of slopes, and other techniques. Prereq: 5310 and 5310 or equivalent. F, A

6510 Topics in Organismic Evolution (1-3) May be repeated. Maximum 9 hrs. F

6700 Animal Behavior (3) Character, theories of action and use of animal behavior in animal practice. The majority of these are in general practice which deals with the diseases of all kinds of animals. About one-fourth of the veterinarians in the United States are engaged exclusively in pet or companion animal practice. A growing number are concerned with the health problems of zoo animals, laboratory animals, wildlife, and aquatic species.

Veterinarians also find rewarding careers in the U.S. Public Health Service, the U.S. Army and Air Force, and in state, county, or local health agencies. A large number of veterinarians are employed by the U.S. Department of Agriculture and by state departments of agriculture for important work in livestock disease control, meat and poultry inspection, serum and vaccine production, and the protection of our country against the importation of foreign animal diseases.

Excellent opportunities exist for veterinarians interested in research, both research for the direct benefit of animals and research conducted with animals but for the benefit of humans. Such opportunities are available at colleges and universities and with governmental agencies, private research institutions, and biological and pharmaceutical companies.

FACILITIES

Administrative offices of the College of Veterinary Medicine are located in Morgan Hall on the agricultural campus. The Department of Animal Science is housed in Brehm Animal Science Building, also on the agricultural campus, and the Department of Microbiology is located in Walters Life Sciences Building on "The Hill" of the University of Tennessee, Knoxville.

The Veterinary Medicine Building on the agricultural campus houses the departments of Environmental Practice, Rural Practice, Urban Practice, and Pathobiology. Additionally, the Veterinary Teaching Hospital, clinics, and the Agriculture/Veterinary Medicine Library are contained within this modern structure of 246,000 gross square feet.

The college has research facilities on Cherokee Farm adjacent to the UT Hospital. Satellite teaching-research facilities are located in Middle and West Tennessee.

ADMISSION REQUIREMENTS

Admission to the professional program of the College of Veterinary Medicine is limited to that number for which an education of high quality can be provided with the resources available to the college.

To qualify for admission, a candidate must have completed at least the following minimum pre-veterinary requirements:

- **Subjects**
  - Minimum Credits
  - **Quarter Semester**
  - English, including speech
  - 12
  - 8
  - Humanities
  - 12
  - 8
  - Social Sciences
  - 12
  - 8
  - Mathematics through introductory calculus
  - 6
  - 8
  - Chemistry: general
  - 12
  - 8
  - Organic
  - 12
  - 8
  - Biochemistry
  - 6
  - 4
  - Physics
  - 12
  - 8
  - Biology or zoology
  - 12
  - 8
  - Microbiology
  - 4
  - 3
  - Animal science, including nutrition and genetics
  - 13
  - 9

*Includes history, literature, music or art appreciation, philosophy, religion, or foreign language.
*Includes economics, anthropology, political science, psychology, sociology, and geography.
*Excluding laboratory.

Pre-veterinary requirements may be completed in any accredited college or university which offers courses equivalent to those at The University of Tennessee.

The Colleges of Agriculture and Liberal Arts of The University of Tennessee offer a three-year pre-veterinary curriculum which satisfies all the course requirements for admission to the College of Veterinary Medicine. Students who are admitted to the College of Veterinary Medicine following completion of this pre-veterinary curriculum will receive a bachelor's degree upon completion of the first year (three quarters) of the professional veterinary medicine curriculum.

ADMISSION PROCEDURE

Admission of new students will be for the fall quarter of each year. Applicants will be screened carefully by a faculty committee to determine those best qualified for admission within the college enrollment quota.

Applicants will be considered in the following order of priority: (1) residents of Tennessee; (2) residents of other states.

Forms and instructions for making application for admission may be obtained from:

Director of Admissions
202 Student Services Building
University of Tennessee
Knoxville, Tennessee 37996-0200

Applications must be completed and mailed so as to reach the Director of Admissions by January 15 each year. All pre-veterinary requirements must be completed by the end of the spring term of the year in which the student plans to enroll in the College of Veterinary Medicine.

COURSE LOAD

The professional curriculum of the College of Veterinary Medicine requires a specific number of hours each quarter. A student may enroll for fewer or more than that number only with the permission of the dean. Because of the sequential and highly integrated character of the professional curriculum, all courses in a given quarter are considered prerequisite to those in the succeeding quarter.
EXTRAMURAL PROGRAMS

The opportunity to participate in off-campus learning experiences may be available for a limited number of students during the latter half of the final year of the professional curriculum. Selection of an extramural learning experience will require approval by the department concerned and the College of Veterinary Medicine Curriculum Committee. The extramural program identified by the student must represent a learning experience not available within The University of Tennessee, Knoxville.

PROFESSIONAL CURRICULUM

The professional curriculum in veterinary medicine is an 11-academic quarter, year-round program, including summers. The first year (three quarters) consists mostly of preclinical subjects such as anatomy, physiology, microbiology, parasitology, and general pathology. The second year (four quarters) includes the study of diseases, their causes, diagnosis, treatment, and prevention. The final calendar year is devoted to intensive training in the solving of animal disease problems, including extensive clinical experience in the teaching hospital. The curriculum also provides for education in the science and art of veterinary medicine and in paramedical subjects such as animal behavior, medical communication, professional ethics, jurisprudence, economics, and practice management.

Only students officially enrolled in the professional veterinary curriculum may register for 8000-level courses.

<table>
<thead>
<tr>
<th>Quarter, Year</th>
<th>Course Code</th>
<th>Hours</th>
<th>Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall Quarter, FIRST YEAR</td>
<td>Vet. Animal Science 8510</td>
<td>5</td>
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<tr>
<td></td>
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<td>Microbiology 8101</td>
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<td></td>
<td>Animal Science 8250</td>
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<td>4</td>
</tr>
<tr>
<td></td>
<td>Environmental Practice 8611</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Winter Quarter, FIRST YEAR</td>
<td>Vet. Animal Science 8520</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Microbiology 8102</td>
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<tr>
<td>Spring Quarter, FIRST YEAR</td>
<td>Microbiology 8103</td>
<td>4</td>
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<tr>
<td></td>
<td>Pathobiology 8730</td>
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<td>Veterinary Medicine 8306</td>
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<td>Veterinary Medicine 8311</td>
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<td>Environmental Practice 8612</td>
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<td>Summer Quarter, SECOND YEAR</td>
<td>Veterinary Medicine 8341</td>
<td>5</td>
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<td></td>
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<tr>
<td></td>
<td>Veterinary Medicine 8353</td>
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TOTAL: 5 weeks

FREE TIME

20 hours

Fall Quarter, SECOND YEAR

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<td>Vet. Medicine 8366</td>
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</tr>
<tr>
<td>Vet. Medicine 8344</td>
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Winter Quarter, SECOND YEAR

<table>
<thead>
<tr>
<th>Course Code</th>
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<th>Credit</th>
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<tr>
<td>Vet. Medicine 8360</td>
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<td>Vet. Medicine 8381</td>
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<td>Vet. Medicine 8351</td>
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<td>Vet. Medicine 8385</td>
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<td>Vet. Medicine 8345</td>
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23 hours

Spring Quarter, SECOND YEAR

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<th>Course Code</th>
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<th>Credit</th>
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<tbody>
<tr>
<td>Vet. Medicine 8370</td>
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<td>Vet. Medicine 8371</td>
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<tr>
<td>Vet. Medicine 8372</td>
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21 hours

TOTAL: 87 hours

THIRD YEAR

Basic Sequence roughly equivalent to Summer and Fall Quarters

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<tr>
<th>Course Code</th>
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<tbody>
<tr>
<td>Core Block -9 weeks</td>
<td>4 hrs and 1 demonstration</td>
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<tr>
<td>Environmental Practice 8600-2 weeks</td>
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<tr>
<td>Pathobiology 8700-2 weeks</td>
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<tr>
<td>Radiology 8401-2 weeks</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>Special Services 8402-2 weeks</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>Rural Practice-8 weeks</td>
<td>12-16</td>
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<tr>
<td>Urban Practice-8 weeks</td>
<td>12-16</td>
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<tr>
<td>Seminars</td>
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Advanced Sequence (roughly equivalent to Winter and Spring Quarters)

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<tr>
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<tbody>
<tr>
<td>Core Block -9 weeks</td>
<td>4 hrs and 1 demonstration</td>
<td>4</td>
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<tr>
<td>Pathobiology 8700-2 weeks</td>
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<tr>
<td>Radiology 8401-2 weeks</td>
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<tr>
<td>Free Time-5 weeks</td>
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<td>Rural Practice-9 weeks</td>
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<tr>
<td>Urban Practice-9 weeks</td>
<td>16</td>
<td>5</td>
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Third Year Credits 82

TOTAL: 232 hours

1 From 2 to 20 credits of Advanced Sequence training may be waived for a limited number of deserving students with convincing proposals for special intramural or extramural study.

GRADUATE PROGRAM

The College also administers a graduate program involving all departments and leading to the Master of Science (M.S.) and Doctor of Philosophy (Ph.D.) degrees. Because of the interdisciplinary departmental administration of the College of Veterinary Medicine, the faculty have opportunities in the graduate programs of other instructional units, including Animal Science (nutrition and physiology), Microbiology (bacteriology, virology and immunology), Ecology (environmental toxicology), Public Health, and Comparative and Experimental Medicine. (Refer to other sections of this catalog for a full description of these programs.) The majority of the graduate students and graduate faculty of the College of Veterinary Medicine are involved in the Comparative and Experimental Medicine program (see page 103). This program provides a wide science spectrum of interdisciplinary training that prepares graduates to assume positions in biomedical environments and in teaching or research capacities involving humans or animals.

Departments of Instruction

Animal Science—Veterinary Medicine

Professors:
- O. D. Richardson (Head), Ph.D., Ohio State; K. M. Barth, Ph.D., Rutgers; M. C. Bell, Ph.D., Oklahoma State; J. K. Bircher (Emeritus), Ph.D., Ohio State; C. C. Chamberlain (Emeritus), Ph.D., Iowa State; B. H. Erickson, Ph.D., Kansas State; O. G. Hurl (Dean), Ph.D., Iowa State; S. L. Hansard (Emeritus), Ph.D., Florida; E. R. Lidov, M.S., Tennessee; G. M. Merriman (Emeritus), D.V.M., Michigan State; T. P. McDonald, Ph.D., Tennessee; J. B. McLaran, Ph.D., Auburn; J. K. Miller, Ph.D., Georgia; M. J. Montgomery, Ph.D., Wisconsin; R. L. Mumford (Emeritus), Ph.D., Wisconsin; H. V. Shirley, Ph.D., Illinois; R. R. Shroyde, Ph.D., Iowa State; R. L. Tugwell (Emeritus), Ph.D., Kansas State.

Associate Professors:
- W. R. Backus, Ph.D., Tennessee; H. Eiler, D.V.M., Ph.D., Illinois; B. R. Bell, Ph.D., Ohio State; J. P. Hilkovich, Ph.D., Michigan State; H. G. Kattesh, Ph.D., Virginia Polytechnic Institute; F. D. Masinck, Ph.D., Kansas State; K. R. Robbins, Ph.D., Illinois; M. H. Sims, Ph.D., Auburn; J. C. Walter, Ph.D., Nebraska.

Assistant Professors:
- B. R. Bell, Ph.D., North Carolina State; W. C. Cullen, Ph.D., Minnesota; J. D. Godkin, Ph.D., Massachusetts; R. W. Heitmann, Ph.D., Maine; S. P. Oliver, Ph.D., Ohio State; T. W. Schultz, Ph.D., Tennessee; J. D. Smalling, Ph.D., Texas A&M.

In addition, academic expertise of staff members at CARL and Oak Ridge is used on appropriate occasions.

PROFESSIONAL COURSES

8240-50 Veterinary Physiology (5.5) Introduction to concepts and problems in physiology which form a base for clinical applications and for formal training in pharmacology, medicine, pathology, and surgery. Order of sequence: Cellular, cardiovacular, digestive, renal, respiratory, and endocrine physiology. 4 hrs and 1 demonstration. F, W.

8510-20 Veterinary Histology/Embryology (4.5) Cytology, histology and anatomy of animal body systems, structural and functional interrelationships. Embryonic development from fertilization and origin of congenital defects. Correlated with 8510-20. F, W.

8570 Special Problems in Animal Science (2-20) Certain topics in anatomy, histology and physiology. May be repeated. W, Sp.


GRADUATE COURSES

Additional courses listed in College of Agriculture, Department of Animal Science.

5530 Mammalian Organography (5) Microscopic study of structure of organs of major organ systems. Prereq: Zoology 3320 or equivalent. 3 hrs and 5 labs. W.

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

Microbiology—Veterinary Medicine

Professors: A. Brown (Head), Ph.D. Chicago; R. W. Beck, Ph.D. Wisconsin; J. M. Becker, Ph.D. Cincinnati; J. H. Courhey, Ph.D. Chicago; P. L. Fidock, M.D. Maryland; W. S. Hargrove, Ph.D. Yale; B. T. Rouse, B.V.S. University of Bristol (England); Pr. University of Guelph (Canada); J. M. Woodward (Emeritus), Ph.D. Kansas; C. J. Wust, Ph.D. Indiana.

Assistant Professors: D. A. Barks, Ph.D. Cornell; D. A. Brian, D.V.M., Ph.D. Michigan State; G. S. Sayler, Ph.D. Idaho.

Assistant Professors: R. M. Moore, Ph.D. Texas-Austin; K. M. Sotkin, Ph.D. Michigan State; G. Stacey, Ph.D. Texas-Austin.

PROFESSIONAL COURSES

8101 Veterinary Bacteriology and Mycology (5) Pathogenesis of bacterial and fungal diseases. Taxonomic study relating microbial structure, metabolism, and genetics to patterns of disease and mode of action of antimicrobials. 3 hrs and 2 labs. F

8102 Veterinary Virology (4) Structure and replication of animal viruses; classification of viruses, mechanisms of viral pathogenesis. Techniques for quantitating viruses, viral antigens, and antiviral antibodies. May be repeated. Maximum 6 hrs. W

8103 Veterinary Immunology (4) Immunobiology, mechanisms of immune reaction, diagnostic immunology, role of immune response in preserving integrity of body as well as in causing disease. 2 hrs and 2 labs. W

8175 Advanced Seminar in Microbiology (1-4) Applied microbiology such as serologic diagnosis, clinical immunology. Su, F

GRADUATE COURSES

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

Pathobiology

Professors: R. L. Michal (Head), V.M.D. Pennsylvania, Ph.D. Michigan State; M. M. McGavin, M.V.Sc. Queensland (Australia); Ph.D. Michigan State; L. N. Di Piotgier, B.V.Sc. Pretoria (South Africa), Ph.D. Iowa State; H. M. Schuller, D.V.M. Justus Lebog (Germany); Ph.D. Hannover (Germany).


Assistant Professors: M. A. Bredier, D.V.M. Oklahoma State, Ph.D. Texas A&M.


PROFESSIONAL COURSES

8700 Basic Pathobiology Rotation (3) Practice and/or demonstrations in laboratory diagnosis, postmortem examination and clinical pathology, parasitologic, and microbiologic techniques. Su, F

8710 Veterinary Pathology (5) Causes of disease, disturbances of cell growth, inflammation, and neoplasia. 3 hrs and 2 labs. Sp

8730 Veterinary Parasitology (4) Parasitology (protozoology, helminthology, and entomology) and relation to disease in animals. 3 hrs and 1 lab. Sp

8760 Advanced Pathobiology (3) Further training in clinical laboratory diagnostic procedures, and in postmortem examinations. W, Sp

8770 Special Problems in Pathobiology (2-10) Opportunity to design and execute research problem. May be repeated. W, Sp

8775 Advanced Seminar in Pathobiology (1-4) Diagnostic topography, electron microscopy, histologic techniques. Su, F

GRADUATE COURSES

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

5010 Comparative Pathology (5) Lectures and lab. Pathogenic mechanisms. Comparative aspects. Lectures reinforced by lab study of gross, microscopic and ultrastructural lesions. Prereq: Zoology 3060, 3350. F, A

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

5010 Special Topics in Pathology (1-3) E

6020 Special Problems in Pathobiology (1-5) Necropsy, histological, clinical, parasitological, clinical pathobiology, clinical bacteriology, clinical virology, and mycology. May be repeated. Maximum 20 hrs. E

6030 Veterinary Biopsy (1-3) Examination of biopsy specimens and interpretation of observations. Preparation of specimens for sectioning. Prereq: Consent of instructor. May be repeated. Maximum 4 hrs. E

6035 Correlative Post-Mortem Pathology (1-3) Gross and microscopic post-mortem examination of animals. Correlative interpretation of clinical diseases and lesions. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs. E

6040 Veterinary Pathology Seminar (1) Microscopic slides and transparences of lesions from cases examined by pathologists, residents, and graduate students. Interpretation of observations. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs. E

6045 Pathology Seminar (1) Subjects of current interest in biomedical science. Students present one seminar per term enrolled. Prereq: Consent of instructor. May be repeated. Maximum 2 hrs. Class meets once monthly. E

6050 Ultrastructural Pathology (1) Ultrastructural changes of diseased tissue. Interpretation of observations. Prereq: Professional medical degree or consent of instructor. F, A

6052 Pathogenesis and Diagnosis of Virus Diseases in Domestic Animals (5) Biology of viruses and pathology of virus infection in domestic animals. Prereq: Biochemistry 4110-20, 4119: Microbiology 4430, 4439; consent of instructor. W

6055 Techniques in Pathology (3) Fixation, processing and staining of tissue specimens; specialized gross section techniques; photography of gross specimens and photomicrography. Prereq: Consent of instructor. 2 hrs and 1 lab. F, A

6060 Principles of Pathology (2) Advanced topics in pathology and mechanisms of disease: pathophysi- ology, cellular degeneration, inflammation, immunopathology, hemostasis. Primal biochemical and morphologic responses of various cells, tissues, and organs to injury and other metabolic derange- ments, principal current seminars on selected topics from current literature and textbooks. Prereq: Consent of instructor. F, A

Rural Practice

Professors: G. M. H. Shires (Head), B.V.Sc., Pretoria (South Africa).

Associate Professors:

Assistant Professors:

Residents:

Interns:
D. B. Kestenman, D.V.M. Purdue; M. L. Rose, D.V.M. Cornell.

PROFESSIONAL COURSES
8900 Basic Clinical Rotations in Rural Practice (12-16) introductory clinical training in food animal, equine, ambulatory and herd health practices, W, Sp

8960 Advanced Clinical Rotations in Rural Practice (3-16) Advanced clinical training in food animal, equine, ambulatory and herd health practices. W, Sp

8970 Special Problems in Large Animal Medicine, Surgery, and Theriogenology (2-10) Opportunity to emphasize specific career objectives. Prereq: Envir. Prac. 8600, Pathobiology 8700, Rural Prac. 8900, and Urban Prac. 8800. May be repeated. W, Sp

8975 Advanced Seminar in Rural Practice (1-4) Equine medicine, food animal surgery, clinical toxicology, Su.

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

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

Interdepartmental Offerings
VETERINARY MEDICINE
PROFESSIONAL COURSES
8010 Client Relations and Communication Skills (1) Interpersonal skills as they apply to client relations and communication with colleagues, employees, general public. 1 lab S/NC only. Sp

8310 Introduction to Veterinary Medical Practice (2) Animal species, breed identification, basic care, feeding, restraint, handling, Introduction to physical diagnosis, intravenous techniques, blood sampling, etc. 1 hr and 1 lab. F

8311 Introduction to Veterinary Medical Practice (2) Physical diagnosis, history taking, and client relations, anesthetic principles, agents, and techniques. 1 hr and 1 lab. F

8320 Medical Science Interaction Laboratory (3) Multidisciplinary lab, lectures and discussions to provide integrative learning and understanding of physiologic, pharmacologic, and surgical principles and techniques, humane care of animals, introduction to instruments used to measure physical processes and drug effects, use of pathologic record. Correlated with 8240, 8250, 8611 and 8612. 2 hrs and 1 lab. Su.

8340 Integumentary System (4) Diseases of integumentary system of animals, with emphasis on laboratory examination, interpretation of pathologic features, diagnosis, and treatment. 3 hrs and 1 lab. F

8341 Hematology and Introductory Clinical Pathology (1) Principles of methods of laboratory evaluation of disease. 3 hrs and 1 lab. F

8342 Alimentary Tract I (5) Pathology, diagnosis, and treatment of disorders of alimentary tract and digestive organs of dogs and cats. F


8344 The Art of Veterinary Medicine (1) Specific diagnostic problems or paramedical subjects important to veterinary medical practice: differential etiology, diagnosis, and treatment of certain disease signs or symptoms; implications for veterinarians of medical jurisprudence and ethics, practice economics, veterinary history. May be repeated. S/NC only. F, W, Sp

8346 Alimentary Tract II (4) Pathologic basis, pathology, diagnosis, and treatment of diseases of alimentary tract and digestive organs of swine, sheep, goats, cows and horses. W

8350 Reproductive System (6) Diagnosis, therapy and prevention of conditions causing reduction of the reproductive efficiency of domestic animals. Abnormal conditions of the mammary gland, diagnosis and prevention of mastitis. 4 hrs and 2 labs. F

8351 Urinary System (4) Understanding of urinary renal system of animals in health and disease. 3 hrs and 1 lab. W

8352 Cardiovascular System (3) Pathology, diagnosis, and management of cardiovascular diseases of animals. Anatomic, physiologic, and pharmacologic principles which provide basis for medical and surgical treatment. 2 hrs and 1 lab. Su.

8353 Endocrine, Metabolic and Nutritional Diseases (4) Biochemical and pathophysiological mechanisms of endocrine, metabolic and nutritional diseases of animals; diagnosis, therapy and prevention. F

8360 Musculoskeletal System I (5) Pathology, diagnosis, and treatment of musculoskeletal diseases of small animals; pathologic changes, interpretation of radiographs and surgical procedures. 4 hrs and 1 lab. W

8361 Musculoskeletal System II (5) Pathology, diagnosis, and treatment of musculoskeletal diseases of large animals. Functional anatomy, radiographic interpretation, surgical procedures and medical therapy applicable to equines and ruminants. 4 hrs and 1 lab. W

8362 Veterinary Toxicology (3) Molecular mechanisms and pathologic and clinical features of animal diseases caused by common toxic agents. Su.

8363 Public Health (2) Public health aspects of veterinary medicine and nature of related laws, ordinances, and regulations. Veterinarian's role in the protection of environment, ecology, and quantity and quality of food. Su.


8365 Radiology (4) Basic radiologic technology, radiation safety, special procedures and radiographic interpretation in diagnosis of clinical cases. 3 hrs and 1 lab. W

8366 Respiratory System (4) Detection and diagnosis of upper and lower respiratory diseases of domestic animals. Pathophysiology and pathology of infectious and noninfectious diseases. Lectures and lab with live and simulated case studies. 3 hrs and 2 lab. W

8370 Neurosciences (5) Normal and abnormal neural structure and function in animals; clinical neurology and neuropathology. 6 hrs and 3 labs. Sp.

8371 Visual and Auditory Systems (3) Diseases involving eyes and ears of animals, with emphasis on anatomic, physiologic, and pathologic features. 2 hrs and 1 lab. Sp.


8375 Principles of Medicine (3) Physiologic and pathologic principles underlying mechanisms of disease. Selected examples of human and animal diseases, recent scientific advances and effects on veterinary medicine. Sp.

8401 Clinical Radiology (3) Training in radiographic technology and interpretation; emphasis on study of diseases as part of the diagnostic process. May be repeated. E

8402 Special Medical Services (3) Clinical training in specialty areas such as anesthesiology and ophthalmology, with casework in both urban and rural animal clinics. Su, F.

8460 Extramural Programs (3-20) Supervised off-campus educational program with an approved institution; limited enrollment. Prereq: Consent of department and College of Veterinary Medicine Curriculum Committee. W, Sp

GRADUATE COURSES
5433 Patterns of Disease (5) Host-agent relationship in disease of animals. Pathogenesis, laboratory diagnosis, control, and public health significance. Epidemiology and ecology in study of diseases in animal populations. Prereq: Consent of instructor and Director. Comparative and Experimental Medicine Graduate Program.

5392 Veterinary Toxicology (3) Pharmacologic basis and pathologic features of diseases of animals caused by common toxic chemicals; clinical manifestations, diagnosis and treatment. Prereq: Consent of instructor and Director. Comparative and Experimental Medicine Graduate Program.

5363 Public Health (2) Public health aspects of veter-
inary medicine and nature of related laws, ordinances and regulations. Veterinarian's role in protection of environment, ecology, and quantity and quality of food. Prereq: Consent of instructor and Director, Comparative and Experimental Medicine Graduate Program. Su

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

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

C. Warren Neel, Dean
John R. Moore, Associate Dean
Roger L. Jenkins, Associate Dean for Graduate Programs
Richard C. Reizenstein, Associate Dean for Undergraduate Programs
Clyde Keller, Associate Dean for External Affairs
John E. Riblett, Director of Management Development Programs
David A. Hake, Director, Center for Business and Economic Research

Graduate Programs

The College of Business Administration offers programs leading to five advanced degrees: the Doctor of Philosophy with majors in Business Administration, Economics, and Management Science, the Master of Arts with a major in Economics, the Master of Science with a major in Statistics, the Master of Accountancy, and the Master of Business Administration. The Department of Management and the Department of Psychology in the College of Liberal Arts jointly offer an intercollegiate program in Industrial and Organizational Psychology leading to the Master of Science and Doctor of Philosophy degrees. (See page 97). Also, the Department of Management Science offers an intercollegiate program leading to the Master of Science degree. (See page 98).

The two College-wide programs, the MBA and the Ph.D. in Business Administration are described below. Descriptions of other degree programs will be found under the appropriate departmental or program headings.

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

THE MBA PROGRAM

The MBA program is designed for students with undergraduate degrees in the social and natural sciences, the humanities, and professional fields such as engineering, business, agriculture, and architecture. For full-time students, the MBA program is a two-year lock-step program with students beginning in the fall of each year and graduating in the spring, two years hence. Those students not having the equivalent of two quarters of undergraduate coursework in accounting, business law, and economics must either attend special UTK MBA classes summer quarter or complete courses in these areas at another accredited institution prior to enrolling in the MBA program.

During the summer between the first and second year, students must complete an internship or equivalent experience. The complete MBA program with a concentration in management or entrepreneurship and new venture analysis is offered for part-time students by the regular faculty of the College. Part-time students enter in the fall quarter and take approximately 4 years to complete the program. Part-time students are required to successfully complete six hours of graduate credit per quarter. Internships are not required of part-time students.

The program consists of 17 MBA core courses and concentrations/ electives of 7 courses. Each course is 3 quarter hours of graduate credit.

Application and Admission: Applications are accepted for Fall Quarter only. The application deadline for Fall quarter is April 1. Any applications received after that date will be considered as space allows.

To obtain application materials, write or call: Associate Dean for Graduate Business Programs
Suite 527, Stokely Management Center
College of Business Administration
The University of Tennessee
Knoxville, TN 37996-0550
Telephone: (615) 974-5033

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

Prerequisites: Upon matriculation, the student must have received a bachelor's degree from a regionally accredited institution. College level mathematics through at least one course in calculus is the only prerequisite requirement for entry into the program. Those electing the management science or statistics concentration must have com-
completed two years of college level calculus. MBA Core: The following courses are required in each student's program. All courses are 3 credit hours. The core courses are: Accounting 5020, 5030: Business Administration 5160, 5310, 5600; Economics 5010, 5011, 5020; Management 5010, 5020; Management Science 5010; Marketing 5010, 5020; Mathematics 5052; Statistics 5010, 5020.

Concentration and Electives: A concentration area(s) may be indicated on the MBA Program Application or this declaration may be deferred until after matriculation. In any event, selection must be made no later than completion of 27 hours of MBA program coursework. In some cases selection of an area(s) early in the program is encouraged to facilitate proper course sequencing. Requests for changes in concentration area(s) must be submitted to the Office of Graduate Business Programs.

Among the 7 courses in the concentration/electives block, at least 4 but not more than 5 must be in one of the following concentration areas (for specific courses required in some concentration areas, see departmental sections on following pages): Controllership, Economics, Entrepreneurship and New Venture, Analysis Finance, Forest Industries Management, Management, Marketing, Management Science, Marketing, Statistics, Transportation and Logistics.

The MBA Center of Excellence: Entrepreneurship and New Venture Analysis is an interdisciplinary concentration comprised of three specifically designed courses (one each in finance, management, and marketing). As the MBA Center of Excellence, this concentration strives to build a strong academic foundation for both entrepreneurial and intrapreneurial activities. The Entrepreneurship and New Venture Analysis concentration will be offered to both the full- and part-time student in recognition of the growing trend in American business today towards new product/venture development.

The remaining elective courses (2 to 3) must be in fields outside the concentration area, normally selected from MBA courses offered in other departments of the College. Up to 2 courses (6 hours) in this block may be taken outside the College of Business Administration.

No more than 3 courses numbered below 5000 may be included in this 7-course block. Courses numbered below 4000 normally are not approved for the MBA program. Before beginning the concentration/electives part of the curriculum the student must have his/her program approved by the Office of Graduate Business Programs.

Transfer Credits: Graduate level courses taken at other AACSB accredited institutions that otherwise conform to University policy (page 21) may be credited toward MBA degree requirements within the following limits:

MBA Core: 6 hours
Concentration Area: 3 hours, provided at least 12 hours of course work at this institution are included in each concentration area
Elective Area: 12 hours
The maximum number of hours that may be transferred is 9 quarter hours.

Other Requirements: The Application for Admission to Candidacy (see page 23) must be approved by two faculty members in the student's area(s) of concentration and the Associate Dean for Graduate Programs in the College of Business Administration, signed by the department head, and submitted to the Graduate Office.

To qualify for the degree, the student must achieve a B average (3.0) or above in MBA core courses required in his/her program, a B average or higher in courses comprising the concentration area(s) and a B average or higher in the overall program.

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

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.

Admissions: Applicants for the J.D.-MBA program must make separate application to, and be competitively and independently accepted by, the College of Law for the J.D. degree and the Graduate School and College of Business Administration for the MBA degree, and by the Dual Degree Committee.

Students who have been accepted by both colleges may apply for approval to pursue the dual program anytime prior to, or after, matriculation in either or both colleges. Such approval will be granted, provided that dual program studies be started prior to entry into the dual program. The dual program studies must require the student to pursue the dual program anytime prior to, or after, matriculation in either or both colleges.

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

Transfer Credits: Graduate level courses taken at other AACSB accredited institutions that otherwise conform to University policy (page 21) may be credited toward MBA degree requirements within the following limits:

MBA Core: 6 hours
Concentration Area: 3 hours, provided at least 12 hours of course work at this institution are included in each concentration area
Elective Area: 12 hours
The maximum number of hours that may be transferred is 9 quarter hours.
ness class, or as a research assistant to a senior faculty member. Typically, the College of Business Administration offers financial support for doctoral students during their tenure in the program.

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

There are five areas of concentration offered in the Ph.D. program:

- **Accounting**
- **Behavioral Science**
- **Business Policy**
- **Economics**
- **Finance**
- **Legal Environment**
- **Management**
- **Marketing**
- **Statistics**
- **Transportation and Logistics**

More detailed information concerning these specific areas is available by writing directly to each department chairperson. The availability of these concentrations is subject to approval by the temporary doctoral advisory committee and the Associate Dean for Graduate Programs.

Department Requirements:

1. **Degree Requirements**: Doctoral students must file a program of study that has been approved by their temporary doctoral advisory committee and the Associate Dean for Graduate Programs by the end of the second quarter of coursework after entry into the program. This committee is nominated by the department chairperson in a student’s intended area of concentration, subject to the Graduate Council’s policies and procedures. Following are specific degree requirements:

   1. Students must complete at least three years of full-time coursework beyond the baccalaureate degree, with two years of residence on the Knoxville campus.
   2. Students must complete appropriate coursework at the graduate level, or other approved concentrations of coursework, in the following areas:

      - Accounting
      - Behavioral Science
      - Business Policy
      - Calculus
      - Computer Science
      - Economics
      - Finance
      - Legal Environment
      - Management
      - Marketing
      - Statistics
      - Transportation and Logistics

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

      3. Economics 5110-20 (or equivalent) is required, except that Management 5610-20 (or equivalent) may be substituted with prior approval.

      4. A minimum of 15 quarter hours of graduate research methods must be completed. At least 6 quarter hours in statistics courses beyond the baccalaureate degree are recommended. The remaining 9 quarter hours can be completed in additional statistics (not to include Statistics 5050) courses or in other areas such as research methodology, management science, computer science, econometrics, and psychometrics.

      5. The major area of concentration is the focal point of the Ph.D. program. Students are expected to master the literature and research techniques in their concentration area, and to do quality research as evidenced by the preparation of an acceptable dissertation. A minimum of 18 quarter hours of coursework is required, including at least 9 hours of doctoral seminars. Graduate work in the major field taken at other institutions is considered by the temporary doctoral advisory committee in approving the specific coursework. Available major areas are: accounting, finance, management, marketing, and transportation/logistics.

      6. A minimum of 12 quarter hours of graduate coursework is required in an area outside, but complementary to, the major area. The student may choose the collateral area from one of the following: one of the five major business areas listed above, economics, statistics, or another area in another school or college of the University.

      **Comprehensive Examinations**: Comprehensive written examinations over the major and collateral areas are required of each person seeking candidacy for the Ph.D. degree. The major area examination is administered in two sessions of approximately four hours each and the collateral area examination in one session of approximately four hours. Preparations may be supplemented with oral examinations. For a doctoral student having a collateral area in the College of Law, the results of only an oral examination may be deemed acceptable, and all comprehensive examinations is coordinated through the Office of Graduate Business Programs. When either the major or collateral area examination is passed, the remaining examination must be taken within the next 13 months. Comprehensive examinations are generally offered during the fall and spring terms.

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

      Doctoral students are advised to give serious attention early in their program to the composition of their doctoral committee. In accordance with the Graduate School policy, the student and the major professor identify a doctoral committee composed of at least four faculty members, three of whom, including the chair, must be on the Graduate Council to direct doctoral research. When the doctoral committee has been formed, the temporary doctoral advisory committee ceases to exist.

      Admission to candidacy must be approved at least two full quarters prior to the date the degree is conferred (admission in the fall quarter permits graduation in the following spring quarter). Advancement to candidacy must occur at least four years after the student enters the program.

      Application for admission to candidacy must include a listing of all courses taken in each of the fields required for the degree (business functional areas, basic disciplines, concentration area and collateral area). Graduate courses accepted from other institutions must be included. Under "Other Requirements," the date of acceptance of the research proposal by the doctoral committee should be indicated. The application must be approved by the student’s doctoral committee and the Associate Dean for Graduate Business Programs before submission to The Graduate School.

      **Dissertation** (minimum of 36 quarter hours): The student must complete a dissertation embodying the results of original research and written in doctoral level English. The dissertation is supervised by the candidate’s doctoral committee, which must certify its completion and acceptability after oral defense of the candidate’s research proposals.

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

    **Grade-Point Average**: A student must maintain a cumulative GPA of 3.0 or higher in graduate courses. However, maintaining a 3.0 GPA does not guarantee the student will be allowed to continue in the doctoral program if there is overriding evidence that the student does not show promise and should be terminated from the program.

    **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 section of the catalog. Also see "Academic Common Market," page 4.

    **MINIMUM ACADEMIC PERFORMANCE STANDARDS**: A graduate student in the College of Business Administration whose grade point average at any point is below 3.0 will be placed on probation. A student on probation will be dropped from the program unless his/her cumulative grade point average is 3.0 or higher at the end of the probationary period. The probationary period is defined as the next 12 quarter hours of coursework attempted which is specified in the student’s degree program. Full-time students must take 12 hours per quarter while on probation and part-time students must take 6 hours per quarter for each consecutive quarter of probation. Exceptions to this policy may be made only with the approval of the Associate Dean for Graduate Programs of the College of Business Administration upon recommendation of the student’s faculty advisor.

    **ADMISSION REQUIREMENTS**: General admission requirements for The Graduate School are stated beginning on page 13. M.Acc., MBA, and Ph.D. in Business Administration applicants are required to take the Graduate Management Admission Test (GMAT). Applicants for programs in economics, management science, and statistics may submit results of either the GMAT or the Graduate Record Examination (GRE). Applicants for management science and statistics programs must have completed at least two years of college level calculus and be proficient in a computer language.

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

The College's continuing education efforts are coordinated through the Department of Management Development Programs. Management Development Programs emphasizes consistent high quality program- ming, small class size, outstanding faculty, and a highly participatory style of instruc- tion. The programs range from customized "in plant" programs to the four-week Univer- sity of Tennessee Executive Development Program (TEDP).

The Tennessee Executive Development Program, tailored to the needs of upper-level managers, has a strategic focus. Its major objectives are to develop executives for increasingly higher levels of management responsibility and to sharpen existing executive skills needed for comprehensive decision-making and leadership. The Management Development Program, designed for mid-level managers, is more operational in scope. It is appropriate for both the ex- perienced manager who has not had advanced management training and the individual being developed for a mid-level position.

Other programs include: (1) The Institute for Productivity Through Quality, which teaches the techniques of statistical process control in an intensive 130-contact-hour program for both managers and executives; (2) the Senior Institute for Productivity Through Quality, a one-week program which provides a strategic overview of statistical manage- ment; (3) the Administrative Services Institute for Productivity Through Quality, a two-week program which applies the philos- ophy and tools of statistical management to non-manufacturing environments; (4) the Executive Development Program for Distribu- tion Managers, which focuses on providing the distribution manager with an intensive exposure to contemporary man- agement approaches; and other programs designed to meet the continuing education needs of business and industry.

Departments of Instruction

Accounting and Business Law

J. R. Williams (Head), Ph.D. Arkansas, C.P.A.

Accounting

MAJOR DEGREE

Accounting M.Acc.


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

The MASTER OF ACCOUNTANCY PROGRAM

The objective of the Master of Accountancy (M.Acc.) program is to provide persons having an undergraduate accounting back- ground and ahigh level of academic motivation with the depth and understanding of accounting which will enhance their prob- ability 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, busi- ness, industry or government.

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

Course Requirements for the M.Acc. Pro- gram: A student's program encompasses a minimum of 45 quarter hours of graduate course work. Specifically, the student must complete courses in selected business disci- plines and in the area of accounting as indicated below. Each course is 3 quarter hours of graduate credit.

Business Core (21 quarter hours): Econ- omics 5030, Finance 5420, Mathematics 50521 and 4 additional courses from the fol- lowing areas subject to the approval of the program advisor (no more than one course may be taken in any one area): Business Policy, Business Law, Computer Science, Economics, Management, Management Science, Marketing, Finance, Statistics, and Transportation.

Accounting Core (15 quarter hours): Accounting 5110, 5120, 5210, 5420, 5950. Accounting Electives (select 12 quarter hours): Accounting 5130, 5140, 5160, 5220, 5430, 5440, 5450, 5460, 5490, 5510, 5560, 5950.

Other Requirements: To qualify for the degree, the student must achieve a B average (3.0) in the business core courses and

1Prior course work will be considered in determining the Business Core courses.
2An exemption may be granted for Mathematics 5052 if the student has recently completed undergraduate course work of equivalent content with grades of C or higher at a regionally accredited institution. "Recently completed" means completion of the last course or regular use of math tools within three to four years of matriculation.
3Selected courses from other disciplines may be substitut- ed for accounting electives upon approval of the M.Acc. program advisor.
also a B average in the accounting courses. Each student must pass a final written examination during the final quarter of study for the degree.

MBA Concentration: Controllership

DBA Concentration: Accounting

Minimum Course Requirements for MBA Concentration: 5110, 5120, 5210, 5420, and two of the following: 5320, 5330, 5340.

The MBA Controllership concentration will provide the student with a comprehensive exposure to issues in financial management and control. The program is designed for students without an undergraduate background in accounting. Controllership concentration core to remain courses include Accounting 5220, 5350, 5360, and 5520. Accounting 5350 and 5360 are available for MBA students only. Students electing the Controllership option may not take courses in the M.Acc. curriculum other than Accounting 5220 and 5620.

5002 Non-Thesis Graduation Completion (3-15)

Required for the non-thesis student not otherwise registered during any quarter when such a student uses the university's facilities before the degree is completed. May not be used toward degree requirements. May be repeated. S/NC only. E

5010 Financial Accounting (3)

Introduction to accounting model of firm and firm's 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 user's general purpose financial reports. Prereq: 5010 or equivalent. F, W

5030 Managerial Accounting (3)

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

5100 Seminar in Accounting Theory (3)

Evolution of accounting theory, concepts underlying financial reporting models, and authoritative accounting literature as each relates to measurement of periodic performance and financial position. Prereq: Consent of department head. May not be taken by students with credit for 4990.

5120 Seminar in Advanced Auditing (3)

Theory and concepts underlying the philosophy of auditing as related to current auditing issues. Prereq: 4120 or equivalent.

5130 Selected Topics—Current Accounting Practices (3)

Critical in-depth consideration of selected financial reporting topics of particular relevance to current accounting practice. Prereq: 5110.

5140 Selected Topics—Current Accounting Theory (3)

Critical in-depth consideration of current issues in the financial accounting literature. Prereq: 5110.

5180 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 Seminar in Advanced Managerial Cost Accounting (3)

Analysis of conceptual and current issues impacting on development and practice of managerial cost accounting. Cost allocation, planning and control under conditions of uncertainty, and responsibility accounting concepts. Prereq: 4230 or consent of instructor.

5220 Budgetary Planning and Control Systems (3)

Alternative approaches to organizing of planning and control systems to meet organizations needs and objectives. Control systems and corporate structure, discretionary expense centers, profit centers, investment centers, transfer pricing, and control in not-for-profit organizations. Prereq: 3220 or 5030.

5310 Auditing Concepts (3)

Concepts and theory of auditing, environment of internal and external auditing, nature of evidence, internal control evaluation, and reporting. Not intended for persons who have credit for auditing course. Prereq: 3130. Prereq or coreq: Statistics 4415 or equivalent.

5320 Advanced Auditing (3)

Case-oriented, including audit of special problems, liability, revenue and expense accounts. Emphasis on reporting, data processing, statistical sampling, and internal auditing. Prereq: 4110 with C or higher and 5110; MBA students who do not have credit for 4120.

5330 Advanced Income Tax (3)

Federal income tax with emphasis on tax planning and research. Prereq: 3120 with C or higher; 3430 with C or higher. (Available only to MBA students who do not have credit for 4430.)

5340 Consolidations and Business Combinations (3)

Theory and practice of accounting for interrelated business entities—transfers, life insurance, annuities for persons who have credit for a course with a similar content. Prereq: 3130.

5350 Financial Accounting Issues in Business (3)

A comprehensive investigation of various financial reporting and auditing issues relating to decision making in financial management. Emphasis is upon the market role of accounting information. Available to MBA students only. Prereq: 5030.

5360 Taxation for Business Decisions (3)

A conceptual foundation and analysis of current issues in taxation impacting on the use and management of financial and investment information applied to individual, corporate, partnership and estate and gift taxpayers. Prereq: 5300. Available to MBA students only.

5420 Tax Research (3)

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

5430 Tax Planning (3)

Advanced study of income tax problems emphasizing alternatives available to minimize tax liability compatible with achieving taxpayer objectives. Prereq: 5420.

5440 Taxation of Estates and Gifts (3)

Transfers at death, intervivos transfers, life insurance, annuities and employee death benefits, marital and other deductions and exemptions, and estate and gift tax returns. Prereq: 4430. (Not available to students with credit for 4440.)

5450 Taxation of Partnerships and Partners (3)

Formation, operation, termination, and liquidation and other special problems of partnerships. Prereq: 5420.

5460 Taxation of Corporations and Shareholders (3)

Organization and structure, distributions, liquidations, reorganizations and special problems including Subchapter S Corporations and Personal Holding Companies. Prereq: 5420.

5490 Tax Policy (3)

Current policies explored through historical development and current status of various types of taxes and American taxing jurisdictions; directed research in selected topics within field of taxation. Prereq: 5430, 5450, 5460.

5510 Not-for-Profit Accounting (2)

Theory and practice of budgetary and fund accounting, financial reporting, measures of output and accomplishment, and financial and performance auditing for nonprofit entities. Prereq: 9 hrs of accounting and consent of instructor.

5610 Accounting Information Systems (3)

Design, implementation, maintenance, and enhancement of accounting information systems; general system theory; audit and control of accounting information systems. May not be taken by students with credit for 4830. Prereq: 5010 or equivalent.

5620 Database Design For Accounting Information Systems (3)

Integration of database models and accounting information systems for structuring financial and operational information. Prereq: 4630 or 5610.

5640 Seminar in Accounting Information Systems (3)

Literature on accounting information systems and advanced systems design and design concepts. Informational needs of other functional areas of business and interfacing of these areas. Prereq: 4630 or equivalent.

5800 Accounting Systems Policy (3)

Seminar in emergent topics in management of accounting information systems, auditing of advanced systems, and knowledge-based systems. Prereq: 5640.

5910-20 Seminar in Accounting (1, 1, 1)

Research and discussion of contemporary issues in practice of accounting. May be repeated. Admission by consent of department head. S/NC only.

5950 Seminar in Accounting Research (3)

Integration of areas of financial, managerial, tax, and auditing, including directed projects and advanced topics. Prereq: 5110, 5120, 5210, 5420. (Not available to MBA students.)

5990 Individual Research in Accounting (3)

Directed research in topic of mutual interest to student and faculty mentor. Prereq: All MBA core courses. Open in quarter prior to anticipated enrollment. May be repeated. Maximum 6 hrs.

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

6110-20 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

Professors:


5510 Legal and Social Environment of Business (3)

Survey of legal and quasi-legal institutions with emphasis on those which have particular significance to business; basic legal notions and principles that pertain to business management. Not available to students with credit for 4110-20 or equivalent. F, W, Su

5130 Administrative Regulation of Business (3)

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

Business Administration

MAJOR

DEGREES

Business Administration

MBA, Ph.D.

5060 Data Processing in Business (3)

Fundamentals of data processing, computer programming and applications, systems design. F, Sp

5100 Business Communications (3)

Theory and practice of effective communication. Analysis of business problems, organization and presentation of results. Written analyses and oral presentations.

5130 Business Policy (3)

Case studies covering policy formulation and administration; point of departure—top and middle management, where companywide objectives are set and departmental policies and activities coordinated; sizing up company's situation, objectives are set and departmental policies and activities are decided; point of departure—top and middle management, where companywide objectives are set and departmental policies and activities coordinated; sizing up company's situation, objectives are set and departmental policies and activities are decided. Prereq: 4430 or equivalent.

5410 Business and its Societal Environment (3)

Analysis of current forces and chances in society and interrelation of plans and actions in business firms with environmental factors. Prereq: Consent of instructor.

5600 Management Information Systems (3)

Design of computer-based business information systems; decision support systems for business problems.

5610 Seminar in Applied Business Analysis (3)

Application of business concepts and analytical skills
to problems of small businesses in community. Students work in teams under supervision of participating pro-

Economics

**MAJOR DEGREES**

**Economics**

M.A., Ph.D.

Professors:

- W. E. Cole (Head), Ph.D. Texas; R. A. Bomh, Ph.D. Washington (St. Louis); L. R. Bowley, Ph.D. Texas; S. L. Carlock, Ph.D. Harvard; H. S. Chang, Ph.D. Vanderbilt; G. R. Pawcell*; Ph.D. McGill.

- C. B. Garrison, Ph.D. Kentucky; H. W. Herzog, Ph.D. Maryland; H. E. Jensen, Ph.D. Texas.


- A. M. Schottman, Ph.D. Washington (St. Louis); G. A. Spiva, Ph.D. Texas.

Associate Professors:

- D. P. Clark, Ph.D. Michigan State; W. F. Fox, Ph.D. Ohio State; E. Gustaff, Ph.D. Stanford.

- D. D. Kasemani, Ph.D. Florida; A. E. Phillips, Ph.D. Washington (Seattle); A. M. Schottman, Ph.D. Washington (St. Louis).

Assistant Professors:

- J. A. Gauger, Ph.D. Iowa State; R. A. Hoffer, Ph.D. North Carolina; J. W. Mayo, Ph.D. Washington (St. Louis).

- H. Thompson, Ph.D. Houston.

*Alumni Distinguished Service Professor

The Department of Economics offers graduate programs leading to the M.A. and Ph.D. degrees. The M.A. degree may be completed by either a thesis or non-thesis option, while the Ph.D. degree requires successful completion of a dissertation. Applicants to these programs should contact the Director of Graduate Studies, Department of Economics for further information. The Department also offers an area of concentration for the MBA degree. Students interested in the MBA program should contact the Associate Dean for Graduate Programs, College of Business Administration.

**THE MASTER'S PROGRAM**

Admission to the M.A. program is based on undergraduate academic performance and on scores from the general portion of the GRE or GMAT. The degree requires a minimum of 45 quarter hours. The non-thesis option requires Economics 5111-12 and 5121-22 and an additional 18 hours of course work at the 5000 level or above, with 9 hours to be concentrated in one field of economics. Students electing the non-thesis option will be required to pass a final written comprehensive examination. The thesis option requires Economics 5111-12 and 5121-22 and an additional 9 hours of course work at the 5000 level or above. In the thesis option, the thesis gives 9 hours of credit.

The requirements for a graduate minor in economics are as follows: Either (1) 5111-12 and 5120, or (2) 5110 and 5121-22, or (3) with the consent of the head of the economics department, an alternative sequence of 9 hours to meet unusual conditions.

**THE DOCTORAL PROGRAM**

Admission to the Ph.D. program is based on promise of scholarship, as evidenced by a minimum of 45 quarter hours of graduate credit in economics demonstrated by previous academic performance and by scores achieved on the general portion of the GRE or GMAT. Requirements for successful completion of the program consist of the four components listed below.

1. **Economic theory:** Microeconomic theory by comprehensive examination or by completion of Economics 5111-12 with a B+ average or higher and successful completion of 6111; macroeconomic theory by comprehensive examination or by completion of 5121-22 with a B+ average or higher and successful completion of 6121.

2. **History of economics:** Economics 5250 and 5260.

3. **History of economics:** Economics 5150 and 3 hours at the 6000 level.

4. **Mathematical and quantitative economics:** Economics 5105, 5109, and 5510.

The 5510 requirement may be waived for students completing Economics 5170, 6180, and 6190.

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

2. Students are required to demonstrate their competence by comprehensive examination in two fields of specialization with the approval of the department, at least one of which must be selected from the following: economic development, economics of labor and human resources, industrial organization, international economics, public finance, and regional and urban economics.

3. Students are required to take two effective economics courses at the 5000 level or above, outside the core subject areas and the two fields of specialization.

4. Successful completion of the dissertation, including an oral defense, to give at least 36 hours of credit (6000).

**MBA Concentration:** Economics

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

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

- **5000 Thesis** (1-5) P/NP only. E

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

- **5006 Workshop in Economics** (3-9) Special topics in economic education. Not available for credit in any College of Business Administration degree program. Prereq: Consent of instructor. May be repeated. Maximum 3 hrs.

- **5190-520 Economics Seminar** (1, 1) Research in progress and related topics of selected topics. May be repeated. S/N/C only. E

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

**ECONOMIC THEORY**

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

4150 History of Economic Thought (3) Development of economic thought, tools of analysis, and economics as a social science, together with an analysis of socioeconomic conditions which influenced this development. Survey 1758 through 1936. Prereq: 1 yr of principles of economics and consent of instructor.

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

4760 Public Expenditure Evaluation (3) Benefit-cost analysis, public sector investment criteria, and the social cost of capital. Not available for credit in graduate programs in Economics.

4770 State and Local Finance (3) Emphasis on revenue systems and divisions of tax burdens. Not available for credit in graduate programs in Economics.

5010 Introduction to Economic Analysis (3) Analytical tools of macro- and microeconomics for students without prior training in economics. Price determination, national income determination, and the banking system. Not available to students with credit for 2510 or equivalent. F, Su


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

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

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

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

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

5150 History of Economic Thought (3) Development of economic ideas from mercantilists through Alfred Marshall, emphasis given to classical and neoclassical tradition.
4430 Labor Legislation (3, 3) 4430-Economic relations or consent of instructor. Resolution of industrial conflict. Prereq: 6 hrs of labor unions and collective bargaining process. Development of American system of industrial relations, poverty and income redistribution, discrimination and examination of policies aimed at their solution. Prereq: introductory statistics or Statistics 5211 or equivalent. F, W

5520 Introduction to Econometrics (3) Statistical demand analysis, production and cost analysis, distribution of income and wealth, models of growth and cycles, macroeconomic applications. Should not be taken by students who contemplate taking Econometrics 6170-80-90. Sp

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

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

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

6121 Advanced Macroeconomic Theory (3) Topics in macroeconomic theory and policy. Prereq: 5122 or equivalent. F

1150-90 History of Economic Doctrines (3, 3) Important ideas of economic thinkers from Middle Ages to present. W

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

ECONOMICS OF CENTRALLY PLANNED ECONOMIES

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

6331 Theory and Practice of Economic Planning (3) Leaders and policies aimed at these solutions to problems. Prereq: Consent of instructor. May be repeated with consent of department. F

ECONOMICS OF LABOR AND HUMAN RESOURCES

4420 Economics of Human Resources (3) Analysis of current problems in human resource development and organization of occupations aimed at their solution. Problems include unemployment, education and training, poverty and income redistribution, discrimination based on sex or ethnicity, or others. Prereq: 2520.


6460 Seminar in Labor Economics (4) Theory of labor market behavior, emphasis on the role of union wage determination, employment and unemployment. Wage differentials, economic discrimination; and impact of unionization. Prereq: 3110 and 3120, or equivalent.

6470 Public Policy in the Labor Field (4) Governmental regulation of wages, hours, and other aspects of industrial relations. Public policy in areas of income, human resource development, equal employment opportunity, occupational safety and health, social insurance, and immigration policy. Prereq: 6450 and 6460.

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: 3210 or 3220. W

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

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

4260 Economics of Resources and Environmental Policy (3) Analysis of environmental policy and allocation of resources. Benefits and costs of development of natural resources and impacts of growth on environment. Prereq: 2510. W

5290 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

5280 Economic History of the U.S. (3) Interpretation of American economic structure and policies from colonial times. W

5610 Location and Regional Development Theory (3) Theory of industrial, agricultural, and residential location; 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, economic base studies, and regional input-output, linear programming, and econometric models. Prereq: 5112 and 5122.

6111 International Economics: Trade (4) Pure theory of classical, neoclassical, and modern international trade. Comparative advantage, free trade and welfare, and international trade; growth and migration, tariffs and subsidies, and customs unions. Prereq: 5112 or consent of instructor.


6213 International Monetary Economics (4) Theories of exchange rate determination, approaches to balance of payments theory, balance of payments adjustment under alternative exchange rate regimes, economic policy in open economy, international capital movements. Prereq: 5121, 5030, 5120 or consent of instructor.

6231 Economic Development: Theories (4) Study of principal theories explaining economic behavior in less developed countries. Prereq: 21 hrs of undergraduate economics or consent of instructor.

6232 Economic Development: Policies (4) Policies, strategies, and planning techniques used to promote modernization in less developed countries. Prereq: 6231 or consent of instructor.

6241 Economic Development: Western Impact on Asia and Africa (4) Studies of consequences of contact between developed world and third world countries of Asia and Africa. Prereq: 21 hrs of upper division undergraduate social science or consent of instructor.

6242 Seminar in Economic Development (4) Topics vary with interests of students. Prereq: 6241 or consent of instructor.

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

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

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 public policy towards environmental problems. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs. Sp, A

MONETARY ECONOMICS

5820 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: 5200 or equivalent.

6510-20 Seminar: Monetary Theory (3, 3) Study of money, credit and liquidity as related to income, interest rates, employment, output, and prices. Prereq: 5112 and 5122.

PUBLIC FINANCE

5710 Public Finance and Public Policy (3) Allocative, distributional and stabilization roles of public sector. Not available for credit in PhD program in Economics. Prereq: Consent of instructor.


Finance

Professors: W. W. Osterweil (Chairman), Ph.D. Pennsylvania; L. P. Anderson, Ph.D. Wisconsin; W. C. Boothby, Ph.D. Wisconsin (Milwaukee); G. G. Garding, Ph.D. New York; R. E. Shrieves, Ph.D. California (Los Angeles); C. P. White, Emeritus, Ph.D. Pennsylvania.

Associate Professors: A. L. Auxter, Ph.D. Iowa; T. P. Boehm, Ph.D. Washington (St. Louis); D. Choi, Ph.D.
Pennsylvania State, J. M. Wachowicz, Jr., Ph.D. Illinois (Champaign-Urbana), C.P.A.  
Assistant Professors:  
R. J. Clayton, Ph.D.; Georgia; M. C. Ehrhardt, Ph.D.; Georgia Institute of Technology; J. P. Ogden, Ph.D.; Purdue; R. A. Weir, Ph.D. North Carolina.  

MBA Concentration: Finance. The curriculum offers courses for those interested in careers in corporate financial management, security analysis and investments, banking and financial institutions, real estate investment and development, business risk management, and financial planning services.  
Minimum Course Requirements for MBA Concentration: At least four and not more than six courses from the following: 4700, 5100, 5140, 5420, 5430, 5510, 5610, 5620, 5630, 5810, 5820, and 5990.  
Ph.D. Concentration: Finance  
5002 Non-Thesis Graduate Completion (3-15) Required for the non-thesis student not otherwise registered during any quarter when such a student uses university facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. S/NC only. E.  
5420 Investment Analysis (3) Principles and techniques for evaluation of investment desirability of marketable securities, with emphasis on common stocks and corporate bonds. Financial statement analysis, short-term methodologies of funds, long-term capital structure and capital budgeting, and multi-national finance. Prereq: 5020, F. W.  
5430 Portfolio Analysis and Management (3) Development of portfolio analysis, long-term methodology of asset selection, management, evaluation, and revision of asset portfolios. Modern analytical and statistical techniques. Prereq: 5420 or consent of instructor. F.  
5510 International Financial Management (3) Analysis of international financial aspects of the financial management in journal literature: informational asymmetry, capital market imperfections, and international financial dynamics. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs. W.  
5610 Real Estate Finance (3) Valuation, financial analyses, and investments in the ownership and management of real property. Tax aspects of acquisition, operation and sale. Synthesis and financing methods. Prereq: 5010 or consent of instructor. F.  
5620 Economic Analysis of Housing and Urban Land Markets (3) An introduction to the statistical, economic, theoretical, and empirical literature of urban problems. Relevance of empirical and theoretical economics literature to policy makers and entrepreneurs. Prereq: Economics 5020 or consent of instructor. W.  
5630 Real Estate Investment Analysis (3) Application of contemporary appraisal and feasibility analysis to real estate case studies. Use of computer models for discounted cash flow and mortgage equity analysis. Prereq: 5010 or consent of instructor. Sp.  
5810 Financial Markets and Intermediaries (3) Capital formation and allocation in the economy. Role of financial intermediaries and markets. Theory and structure of interest rates. Analysis of money and bond markets; study of international financial markets. Prereq or coreq: 5010. (Same as Economics 5810.) F, W.  
5830 Commercial Banking (3) Analysis of management policies of financial institutions, including assets, liabilities, and capital. Introduction to the operation and interaction of economic, and regulatory environment, and implications for management. Examination of bank structure and competition, and financial problems of the U.S. financial system. Prereq: 5010. Or coreq: Economics 5830. (Same as Economics 5830.) Sp.  
5990 Research in Finance (3) Directed research on topic of mutual interest to the student and staff member. Prereq: Consent of Department Chairperson. May be repeated. Maximum 6 hrs.  
6000 Doctoral Research and Dissertation (3-15) Ph/ NP only. E.  
6520 Advanced Seminar in Capital Markets (3) Recent developments in financial intermediation: informational asymmetry, capital market imperfections, and international financial dynamics. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs. W.  
Management  
Professor:  
H. D. Dewhurst (Head), Ph.D. Texas; C. F. Boling, Ph.D. Stanford, Ph.D. California; A. H. Kesly (Emeritus), MBA Pennsylvania; J. M. Larsen, Jr., Ph.D. Purdue; S. K. Reed, Ph.D. Duke; D. Roeo, Ph.D. Iowa; R. Smith, Ph.D. Ohio; J. J. Starrfield, Ph.D. Ohio State; S. C. Van Meter, Ph.D. Pennsylvania; G. A. Wagner (Emeritus), M.S. Indiana; G. H. Whitlock, I (Emeritus), Ph.D. Tennessee; M. S. Wortman, Jr., Ph.D. Minnesota.  
Assistant Professors:  
O. S. Fowler, Ph.D. Georgia; R. C. Maddox, Ph.D. Texas; C. W. Neel, Ph.D. Alabama; M. C. Rush, Ph.D. Akron.  

Assistant Professors:  

William B. Stockey Professor of Strategic Management.  
Alumni Distinguished Service Professor.  

MBA Concentrations: Management, Forest Industries Management.  
DBA Concentration: Management.  
Minimum Course Requirements for MBA Concentrations: May be approved by the area faculty advisor. Forest Industries Management—5110, 5130; Forestry 5260, 5270.  
5000 Thesis I (1) P/NP only. E.  
5002 Non-Thesis Graduation Completion (3-15) Required for the non-thesis student not otherwise registered during any quarter when such a student uses university facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. S/NC only. E.  
5101 Organization Theory and Behavior (3) Basic concepts and organizational behavior. Integration and management analysis of behaviors.  
5200 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: Management Science 5010; Statistics 5020.  
5110 Organization Theory (3) Analysis and design of organization structure. F.  
5130 Managerial Planning and Control (3) Processes of management planning and controlling with emphasis on corporate strategic planning. Sp.  
5170-80-90 Proseminar in Industrial and Organizational Psychology (3, 3, 3) Introduction to basic concepts and ideas required for graduate study in industrial and organizational psychology. Must be taken in sequence 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.  
5220 Wage and Salary Administration (3) Analysis of problems, programs, and practices. W.  
5230 Human Problems in Administration (Review) and critique of research in industrial human relations. (Same as Psychology 5450.) F. W, Su.  
5250-60 Industrial and Organizational Psychology (1-3, 1-3) Readings in industrial and organizational psychology. Available only by prearrangement with supervising faculty member. May be repeated. Maximum 6 hrs. S/NC or letter grade. F.  
5280 Independent Study, Project or Research in Management (1-3) Topic of mutual interest to student and faculty member. Available only by prearrangement with supervising faculty member. May be repeated. Maximum 6 hrs. S/NC or letter grade. F.  
5320 Management Problems in Industrial Research (3) Basic principles of the research processes encountered in management of industrial technological research and engineering programs, and comparable programs in various professional and academic departments.  
5410-20-30 Production Management (3, 3, 3) Quantitative approach to solution of production management problems. Prereq: 5020 or 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. F. W.
5630 Research Methods in Management (3) Methodology in management research. Review of experimental design, measurement problems, data sources and collection, and application of statistical methodology. For graduate students and graduate research proposals. Prereq: DBA student status or consent of instructor. S/NC only. Sp

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

5810 Energy Management: Theory and Practice (3) Management of energy resources in operating systems, decision 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) P

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 (A, 3) Advanced problems in organizational psychology. Areas include performance evaluation, executive development, group process, and morale. (Same as Psychology 6250-63-70.)

6300 Seminar in Industrial and Organizational Psychology (3) (Same as Psychology 6300.)

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

DEGREE

Management Science Ph.D.

Professors: R. S. Garfinkel (Chairperson), Ph. D. Johns Hopkins, J. K. Ho, Ph D. Stanford, Assistant Professor: D. R. Fox, Ph. D. Purdue University.

Management Science Committee: Robert S. Garfinkel, Chairperson; John Bradley, Ph.D. & John, Mathematics; Dale R. Fox, Assistant Professor; Ronald E. Shrieves, Professor, Department of Finance; John Bradley, Associate Professor, Department of Economics; James K. Ho, Professor, Management Science; Mary G. Leinweber, Assistant Professor, Department of Statistics; Bruce Railet, Associate Professor, Geography Department; Ronald E. Shrieves, Assistant Professor, Department of Finance; William Sullivan, Professor, Industrial Engineering; Gary Thomson, Computer Science Department.

MBA CONCENTRATIONS

For students whose MBA concentration area is Management Science, the MBA Core is revised as follows: substitute Management Science 5310 for 5010, Statistics 5110 for 5020, and with the addition of Management Science 5530 and 5340.

MBA CONCENTRATION

MANAGEMENT SCIENCE

MBA CONCENTRATION

THE DOCTORAL PROGRAM

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

(1) to provide, through management science course work, a thorough knowledge of common Management Science/Operations Research mathematical models and their uses;

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

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

Admission Requirements: The doctoral exam requires three Graduate School Rating Forms and the GRE. The GMAT is acceptable in lieu of the GRE.

Degree Requirements: General University requirements for the doctoral degree are stated on page 186.

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

The program includes approximately 24 to 30 quarter hours of course work in the applied concentration which will serve the graduate well throughout a life-long career, whether in management, research, or teaching.

Qualifying Examinations: The student must demonstrate mastery of probability theory and statistical inference (Statistics 5110-20-30) by passing a written qualifying examination.

Master of 18 to 21 quarter hours in mathematics course work must be demonstrated by passing a written qualifying examination. Topics normally include numerical analysis (either Mathematics 4222, 4245, 4080, or Mathematics 5655-65-75) and real analysis (Mathematics 4510-20-30). Other options may be approved. In exceptional circumstances the faculty will consider waiving the mathematics and/or statistics qualifying examinations.

These requirements generally are completed by the end of the first year of the program.

There is no foreign language requirement, Comprehensive Examination: Prior to admission to candidacy for the degree, and normally after completion of the second year of the program, the student must pass a written comprehensive examination covering the theory of deterministic and stochastic management science models. Topics included in this examination are determined on an individual basis. Students will be expected to demonstrate an integrative ability that goes beyond simple mastery of course content.

Research and Dissertation: The student must complete 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 hours of course work, normally is completed in the second year of the program.

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

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

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

5100 Quantitative Analysis for Management Decisions (3) Assignment, transportation and general linear programming problems; decision theory. Markov chains and queuing. Prereq: 5010. 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 advanced methodologies for large scale management problems. 5350 may be taken concurrently. Su

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

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

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

6110-20 Models for Production Systems (3, 3) Seminar providing research practice to enhance professional development of doctoral students. May be taken toward degree requirements. May be repeated. S/NC only. E

6210-20 Network Flows (3, 3) In-depth treatment of network flow models and algorithms including transportation and transshipment; primal-dual and primal basis-tree methods; multimmodity, multiterminal and dynamic flows; flow with gains; and other advanced topics. Prereq: 5310 or equivalent. A

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

6410 Large Scale Mathematical Programming (3) Development of solution strategies for linear programming
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: 5020. F

5230 Analysis and Design of Marketing Systems (3) Macromarketing approach to marketing system: conceptual framework for examining marketing agency and channel interrelationships, public policy, cost and efficiency, and innovation. Prereq: from viewpoint of decision maker. Prereq: 5020. Sp

5300 Marketing Research (3) Investigation and solution of problems: application of research methods to functions of marketing. Research concepts, methods, and techniques. Prereq: 5020; Statistics 5010. F

5350 Buyer Behavior Analysis for Marketing (3) Buyer behavior patterns with emphasis on implications for marketing analysis and executive action. Marketing and behavioral sciences. Prereq: 5020. F

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 marketing opportunity analysis results to marketing decisions. Prereq: 5020. 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: 5020 and 5350. Sp

5450 International Marketing Management (3) Development and management of international marketing programs. Problems involved in marketing goods and services in foreign markets. Political, cultural, and economic conditions in different countries. Prereq: 5020. Sp

5990 Research in Marketing (3) Directed research on subject of mutual interest to student and staff member. Prereq: 5020 and 5300. May be repeated. Maximum 6 hrs. E

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

6050 Macroe/Theoretical Foundations of Marketing (3) Fundamental nature and history of marketing processes. Role of marketing theory in developing marketing discipline and in research process. Environment and background of marketing decision making. Prereq: Consent of instructor. A

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

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

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

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

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

Transportation and Logistics

Professors:


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

MBA Concentration: Transportation and Logistics.

MBA Concentration: Transportation and Logistics.

Minimum Course Requirements for MBA Concentration: 18 credit hours required including 5010, 5110, 5130, 5220.

Transportation 5010 is prerequisite to all other graduate courses in this area.

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

5010 Survey of Transportation and Logistics (3) Intensive survey of logistical demands made by society and specific users on nation’s transportation system: problems facing career transportation and logistics professional. Prereq: 5020. Sp

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

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

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

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

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

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

5990 Independent Study in Transportation/Logistics (3) Directed study in subject of mutual interest to student and staff. Prereq: 5010. May be repeated. Maximum 6 hrs. E

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

6110 Seminar in National Policy (3) Critical analysis of contemporary national transportation policy issues. Prereq: 5110. F

6210 Seminar in Transportation and Logistics Models (3) Analysis of contemporary models and methodologies in transportation and logistics research. Relative abilities and limitations of current software. Prereq: Management Science 5010; Statistics 5010 or equivalent.

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

problems that have many constraints, many variables or extremely sparse constraint matrices. Prereq: 5310 or equivalent. A

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

6610 Markovian Decision Models (3) Formulation and analysis of Markovian models. Markovian models which incorporate decisions—who their formulation, application and solution through policy iteration. Stochastic dynamic programming models in continuous time. Prereq: 5330. F

6620 Queuing Models (3) Application and mathematical analysis of models of congestion. Basic birth-death process models, other Markovian models; non-Markovian models for systems with general service or arrival patterns, priority customers or other complexing assumptions; queues in series. Prereq: 5330 or Mathematics 4750-60. Sp

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

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

6910-20 Management Science Seminar (1-3, 1-3, 1-3) Subjects selected from current management science literature. F, W, Sp

Marketing and Transportation

D. J. Barnaby (Chairman), Ph.D. Purdue.

Marketing

Professors:


Assistant Professors:

R. C. Reizenstein, Ph.D. Ohio State; J. R. Jenkins, Ph.D. Ohio State; J. R. McMillan, Ph.D. Ohio State; R. C. Reizenstein, Ph.D. Cornell.

Associate Professors:

J. H. Foggin, Ph.D. North Carolina; J. P. Speck, Ph.D. North Carolina; D. W. Schumann, Ph.D. Missouri (Columbia); S. F. Gardial, Ph.D. Houston.

MBA Concentration: Marketing.

MBA Concentration: Marketing.

Minimum Course Requirements for MBA Concentration: 5300, 5310, 5340, 5410.

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

5010 Marketing and Distribution Management (3) Analysis of current marketing and distribution structure including functions, problems. Systems concepts and analytical decision process. Prereq: Accounting 5010; Economics 5010. Prereq or coreq: Statistics 5010. W, Sp

5200 Marketing Strategy and Decision Making (3) Management of basic marketing functions. Integration of functional decisional areas into development of marketing strategy, both domestic and international. Prereq: 5110, 5130; Economics 5020; Statistics 5020. Sp, Su. W

5210 Sales Force Management (3) Basic communication theory affecting objectives and problems of sales management, appointment, selection, training, motivation, evaluation, and control of sales force. Sales forecasting, territory design, and routing. Prereq: 5020. W
Statistics

MAJOR DEGREE

Statistics

M.S.

Professors:
D. L. Sylvestre (Chairman), Ph.D. Stanford; D. S. Chambers (Emeritus), M.B.A. Texas; R. A. McLean, Ph.D. Purdue; J. W. Philpot, Ph.D. Virginia Polytechnic Institute; C. C. Thigpen, Ph.D. Virginia Polytechnic Institute.

Associate Professors:
G. B. Ranney, Ph.D. North Carolina State; R. O. Green, Ph.D. North Carolina; R. D. Sanders, Ph.D. Texas; M. S. Younger, Ph.D. Virginia Polytechnic Institute.

Assistant Professors:
M. G. Lethen, Ph.D. Kentucky; J. L. Schmidthammer, Ph.D. Pittsburgh.

THE MASTER'S PROGRAM

The Master of Science program in Statistics is designed to provide students with a basic foundation in theoretical and applied statistics for careers as consulting and practicing statisticians. A special industrial statistics concentration is available for students wishing to focus on industrial applications of statistics.

A candidate should possess an undergraduate degree with a background in calculus, but no restrictions are imposed regarding the undergraduate major.

The department offers both thesis and non-thesis options for work towards the degree. With Options I and II, two-thirds of the total hours in each program must be at or above the 5000 level. Option I or II must be approved by the department.

Option I: The student must present a minimum of 48 quarter hours of approved coursework to include:
(a) a minimum of 27 hours in graduate statistics courses,
(b) a minimum of 9 hours in collateral work outside the department, and
(c) a minimum of 3 hours credit for a directed study project.

Option II: The student may be approved for a thesis option consisting of a minimum of 45 quarter hours to include:
(1) a minimum of 24 hours in graduate statistics courses, and
(2) 9 hours credit for master's thesis.

Option I or II must be approved by the department. An industrial statistics concentration is available within the framework of either option.

MBA CONCENTRATION

For students whose concentration area is Statistics, the MBA Core is revised to substitute Statistics 5110 for 5010. The concentration area must include 5120 and 5130. Normally, Statistics 5250-60-70 are also included which require 3450 as a prerequisite.

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


4310 Regression Analysis (3) Linear regression and correlation, multiple regression, stepwise methods, polynomial regression, use of dummy variables. Use of standard regression computer programs. Elementary theory and applications. Prereq: 6 hrs in statistics. E

4415 Sampling Techniques and Theory (3) Procedures used in probability sampling for a variety of arrangements of statistical universes and development of estimators and standard errors associated with the sampling schemes. Some properties of estimators. Determination of sample size. Not available for credit to students with credit for 3410. Prereq: 6 hrs in statistics. E

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

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

5010 Probability and Statistical Inference (3) Fundamentals of probability, discrete and continuous probability models, mathematical expectation, and inference concerning means. Prereq: Mathematics 5560 or equivalent and a computer programming course. May not be taken for credit by students who receive credit for 5110. 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. Sp

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

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

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

5190-60-70 Statistics for Researchers in the Behavioral and Biological Sciences (3, 3, 3) Principles and applications of statistical methodology, integrated with interactive use of major data analysis systems. 5190—Probability and probability distributions; forming and testing hypotheses using parametric and nonparametric methods. 5160—General linear model: regression methods using matrix algebra. Least-square estimation and general normal-theory testing; simple, multiple, and partial correlation; model selection and diagnostic techniques. 5170—General linear model: analysis of variance methods. One-way, factorial, and nested designs; preplanned and post-hoc tests of contrasts; blocking factors and covariates, random-effects and repeated-measures designs. Must be taken in sequence. Intended primarily for doctoral students. Credit not available to those completing 3450. Prereq: 3450. W

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

5250 Parametric and Nonparametric Statistics (3) Methods for inference about one or more populations, and measures of association. Prereq: 3450. F

5260 Applied Regression Analysis (3) Simple linear and multiple regression, polynomial models, use of dummy variables, variable selection procedures, and nonlinear least squares estimation. Prereq: Matrix algebra, 3450, and statistical computing experience. W

5270 Design of Experiments (3) One-way ANOVA, multiple range tests, equal and unequal variances, transformations, factorial experiments, completely randomized designs, split-plots, and nested designs. Prereq: 3450. Sp

5310 Statistical Techniques in Industrial Processes (3) Control charts for attributes and variables, capability analysis, parametric and nonparametric tolerance intervals, tool wear, and problems of measurement. Prereq: 3450. W

5320 Statistical Techniques in Industrial Processes II (3) Special control chart techniques, transformations, statistical tolerancing, acceptance sampling, sequential analysis, and analysis of variability. Prereq: 5310. Sp

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

6060 Applied Multivariate Analysis (3) Applications of multivariate general linear model, analysis of covariance, discriminant analysis and classification, multivariate analysis of variance and covariance, multivariate approach to repeated-measure analysis. Prereq: Graduate level coursework in multiple regression and analysis of variance; experience using SAS or SPSS via interactive terminals. F; W

6070 Factor Analysis (3) Principal component analysis and principal factor analysis; estimates of communalities; methods of rotation; interpretation of factors; cluster analysis. Prereq: 6060. Sp

6250 Linear Models (3) Linear statistical models for analysis of variance with disproportionate and unequal subcell numbers using generalized inverses, concepts of estimability, and hypothesis testing. Prereq: Matrix algebra and either 4310 and Animal Science 5720, or 5720. W
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 adviser and an adviser from the College of Undergraduate Studies.

The M.S. program is accredited by the Accrediting Council on Education in Journalism and Mass Communication. The College is a member of the Association of Schools of Journalism and Mass Communication and the Broadcast Education Association.

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

MASTER OF SCIENCE

The Master of Science degree with a major in Communications is intended for students who desire a career in the mass media with an emphasis on communications management, and a deeper understanding of the communication process and social role of the mass media. The program follows a broad-based multi-media approach which also allows the student to concentrate in one of four fields: advertising, broadcasting, public relations, and newswriting. Required course work includes graduate introductory courses in advertising, management, and a deeper understanding of the mass media with an emphasis on communications management. The program follows a broad-based multi-media approach while also allowing the student to concentrate in one of four fields: advertising, broadcasting, public relations, and newswriting. Required course work is required:

- 12 hours of core courses: Communications 5100, 5121, 5140, and 5470, 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.
- 12 hours of Communications elective courses consisting of one graduate-level law course from the Communications, Business Administration, or Law Colleges, and one course each from Advertising, Broadcasting, and Journalism from the following lists:
  - Advertising 5310 or 5340,
  - Broadcasting 4670 or 5610,
  - Journalism 4420, 5210, or 5710.
- 12 hours in a major area within the College, including at least 6 hours at the 5000 level. An internship, if needed, is included.
- 9 hours of thesis (Communications 5000), including 3 hours of thesis seminar.

Students interested in subsequent entry into a doctoral program are advised to take additional courses in communications theory and research, subject to adviser's approval. All students in the Master's program without an undergraduate background or professional experience in communications will normally complete an internship that involves professional experience in the communications field. The student's internship experience requires approval by his/her adviser. Credit will be given through Advertising 5980, Broadcasting 5980, or Journalism 5980 on the basis of 3 hours credit for the equivalent of 10 weeks of full-time professional experience. This credit is to be included in the student's 45-hour M.S. program. Previous professional experience will be evaluated by the student's committee.

After completion of the formal program of coursework and thesis research, 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
The Communications Research Center is an 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, 974-3031.

Communications

MAJOR

DEGREES

Communications

Professors:

P. G. Ashdown, Ph.D. Bowling Green; J. A. Crook, Ph.D. Iowa State; G. A. Everett, Ph.D. Iowa;

J. H. Haskins, Ph.D. Michigan State; D. W. Scott, Ph.D. Northwestern;

H. H. Howard, Ph.D. Ohio;

J. B. Leader, Ph.D. Southern Illinois;

R. S. Swan, Ph.D. Missouri;

G. A. Everett, Ph.D. Bowling Green;

J. B. Crook, Ph.D. Michigan State;

M. W. Singletary, Ph.D. Southern Illinois;

R. E. Taylor, Ph.D. Illinois.

Associate Professors:

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

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

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

5140 Mass Communication Theory (3) Critical appraisal of selected hypotheses and theoretical concepts in research literature of mass communications. Conceptualization of communication processes. Prereq: 5100 or 6100. F

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

5200 Seminar in Communications Education (3) Principles and historical perspectives of education for journalism, broadcasting, and advertising. Su

5410 Seminar in Communications Law (3) Legal limitations, privileges, and major issues affecting mass media: law of libel and invasion of privacy, development of obscenity law, free press and fair trial, contempt of court, federal regulation of broadcasting, advertising and public relations industries, copyright and access to information. W

5420 Seminar in Communications History (3) Major trends in media history, development of major concepts and issues. Prereq: Survey course in communications history or consent of instructor. F

5470 Seminar in Media Economics (3) Electronic and print media ownership and finance, role of new technologies and marketing techniques; corporate personnel policy, budgeting and expansion. Sp

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

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

6100 Introduction to Doctoral Studies (1) Doctoral degrees and dissertation requirements. Committee formation and program planning. Overview of research methods and informational sources. S/NC only. F

6140 Mass Communication Theory II (3) Application of theory to contemporary mass communication problems. Topical approach; literature reviews and analytical papers. Prereq: 5120, 5140, 6100. W

6141 Mass Communication Theory III (3) Continuation of 6140, detailed analysis of selected topics in theory and research. Tutorials, readings, reviews, reports, and papers in fields of interest. Prereq: 6140. Sp

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

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. W

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

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

6330 Content Analysis (3) Content analysis as mass media, media research techniques, conceptual foundations. Research design, categorization, sampling procedures, data gathering, and analysis. Sp

Advertising

Professors:

J. B. Haskins, Ph.D. Minnesota.

Ph.D. Illinois.

G. A. Everett, Ph.D. Bowling Green;

J. A. Crook, Ph.D. Michigan State;

M. W. Singletary, Ph.D. Southern Illinois;

R. E. Taylor, Ph.D. Illinois.

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

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

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

5140 Mass Communication Theory (3) Critical appraisal of selected hypotheses and theoretical concepts in research literature of mass communications. Conceptualization of communication processes. Prereq: 5100 or 6100. F

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

5200 Seminar in Communications Education (3) Principles and historical perspectives of education for journalism, broadcasting, and advertising. Su

5410 Seminar in Communications Law (3) Legal limitations, privileges, and major issues affecting mass media: law of libel and invasion of privacy, development of obscenity law, free press and fair trial, contempt of court, federal regulation of broadcasting, advertising and public relations industries, copyright and access to information. W

5420 Seminar in Communications History (3) Major trends in media history, development of major concepts and issues. Prereq: Survey course in communications history or consent of instructor. F

5470 Seminar in Media Economics (3) Electronic and print media ownership and finance, role of new technologies and marketing techniques; corporate personnel policy, budgeting and expansion. Sp

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

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

6100 Introduction to Doctoral Studies (1) Doctoral degrees and dissertation requirements. Committee formation and program planning. Overview of research methods and informational sources. S/NC only. F

6140 Mass Communication Theory II (3) Application of theory to contemporary mass communication problems. Topical approach; literature reviews and analytical papers. Prereq: 5120, 5140, 6100. W

6141 Mass Communication Theory III (3) Continuation of 6140, detailed analysis of selected topics in theory and research. Tutorials, readings, reviews, reports, and papers in fields of interest. Prereq: 6140. Sp

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

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. W

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

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

6330 Content Analysis (3) Content analysis as mass media, media research techniques, conceptual foundations. Research design, categorization, sampling procedures, data gathering, and analysis. Sp

Advertising

Professors:

J. B. Haskins, Ph.D. Minnesota.
4020 Radio Production (3) Study of radio production, past and present. Familiarization with production tools and techniques. Group and individual production activities. Prereq: 2750 or consent of instructor. Cannot be taken for graduate credit by communications majors.

4030 Television Production (3) Overview of elements of television production: cameras, sound, lighting, film, videotape recording, optics, and studio control centers. Presented with the layperson and professional broadcasting mind. Prereq: 4020 or consent of instructor. Cannot be taken for graduate credit by communications majors. F, W, Sp

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

4100 Broadcast News Operation (3) Theory and practices of covering local news and public affairs events for radio and television. Gathering and production of news broadcasts, use of tools of broadcast Newscaster. Prereq: 3810 and 3670 or consent of instructor. 2 hrs and 1 lab. F, W, Sp

4670 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. F, W, Sp, Su

4680 Broadcast Sales Management (3) Problems and practices of radio, television, and sales forces. Projects that sell development pricing, promotion, and other areas of sales management. Prereq: 2750 or consent of instructor. F, W, Sp

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

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 creativity, media, management, and research. Extensive individual reading: preparation and delivery of papers. Prereq: Consent of instructor. F

5340 Advertising Management (3) Agency-client relations, media strategy, creative strategy, research, and relationship between advertising and marketing function. Prereq: 4360 and 3630 or consent of instructor.

5350 Advanced Advertising Research (3) Nature, scope, and application of research including measurement of advertising, media audiences, and evaluation of messages. Prereq: 4660 or consent of instructor: W

5670 Independent Study (3) E

5980 Internship (3)

Broadcasting

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

Associate Professor: B. A. Moore, Ph.D. Ohio; I. G. Simpson, M. S. Syracuse.

Assistant Professor: G. C. Johnson, Ph.D. Southern Illinois;

Communications Specialist: J. H. Carr, M.S. Tennessee; D. Ziegler, Ph.D. Southern Illinois

3360 Television and Radio Advertising (3) Principles of successful radio-television advertising; emphasis on media research, rate structure, programming, creative, television commercial. F, W, Sp

biology/nutrition, chemistry/environment, physics/astronomy/engineering. Prereq: Basic reporting course or consent of instructor.

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

5550 Magazine Article Writing (3) Techniques of writing in-depth articles for mass circulation magazines. Organizing and presenting material. Problems in specialized areas, such as business, science, agriculture, the humanities. Prereq: 3120 or consent of instructor.

5710 Studies in Public Relations Communications (3) Problems of communication between institutions and organizations and their publics. Case histories and evaluations of programs. Prereq: 2710 or consent of instructor. F

5810 Magazine Editing and Production (3) Analysis of editorial and production problems of general, regional, and specialized publications. Reader interest evaluation. Individual editorial projects. Prereq: Consent of instructor.

5910 Communications and International Development (3) Seminar emphasizing mass media in national and international development. Communications and change in developing countries. Problems in international and cross-cultural communications. Prereq: 4950 or consent of instructor.

5970 Independent Study (3)

5980 Internship (3)
Richard Wisniewski, Dean
C. Glennon Rowell, Associate Dean for
Undergraduate Studies
Thomas W. George, Associate Dean for
Graduate Studies
Charles M. Peccolo, Director, Bureau of
Educational Research and Service

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

The College of Education holds member-
ship 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 Depart-
ment of Education.

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

TEACHER CERTIFICATION

Applicants for initial teacher certification
and those applicants previously certified
who are seeking initial institutional recom-
mendation for certification must gain
admission to the College's Teacher Educa-
tion Program. A complete explanation of the
admission process appears in the General
Catalog.

MASTER OF SCIENCE

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

SPECIALIST IN EDUCATION DEGREE

This degree may be earned in Educational
Administration and Supervision, in Educa-
tional Psychology and Guidance, in
Curriculum and Instruction, in Safety Educa-
tion 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.

The Ph.D. program with a major in Educa-
tion provides six options for study in the
departments of Curriculum and Instruction,
Educational Administration and Supervision,
Educational and Counseling Psychology,
Special Education and Rehabilitation, Tech-
nological and Adult Education and the
divisions of Health and Safety, and Physical
Education. The program requirements and
the concentrations and emphases are:

The Program

- Research Area 21 Hours
  - Foreign or Computer Language
    (demonstrate proficiency) 0-9 Hours
  - General Core Requirements
    - Courses in history of education, philosophy of education
      (two areas must be represented) 6 Hours Minimum
    - Courses in learning theory, curriculum theory, and
      administrative theory
      (three areas must be represented) 9 Hours Minimum
    - Trans-college seminar—four
      consecutive quarters 4 Hours Minimum
  - Alternative Core Requirements
    - Courses in philosophy of science
      4 hours minimum
    - Transcollege Seminar—four
      consecutive quarters 4 hours
    - Seminar in area of emphasis 4 hours minimum
  - Courses in learning theory/group or
    independent study 3 hours minimum

  - Specialization
    Major Option—A minimum of 24
    hours normally selected from
    one or two emphases within
    the major option 24 Hours Minimum
    Supporting Emphasis—A minimum
    of 12 hours selected from
    an emphasis other than those
    emphases selected in the
    major option. (May be selected
    from any one of the five
    options but not a combination
    of options.) 12 Hours Minimum
    Cognate—A minimum of 9
    hours selected from outside
    the College in addition to
    the designated research
    courses. 9 Hours Minimum
    Dissertation 36 Hours Minimum

Concentrations and Emphases

Option I*. - Emphases in
Administrative Theory and Practice

Major Options and Emphases:
1. School Administration
2. Higher Education Administration
3. Organizational Leadership and Policy
   Studies

Option II*. - Emphases in Theories
of Curriculum Development and
Foundations of Education

1. Bases for educational Planning and
   Curriculum: Anthropological, Historical, Philosophical,
   and Sociological.
2. Principles and Models for Planning,
   Developing, and Evaluating Educational Programs.
3. Research Design for Educational
   Programs.

Option III*. - Emphases in
Instructional Theory and Practice

1. Principles and Models for Instructional
   Improvement.
Departments of Instruction

Art and Music Education

C. H. Bail, Head

Art Education

MAJOR DEGREE

Art Education M.S.


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

The Master of Science degree in Art Education is offered for art teachers, supervisors, and art-trained persons holding the 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>Course</th>
<th>Quarter Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Art Education 5310, 5320 and electives</td>
<td>18</td>
</tr>
<tr>
<td>2. Curriculum and Instruction 5710, and electives</td>
<td>21</td>
</tr>
<tr>
<td>3. Minor (selected with committee)</td>
<td>9</td>
</tr>
<tr>
<td>4. Thesis (Art Education 5000)</td>
<td>9</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Course</th>
<th>Quarter Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Art Education 5210, 5310, 5320, and electives</td>
<td>21</td>
</tr>
<tr>
<td>2. Curriculum and Instruction 5800, and electives</td>
<td>9</td>
</tr>
<tr>
<td>3. Minor (selected with committee)</td>
<td>9</td>
</tr>
<tr>
<td>4. Electives</td>
<td>6</td>
</tr>
</tbody>
</table>

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

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

Prerequisites:
- 4590-40-70 Problems in Art Teaching (3, 3) Prereq: Consent of instructor. E
- 5000 Thesis (1-15) P/NP only. E
- 5002 Non-Thesis Graduation Completion (3-15) Required for the non-thesis student not otherwise registered during any quarter when such a student uses university facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. S/N/C only. E
- 5210 Organization, Administration, and Supervision of Art in the School Program (3) W
- 5310 Art in Education (3) Historical background, current philosophy, theory, and trends; nature and function of aesthetic behavior in visual arts; relationships to psychology, sociology, and anthropology. F
- 5320 Program Development in Art Education (3) Objectives, organization, content selection, facilities, and equipment: supervision; evaluation; professional growth; leadership and community relationships; art for special student. Sp

Prerequisites:
- 5850-60-70 Problems in Art Education (3, 3) Prereq: Consent or instructor. E

Music Education

MAJOR DEGREE

Music Education M.S.


Assistant Professors: J. R. Sparks, M.S. Tennessee.

Thesis and non-thesis programs lead to the Master of Science degree in Music Education.

Prerequisite preparation: undergraduate degree or equivalent in music education. All graduate students in music education must pass proficiency examinations in music theory and applied music.

Thesis Option: Quarter hours
- Music Education 5210, 5220, 5230 and electives | 18            |
- Music electives | 9             |
- Professional education courses including Curriculum and Instruction 5710 | 9             |
- Music Education 5000 | 9             |
- Total | 45            |

Non-Thesis Option: Semester hours
- Music Education 5210, 5240, 5250, 5710, one seminar, and electives numbered 5000 and above | 27            |
- Music electives at 3000, 4000, and 5000 levels (not to include required undergraduate curricula courses) | 15            |
- Professional education electives including Curriculum and Instruction 5610, Educational Counseling and Psychology 4760, Educational Counseling and Psychology 5050, 5320, or other appropriate course | 9             |
- Total | 51            |

1. Evaluation (in addition to routine examinations in courses):
   a. Written comprehensive examination in major and minor fields.
   b. The student shall elect one of the evaluation procedures below (with approval of advisor and committee):
      (1) Oral examinations in major and minor fields.
      (2) A public recital on principal instrument, piano, or voice.
      (3) The presentation in public performance of an original music composition(s) accepted by the committee as music suitable for school music performing groups.
      (4) Plan, rehearse and conduct a full public performance of music by junior or senior high school music groups. This shall be worked out as a long-term project under the supervision of the student's committee.
   2. Student's Committee: A minimum of
three faculty members—the advisor from music education, one member from music education, and one member from education.

4411-42-43 Teaching Class Plano (1, 1, 1) For majors in music, music education, or elementary education. Prereq: Consent of instructor. F, W, Sp

4450 Music in Special Education (3) Functions, organization, and development of a school marching band. Prereq: Consent of instructor. Coreq: 3511 F

4460 Marching Band Techniques (3) Functions, organization, and development of a school marching band. Prereq: Consent of instructor. Coreq: 3511 F

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

5092 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 or spends full-time before degree is completed. May not be used toward degree requirements. May be repeated. S/NC only. E


5210 Psychological Foundations of Music (3) Perception; function; aesthetics; talent identification; implications for teaching theory and practice. A review of classic and contemporary studies. Prereq: Consent of instructor. Su

5220 The Administration and Supervision of School Music (3) Improvement of teacher-learning conditions for higher quality in music education. Prerequisites: Supervision, research, and mixed-service education, teacher preparation, and guidance. Su, A

5230 Comparative Teaching Procedures in Music Education (3) Modern teaching theories and their implications. Su, A

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

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, A

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

5270 Studies of Music for Children in the Primary Grades (3) Children’s growth processes in music for Grades 1-3, and musical experiences. For major in music education and/or elementary education. Prereq: 3120 and 3130 or consent of instructor. Su

5320 Advanced Choral Literature and Conducting (3) Reading, conducting, and interpreting vocal scores. Requisites: Vocal ensemble, choir, and community groups; emphasis on contemporary and standard major choral works. Prereq: Undergraduate degree with a major in music education or equivalent. 3510 or equivalent. Sp, A

5330-30-70 Special Problems in Music Education (3, 3, 3) Current problems in music education at all levels of instruction and in various specialized areas of music curriculum. Prereq: 3510 or equivalent and consent of instructor. E

5410 Advanced Band Literature and conducting (3) Reading, conducting, and interpreting band scores. Prerequisites: Knowledge of music theory, sight-reading, orchestration, and band studies; emphasis on contemporary and standard band literature. Prereq: Undergraduate degree with a major in music or music education; 4430 or equivalent W, A


5710 Research in Music Education (3) Prereq: Consent of instructor. Su

5810 Seminar (3) Music teaching in primary and intermediate grades; professional literature and development of bibliography. Laboratory activities. Projects. Prereq: Admission to M.S. program. Su, A

5820 Seminar (3) Music teaching in vocal and general music areas of middle school curriculum. Survey of research, professional literature and development of bibliography. Laboratory activities. Projects. Prereq: Admission to M.S. program. Su, A

5830 Seminar (3) Music teaching in instrumental areas of the elementary, junior high, and senior high curricula. Survey of research, professional literature and development of bibliography. Laboratory activities. Projects. Prereq: Admission to M.S. program. Su, A

5840 Seminar (3) Music teaching in vocal, theoretical, historical, and appreciation area of the secondary school curricula. Survey of research, professional literature and development of bibliography. Laboratory activities. Projects. Prereq: Admission to M.S. program. Su, A

Curriculum and Instruction

MAJORS

Curricular

Elementary Education

Foreign Language Education

Mathematics Education

Reading Education

Science Education

Social Science Education

DEGREES

M.S.

M.S.

M.S.

M.S.

M.S.

M.S.


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

Graduate programs are designed to improve scholarship and educational competence in a number of areas leading to the Master of Science degree in Education, the Doctor of Education degree, and the Doctor of Philosophy in Education degree.
the basic communications process, need for instructional media in instructional development, selection and utilization of media, and basic software production techniques. (Same as Library and Information Science 4750 and Vocational Technical Education 4750.) E

4860 Programmed Learning (3) Theories of learning as related to technology of programmed instruction; techniques and applications of programing. Prereq: Psychology 3210, or consent of instructor. (Same as Psychology 4860.) 2 hrs and 1 lab.

4870 Applications of Computers for Instructional Purposes (3) Computer concepts for teachers at all grade levels. Emphasis on the utilization of applications of computers for teachers, and current classroom uses of computers. Prereq: consent of instructor.

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

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

5010 Contemporary Philosophies of Education (3) Existentialism, phenomenology, Marxism, structuralism, pragmatism, feminist theories, and relativism. E

5020 Current Issues in Educational Theory (3) Theoretical analysis of some current national and regional educational problems.

5040 Studies and Theory in Language Development (3) Studies and theory of language development in children. Prereq: 1 elementary school language arts course or consent of instructor.

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

5080 Special Topics (1-6) Topics to be assigned. May be repeated. May be offered for letter grade or S/NC. E

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

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

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


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

5140 Comparative Philosophies of Education (3) Educational theory and policy proposals of the major philosophic schools of thought. Prereq: Consent of instructor.

5141 Pragmatism in Education (3) Effects of American pragmatist tradition on educational policy and practice. Prereq: At least one course in History or Philosophy of Education.

5150-70 Seminar (1-3, 1-3, 1-3) Curriculum, elementary education, secondary education, or social foundations. Prereq: consent of professor and major goals of students' programs. Maximum 9 hrs. May be offered for letter grade or S/NC. E

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

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

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

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

5229 Introduction to Diagnosis and Correction of Classroom Arithmetic Difficulties (3) Classroom strategies for diagnosis and correcting arithmetic difficulties grades 1-8. Prereq: 3550 or 3751 or equivalent.

5230 Advanced Study and Practicum in Diagnosis and Remediation of Arithmetic Difficulties (3) Assessment and practicum experience with students having corrective and remedial arithmetic needs. Prereq: 4330 or equivalent. F, Su

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

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

5360 Philosophy of Education (3) Truth, knowledge, and values in education. Prereq: 3101, Educational Psychology 2430 or 3810, or equivalents. E

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

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

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

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

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

5283 Programs and Materials in Teaching Elementary Science (3) Analysis of new and innovative science program materials, methods of diversifying teaching, using materials, and analyses of program structure. Prereq: 3720 or equivalent, or consent of instructor.

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

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

5291 Programs and Materials in Elementary School Language Arts (3) Programs and special instructional aids associated with language arts. Prereq: 3580 or equivalent, or consent of instructor.

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

5300 Problems in Improvement of Instruction (1-3)
Special conferences, workshops, and in-service programs. May be repeated. Maximum 9 hrs. S/NC only.

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

5310 Education in Cultural Perspective (3) Contributions of anthropological concepts (primarily concepts of culture) to understanding of education processes, professional guidelines for middle, junior and senior high schools. Consent of instructor.

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

5570 The Junior High and Middle School Curriculum (3) Curriculum designs and appropriate patterns of instruction to middle grade students.

5580 Curriculum Planning and Development (3) Introduction to curriculum theory and basic principles. Prereq: 5410 or 5270 or consent of instructor. E

5610 Educational Statistics (3)

5620 Direction and Supervision of Student Teaching (3) Roles and responsibilities of cooperating teachers and students; objectives and policies of student teaching programs; elements of clinical supervision; overview of research.

5630 Individualization of Instruction (3) Practical experience in designing individualized activities and materials. Prereq: 5580 and 5509 or consent of instructor.

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

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

6680 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

5960 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.

5961 Advanced Production of Audiovisual Software (3) Designing and producing overhead projectors, mounting, preserving, synthesizing, photocopying, nonphotographic slides, and videotaping for producing classroom audiovisual software. Prereq: 5660 or consent of instructor, Library and Information Science 4750 or equivalent. (Same as Library and Information Science 5681.)

5963 Administering Instructional Media Programs (3) Duties, functions, and responsibilities of media professionals developing and administering media programs in various organizational and learning settings. Prereq: 5691, 5692, or consent of instructor.

5964 Utilization of Educational Television and Radio (3) Use of noncommercial educational TV and radio in schools and colleges. Prereq: Consent of instructor.

5965 Research in Instructional Media (3) Media research and its application toward improvement of instruction and learning. Prereq: Consent of instructor.

5966 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.

5967 Application of Instructional Media (3) Media theory and research, newer media and technology, application of media in instructional settings. Prereq: Consent of instructor.

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

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

5790 Career Development: Workshop (1-4) (Same as Educational Psychology 5790.)

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

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

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

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 mathematics instruction to middle childhood education (K-6), methods, and materials for teaching. Materials suitable for individualized instruction, mathematical laboratories, and individual and group projects. 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 Secondary School and Community Colleges (3) Curriculum and teaching problems. Methods of teaching "analysis" courses such as Algebra II, trigonometry, analytic geometry and calculus. Prereq: 3751-52 or equivalent.

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

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

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

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

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

5846 Language Arts in Early Childhood Education (K-3) (3) Behavioral characteristics of children in regard to language, content materials and functional instructional settings, and teaching strategies for development of linguistic skills. Prereq: 3350 or equivalent.

5847 Social Studies and Science in Early Childhood Education (K-3) (3) Integrative approaches to and substantive classification systems of content areas of social studies and science for early childhood years. Emphasis on selection of appropriate social studies and science content and approaches for the young child. Prereq: 3270 and 3720 or equivalent. F, Su

5848 Language Arts in Early Childhood Education (K-3) (3) Language development of young learner with emphasis on teaching methods, procedures, program and materials in early childhood language arts program. Prereq: 3260 or equivalent consent of instructor.

5850 Field Experience (1-5) Application of curricular and instructional principles, methods, and materials in schools. Program prerequisites must be met, and consent of instructor required. May be repeated. Maximum 12 hrs. S/NC only.

5900 Seminar in the Teaching of English in the Secondary School (3) Su

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

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

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

5904 Teaching the Mass Media in the English Classroom (3) Nature of mass media and importance to American education and life. Sp

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

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

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

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

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

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

5911 Directing the Forensic Program (4) (Same as Speech 5511.)

5912 Play Production in Secondary Schools (4) (Same as Theatre 5912.)

5916 The Function of the Thinking Process in Education (3) Analysis of thinking process for purpose of tracing its implications for education theory and practice.

5918 The Teaching of Natural Science (3) Strategies, laboratory techniques, testing and evaluation, professional guidelines for middle, junior and senior high schools, community colleges. Prereq: Consent of instructor.

5961 Seminar in Science and Environmental Education (3) Recent developments in science education, interrelationships of major environmental factors on science education for middle, junior and senior high schools, community colleges. Prereq: Consent of instructor. W

5962 Studies in Energy Education (3) Major and alternative energy sources with applications for development of energy educational programs and materials; special emphasis on science taught in schools including community colleges. Prereq: 5961 or consent of instructor.

5967 The Teaching of the Social Studies (3) Su

5980 Projects, Programs, and Materials in Social Studies (3) Projects and aids associated with each social science discipline. W

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

6010 Studies in English Education (3) Reading and study in various areas of teaching of English: composition, language, and literature. Su

6020 Seminar in Teaching the Social Studies (3) Problems associated with classroom instruction in junior and senior high schools. Su

6030 Research and Theory in Teaching Reading (3) Research and theory in application to teaching of reading; research design as it applies to reading investigations. Prereq: Two 5000-level courses in reading. W

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

6032 Organization and Administration of Reading Programs (3) Synthesizing instructional and learning components of reading into classroom, school,
6730 Evaluation in Curriculum Planning: Theory and Application (3) Trends, issues, and theoretical frameworks, implications for conducting evaluation studies in elementary educational settings. Prereq: 5580 and 5350, or equivalent.

6731 Advanced Studies in Curriculum (3) Analysis of influential curricular theories and approaches, structure and design of educational programs. Prereq: 5580 and 5350 or equivalent.

6830 Studies in Mathematics Education (3) Reading and study related to historical trends and issues in mathematics education in United States providing broad perspective on current curricular problems and future trends. Prereq: 5830 or consent of instructor.

6850 Principles of Educational Leadership (3) Conceptual conflicts, with application to major problems in instruction, supervision, and administration.

6890 Internship (1-6) Advanced level experiences in the application of principles and practices of curriculum development and instructional improvement. Program prerequisites must be met and consent of instructor required. May be repeated. Maximum 12 hrs. S/NC only.

6960 Advanced Studies in Secondary Science and Environmental Education (3) Programs, materials, and recent research for middle, junior and senior high schools, community colleges. Prereq: 5960 or equivalent, consent of instructor.

Education

MAJOR

DEGREE

Education

Ph.D.

EDUCATIONAL AND COUNSELING PSYCHOLOGY

MAJORS

DEGREES

Guidance

M.S.

Educational Psychology

M.S.

Educational Psychology and Guidance

E.

Ph.D.

Professor:


Associate Professors:


Programs of Specialization: Educational psychology, counseling psychology, school psychology, counselor education, guidance and community agency counseling are programs of specialization offered.

THE MASTER'S DEGREE

For the Master of Science degree, thesis and non-thesis options are available in the following programs: Community Agency Counseling, Educational Psychology, and Elementary or Secondary Guidance and School Counseling. The non-thesis option requires the completion of 60 hours of course work and both options require a comprehensive examination over course work.

THE SPECIALIST DEGREE

The Educational Specialist degree is available through the following programs: Community Agency Counseling, Educational Psychology and School Psychology. Thesis and non-thesis options are available and the number of required credit hours is 90.

THE DOCTORAL DEGREE

The Department is Option IV within the college-wide Ph.D. in Education major and offers program concentrations in: Counseling Psychology (APA approved), Counselor Education, and Educational Psychology. Requirements to complete a Ph.D. in Education are listed on page 56. The Ed.D. in Educational Psychology degree may be obtained through a program concentration in Counselor Education.

Appropriate course work taken in this department will satisfy requirements for certification in Tennessee as a school psychologist or school counselor; course work in the counseling psychology doctoral program is designed to allow the graduate to qualify for examination as a licensed psychologist.

Write the department for information concerning admission criteria and program requirements.

Application deadlines for the Ph.D. or Ed.D. are March 1; Ed.S. and M.S. deadlines are March 1 and November 1.

4110 Psychology of Sex Role Development (3) Examination, from both a theoretical and research basis, of factors which contribute to sex role development and definition in society and role of education in these changes. For student with minimal background in behavioral sciences. F, Su

4130 Mental Health (3) Studies and exploration of positive mental health. Application of mental health criteria to a study of one's self based on a battery of personality assessment instruments. F, Sp, Su

4320 Self-Management for Personal and Professional Development (3) Applications in career, social, emotional, and physical development. Theoretical and experiential activities. Prereq: Introductory course in psychology or consent of instructor. Letter grade or S/NC. F, Sp, Su

4350-60-70 Special Topics and Problems (1-6, 1-6, 1-6) May be repeated. S/NC or letter grade. E

4640 Standardized Testing (3) Use and interpretation of standardized group instruments in assessment of intelligence, aptitude, achievement, vocational interests, and personality. F, Sp

4850 The Construction of Classroom Tests (3) Concerned with teacher-made classroom tests: instructional objectives, principles of test construction, item analysis, validity, and reliability, interpretation of test scores, the relationship between testing and grading. W, Sp

4760 Advanced Child Study (3) Prereq: 3420 or 3810 or consent of instructor. F, Su

4800 Psychology of the Disadvantaged Child (3) Significant behavioral differences and causes; appropriate intervention approaches. E


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

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

5540 Guidance and Pupil Personnel Services in Education (3) (Same as Vocational-Technical Education 5540) F, Su

5550 Children and Adolescents (3) Mental, social, physical, and emotional growth, development, and learning of children and adolescents; prevention,
5700 Seminar in Elementary School Guidance (3) Trends, role, function, and administration of guidance in elementary school. Sp

5099 Field Work (1-6) Practical experience in departmentally approved field placement. Supervision by field and University personnel. Program prerequisites to field work must be met. May be repeated. Maximum 6 hrs. S/NC only.

5100 Developmental Psychology (3) (Same as Psychology 5100) W

5101 Advanced Psychology of Adolescence (3) Theory and research on principles and problems of adolescence development; application to individual adolescents. Prereq: 3810 or equivalent. A

5110 Psychology of Women (3) Past and current educational and psychological theory and practice with special attention to assumptions and practice in regard to women; social context in which various theories were developed and current theories and research focusing on women and/or sex differences. Prereq: 4130 or basic course in personality theory. S

5111 Seminar in Current Issues in School Psychology (3) Historical, legal, ethical and technological issues in practice of school psychology. S/NC only.

5140-50-60 Psychoeducational Assessment (3, 3, 3) Naturalistic, psychometric, and sociometric assessment methods on school learning environments. Must be taken in sequence. Prereq: Admission to School Psychology program or consent of instructor.


5180-90-300 Educational Specialist Research and Thesis (3, 3, 3) P/NP only. E

5210 Interpreting Published Articles: Statistics (3) Descriptive and experimental research in educational psychology, guidance and counseling, and college student personnel. Prereq: Non-thesis option students only or consent of instructor. F, W, Su

5220 Interpreting Published Articles: Research Design (3) For students not conducting research projects; interpret and evaluate statistical tables and statistical text as reported in journals. Prereq: 5210 or consent of instructor. W, Sp, Su

5310 Diagnostic and Corrective Teaching (3) Application of psychology of learning to instruction and problems in instruction, occupational, and community information in the guidance program; sources, types of materials, and occupational filing plans. For use both in group and individual guidance programs. W, Su

5855 Career Development: Program Development Implementation and Evaluation (3) Career development and pre-vocational programs and projects, K-adult with emphasis on development, implementation, and evaluation. Prereq: 5780 or equivalent, or consent of instructor. Sp

5970 Career Development: Workshop (1-6) Designed for in-service training of school personnel. Developments, programs, and trends related to career development. May be repeated. Maximum 6 hrs. (Same as Curriculum and Instruction 5790 and Special Education 5790.) Su

5800 Cross-Cultural Counseling (3) Counseling individuals from various cultural backgrounds. Issues in cross-cultural counseling use of tests and client expectations, Prereq: Consent of instructor or admission to educational and counseling psychology. W

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

5850-S0-70 Special Topics and Problems (1-6, 1-6, 1-6) May be repeated. May be taken for letter grade or S/NC. E

5880 Career Development: Occupational and Educational Resources (3) Gathering, interpreting, and using educational, occupational, and community information in the guidance program; sources, types of materials, and occupational filing plans. For use both in group and individual guidance programs. W, Su

5885 Career Development: Field Experience (1-3) Application of career development principles and practices in school, community, business, and/or industry. May be taken concurrently or separately: 5780, 5785, 5790, 5880, and/or consent of instructor. May be repeated. Maximum 6 hrs. E

5890 Counseling Theories and Techniques (3) Presentation, demonstration, and application. Open to students interested in counseling process. F, W, Su

5897 Prepracticum (3) Didactic experiences and counseling simulations in learning laboratory. Coreq: 5890, F, W, Su

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

5940 Counseling Practicum (3) Supervised practice in counseling in elementary or secondary school guidance and/or student personnel work. Prereq: 4640, 5060 or 5340, 5800, 5897, or consent of instructor. May be repeated with consent of department. Maximum 6 hrs. E

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

5959-5969 Practicum in Counseling (2, 2) (Same as Psychology 5959-60.)

5970 Internship in Community Agency Counseling (1-6) Supervised training at departmentally-approved internship sites. Prereq: Consent of instructor and admission to the community agency counseling program. May be repeated. Maximum 12 hrs. S/NC only. E

5975 Vocational Assessment (3) Use and interpretation of tests in vocational assessment. Prereq: 4640 or Psychology 4640, and 5780, or consent of instructor. W

5980 Organization and Administration of Pupil Personnel Programs (3) Basic principles, procedures, and policies. Prereq: 4640; 5040 or 5210, or consent of instructor. W

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

6040 Seminar in Educational and Counseling Psychology (1-3) Seminar required in fall quarter. Maximum 4 hrs. S/NC only. F (Formerly: Seminar (1))

5919 Internship in School Psychology (1-6) Supervised training at departmentally-approved internship sites. Prereq: Consent of instructor and admission to the school psychology program. May be repeated. Maximum 12 hrs. S/NC only. E

6006 Internship in Counseling Psychology (1-6) Supervised training at departmentally-approved internship sites. Prereq: Consent of instructor and admission to the doctoral program in counseling psychology. May be repeated. Maximum 12 hrs. S/NC only. E

6007 Internship in Educational Psychology (1-6) Supervised training at departmentally-approved internship sites. Prereq: Consent of instructor and admission to the educational psychology program. May be repeated. Maximum 12 hrs. S/NC only. E

6008 Internship in Counselor Education (1-6) Supervised training at departmentally-approved internship sites. Prereq: Consent of instructor and admission to the counselor education program. May be repeated. Maximum 12 hrs. S/NC only. E

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

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

6510 Ethical and Professional Issues in Psychology (3) Professional, ethical, and legal issues related to research, human services, teaching and public policy. Prereq: Admission to Psychology doctoral program or consent of instructor. (Same as Psychology 6510.) Sp

6610-20-30 Seminar in Dissertation Proposal Writing (1, 1, 1) Preparation and evaluation of dissertation proposals. Prereq: Two consecutive statistics courses or consent of instructor. F

6750-60-70 Special Topics and Problems (1-6, 1-4, 1-6) Not to be taken to fulfill regular 6000-level course requirements. Prereq: Consent of instructor. May be repeated. Maximum 12 hrs. May be taken for letter grade or S/NC. E

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

6820 Analysis of Personality Theories (3) Comprehensive and systematic conceptual analysis of major personality theories. Implications for research in counseling and education. Prereq: Consent of instructor or admission to educational and counseling psychology program. F

6910 Special Topics Seminar (3) Exploration of specific research or theoretical topics with students who have necessary background. Topic will vary from quarter to quarter, depending upon instructor. Prereq: Advanced standing as doctoral student. May be repeated. S/NC only. F, W

6931-32-33 Practicum in Counseling Psychology (3, 3, 3) Supervised practice. Minimum: 90 clock hours each quarter. Prereq: Admission to counseling psychology program and consent of instructor. F, W, Sp

6940 Group Counseling Practicum (3) Supervised practicum with children and/or adults. Prereq: S340, 5890, 5891, and 5840 and consent of instructor. May be repeated with consent of department. Maximum 6 hrs. F, Sp

6941-42-43 Practicum in Guidance, Counseling, and Personnel Services (3, 3, 3) Supervised practice in application of guidance, counseling, and personnel services. Minimum: 90 clock hours each quarter. Prereq: 5890 and consent of instructor. F

6944-45-46 Teaching Practicum (3, 3, 3) Prereq: Acceptance in doctoral program and consent of instructor. May be repeated. Maximum 6 hrs for each course. E

6950 Counseling Supervision (3) May be repeated with consent of advisor. Prereq: 5890, 5940, 5941. S/NC only. E
M.S. IN COLLEGE STUDENT PERSONNEL
This program is designed for individuals interested in entering the field of student personnel administration in colleges and universities and in community or junior colleges. The program has both a thesis and non-thesis option. A minimum of 90 credit hours is required, including 9 hours of 5910-20-200 is required. Twelve hours must be in a collateral area within the college and 12 hours outside the college. An internship is highly recommended but not required. A written comprehensive examination is given as well as an oral exam over the thesis.

Non-Thesis Option: A minimum of 90 credit hours beyond the baccalaureate degree including 9 hours of 5910-20-200 is required. Twelve hours must be in a collateral area within the college and 12 hours outside the college. An internship is highly recommended but not required. A written comprehensive examination is given as well as an oral exam over the problem papers.

THE DOCTORAL PROGRAMS
For the Ed.D. program, the minimum credit hours are determined by the student's doctoral committee. Nine to 12 hours must be in a collateral area within the college and 9-12 hours outside the college unless the student has a Master's degree in a field outside the College of Education. Three consecutive quarters of 6040 must be taken during residency. An internship is highly recommended but not required. A foreign language requirement is at the discretion of the committee. A written comprehensive examination is given as well as an oral exam over the dissertation.

The Ph.D. degree with a major in Education includes concentrations and emphases as listed on page 56.

Educational Administration and Supervision
5000 Thesis (1-15) P/NP only. E
5002 Non-Thesis Graduation Completion (3-15) Required for the non-thesis student not otherwise registered during any quarter when such a student uses university facilities and/or by-laws time before degree is completed. May not be used toward degree requirements. May be repeated. S/NC only. E
5100 Internship in Educational Administration (3)
5130 Introduction to Educational Administration (3, 3, 3) P/NP only. E
5220 Philosophy and Theory in Educational Administration (3) Tasks, functions, and processes of educational administration; organization and structure of educational programs and institutions. E
5180-90-200 Educational Specialist Research and Thesis (3, 3, 3) P/NP only. E
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, human and space. E
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, human and space. E
5290 The Politics of Education (3) Special emphasis on leadership structures, operational beliefs, and communication of ideas with regard to community decisions concerning education. F, Sp, Su
5310 School Administration and Civil Rights Issues (3) To help school administrators meet responsibilities and resolve problems stemming from civil rights legislation pertaining to race, sex, and the handicapped. F
5420 District Level Administration (3) Role of central administrative team, related roles, behaviors, and competencies to develop an effective school organization. F
5430 Building Level Administration (3) For beginning school principals and administrators, and for those operating in rural elementary, secondary, or consolidated schools. W, Su
5440 Introduction to Law, Finance, and Business Management at the Building Level (3) Orientation for beginning principals for basic foundations of the American legal system; how case law effects daily building level operations; building level methods of fiscal and logistical support measures. Sp, Su
5450 Organization of the School Program (3) For principals and supervisors; conceptual and technical skills in organizing school program including curriculums, instruction, student grouping, staff, schedules, and space. Sp, Su
5460 Personnel Administration (Local School) (3) Planning, personnel needs, job analysis, recruitment, selection, placement; orientation of new staff; fair employment and dismissal; and contract administration for both professional and supporting staff. Sp, Su
5470 Introduction to School Facility Planning (3) For school administrators; facility planning, studies in building planning, use and evaluation. Sp, Su
5480 Instructional Supervision—Local School (3) Developing a concept of supervision; instructional help, support, and service for teachers; supervision of curriculum; staff development; and staff evaluation. F, Su
5530 Introduction to Educational Planning (3) Processes for improving decision-making functions through both quantitative and qualitative planning techniques. Relating educational policy analysis to educational planning. W
5560 Research for Educational Administrators (3) Descriptive, experimental, and quasi-experimental methodologies to help students learn qualitative background to read and understand technical literature. Primarily for nonthesis option students should be taken early in M.S. or Ed.S. program. W, Su
5580 Seminar in Communication Skills for Educational Administrators (3) Identification, development and use of interpersonal and group related communication skills. Sp, Su
5711 Problems in Educational Administration and Supervision: School Operation (3) May be repeated. E
5712 Problems in Educational Administration and Supervision: Higher Education (3) May be repeated. E
5713 Problems in Educational Administration and Supervision: State School Administration (3) May be repeated. E
5714 Problems in Educational Administration and Supervision: Preparation Programs (3) May be repeated. E
5715 Problems in Educational Administration and Supervision: Community Education (3) Independent study of administrative problems. May be repeated. E
5752 Problems in Educational Administration and Supervision: Finance (3) May be repeated. E
5753 Problems in Educational Administration and Supervision: Transportation (3) May be repeated. E
5754 Problems in Educational Administration and Supervision: Business Management (3) May be repeated. E
5755 Problems in Educational Administration and Supervision: Personnel (3) May be repeated. E
5756 problems in Educational Administration and Supervision: School Plant (3) May be repeated. E
5757 Problems in Educational Administration and Supervision: Organization and Structure (3) May be repeated. E
5758 Problems in Educational Administration and Supervision: School Law (3) May be repeated. E
5759 Problems in Educational Administration and Supervision: Supervision (3) May be repeated. E
5760 Maintenance of School Plants (3) Skills in operating school custodial and maintenance programs. Sp
5810 Survey Research Methods (3) Overview of descriptive studies, data collection, analysis, and interpretation for survey studies and school surveys, strategies for describing and analyzing school data. F, Su
5850-60 Independent Study in Educational Administration (3, 3) Prereq: Consent of instructor. E
5900 Special Topics (3) May be repeated. E
5910-20-30 Problems in Lieu of Thesis (3, 3, 3) S/NC only. E
5950 Elementary Administrators Seminar (3) For in-service training of elementary school administrators, developments, programs, problems, and trends of elementary schools and management skills of elementary school administrators. Prereq: Presently an elementary school administrator or consent of instructor. May be repeated. S/NC only. F
5960 Middle School Administrators Seminar (3) For in-service training of middle school administrators, developments, programs, problems, and trends of middle schools and management skills of middle school administrators. Prereq: Presently a middle school administrator or consent of instructor. May be repeated. S/NC only. F
5970 Secondary Administrators Seminar (2) For in-service training of secondary school administrators, developments, programs, problems, and trends of secondary schools and management skills of secondary school administrators. Prereq: Presently a secondary school administrator or consent of instructor. May be repeated. S/NC only. F
6000 Doctoral Research and Dissertation (3-15) P/ NP only. E
6040 Seminar in Educational Administration and Supervision (1) Required three consecutive quarters. S/ NC only. E
6100 Internship in Educational Administration (3) May be repeated at discretion of student's committee. Opportunity for doctoral students and advanced graduate students to gain experience in performance of critical tasks of educational administration under supervision of practitioner and University representative. E
6110 Administrator Update (3) Current topics of concern to principal school administrators, selected each quarter and presented by a specialist. Prereq: Presently a school supervisor or instructor, or consent of instructor. May be repeated. S/NC only. E
6340 Current Trends in School Law (3) Logical arrangement of case and statutory material for public school administration; in-depth examination of problems concerning the law and public education. W, Su
6380 Instructional Supervision—School District (3) Definitions, legal requirements, and legal supervision at the school district level. Supervisory operations including goal development; curriculum development; instructional support, help, and service for teachers and administrators; personnel development; program evaluation. W, Su
6420 School Board-Superintendency Relationships (3) The local unit of school administration, school district and its governing body, board of education or school board. Sp
6440 School Business Management (3) Emphasizes supervisory team concept, planning, procurement, and utilization of fiscal resources. F, Su
6450 Grant and Contract Proposal Preparation (3) Grants and contracts processes in education. Basic concepts applicable to other special agencies. A
6460 School Personnel Administration (3) Personnel administrative functions for professional and supporting staff in educational organizations. Recruitment, selection, placement, personnel policies, employee wage and salary administration, fringe benefits, collective negotiations, human relations, staff development, and staff evaluation. F, Su
6480 Special Topics in School Personnel Administration (3) Human problems in school personnel administration; staff planning, record systems, personnel policy development; collective bargaining in education; and staff evaluation. May be repeated. Maximum 12 hrs. W, Su
6530 Futuristic Educational Planning Methods (3) Methods for describing alternative futures. A
6540 Contemporary Economics and Educational Finance (3) Contemporary educational finance policies and their influence on educational service and program, national economy, welfare of individuals, and welfare of public education. F, Su
6550 State-Federal Relations in Education (2) Purposes and functions of federal/regional/state/local educational agencies, organizational control and political variables. Major education laws, rule and regulation-making process, grants and contracts as inter-level policy instruments. F, Su
6560 Legal Foundations of Public Education (3) Legal framework and theoretical concepts that impinge on operation of school districts within present legal structure of the United States. A
6580 Seminar in Managing Conflict (3) Learning about and experiencing various forms of conflict. W, Su
6750-60-70 Independent Studies in Educational Administration and Supervision (3, 3, 3) Prereq: Consent of instructor. May be repeated. E
6800 Administration of Complex Educational Organizations (3) Concepts and theoretical formulations to understand, analyze, evaluate, and change complex educational organizations. W, Su
6870 Advanced Study in School Facility Planning (3) In-depth experiences in development of educational specifications, making decisions, and leadership in creation of quality educational facilities. A
6900 Special Topics (3) May be repeated. E
6981 Specialized Seminar: School Operation (3) E
6982 Specialized Seminar: State School Administration (3) E
6984 Specialized Seminar: Preparation Programs (3) E
6991 Specialized Seminar: Theory (3) E
6992 Specialized Seminar: Finance (3) E
6994 Specialized Seminar: Business Management (3) E
6997 Specialized Seminar in Organization and Structure (3) Organizational theories in education including systematic review of status of organizational and leadership research in education and related disciplines; implications for further research; application of existing theory and research to known educational settings. Prereq: Consent of instructor. A
6998 Specialized Seminar: School Law (3) E
6999 Specialized Seminar: Supervision (3) A
Higher Education
4554-55-56 Student Leadership Workshops (1, 1, 1) Small group and individualized experiences to develop knowledge and skills in leadership roles; for resident assistants, student government leaders, student activities, other student organizations. Prereq: Consent of instructor. S/NC only.
5000 Thesis (1-19) P/ NP only. E
5002 Non-Thesis Graduation Completion (3-15) Required for the non-thesis student not otherwise registered during any quarter when such a student uses university facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. S/NC only. E
5110 Seminar in College Teaching (3) Effective college teaching: testing and measurement; recent research in college instruction; major problems and issues in higher education. Required of candidates for the MACT degree. S/NC only. Sp
5360-70-80 Problems in Continuing and Higher Education (1-3, 1-3, 1-3) Independent study of problems and special institutes. S/NC only. E
5410 College and University Law—The Legal Environment (3) Legal precedent affecting organization, administration, and financing of public higher education. Academic freedom, faculty termination, taxation, private support, religion, tort liability, administrative law, academic due process, and affirmative action in employment. W
5420 College and University Law—Constitutional Rights and Responsibilities of Students (3) Legal precedent affecting student personnel services in public higher education. Student discipline, housing, dress, organizations, activities, fees, tuition, and related federal regulations.
5440 American Higher Education (3) Purposes, functions, organizations, and programs. F, Sp
5450 Instruction in Higher Education (3) Problems, procedures, and techniques. W
5470 The Curriculum of Undergraduate Higher Education (3) Background, content, and organization of instructional programs, trends and evaluation procedures, including accreditation activities.
5510 Governance of Colleges and Universities (3) Development, change, trends, process, and structure of collegiate governance; public administration, and special institutes. S/NC only. E
5580 Fiscal Problems in Higher Education (3) Revenue sources and fiscal management in public and private colleges and universities. Sp
5750 Student Personnel in Higher Education (3) Philosophy and scope.
5750 Case Studies in College Student Personnel (3) Prereq: 5750 or consent of instructor.
5860 The Community-Junior College (3) History and role of the college, major functions, organization and administration, problems, and issues. F, Sp
5855-65-75 Practicum in Continuing and Higher Education (1-3, 1-3, 1-3) Supervised practice in selected areas of instruction or administration of continuing or higher education programs. S/NC only. E
5960-70-80 Seminar in Continuing and Higher Education (1-3, 1-3, 1-3) Review of current literature and preparing professionals in fields of adult or higher education. E
5990 Practicum in College Student Personnel (3) Prereq: 5750, 5770. Educational Psychology 5560, or consent of instructor. May be repeated with consent of instructor. Maximum 9 hrs.
6190 Administration in Higher Education (3) Developing conceptual understanding of administrative theory and practice in higher education. F, Su
Special Education and Rehabilitation

MAJORS DEGREES

Special Education M.S.
Vocational Rehabilitation Counseling M.S.
Education Ph.D.

Professors:

Mississippi State

Associate Professors:

Assistant Professors:
W. Mulkey, Ph.D. Florida State.

Instructors:
D. H. Ashmore, M.S. Tennessee; M. Griffin, M.D. Tennessee; M. S. Wilson, M.S. Tennessee; G. D. Tyler, M.S. Tennessee; K. M. Warden, M.S. Tennessee.

Lecturers:
H. L. Byrd, Jr., M.S. Tennessee.

The Department of Special Education and Rehabilitation offers graduate programs (thesis and non-thesis options) leading to the Master of Science degree with a major in Special Education or Vocational Rehabilitation Counseling. These are 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 emphasis in 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 these areas.

The Doctor of Philosophy degree with a major in Education includes concentrations and emphases as listed on page 56.

Under the sponsorship of the Office of Special Education and Rehabilitative Services (R.S.A.), a specialized institute for the preparation of professionals to adapt their skills toward services to hearing impaired and deaf people is provided.

For further information write the department head.

EDUCATION OF THE HEARING IMPAIRED

4230 Communication Processes for the Hearing Impaired (3) Various communicative skills required by hearing impaired person; speech and language development, training, speechreading, many language and its relation to other forms of communication: Observations and practicum. (Students 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, Deaf studies and receptive and expressive fluency. Prereq: 4230 or consent of instructor. E

4240 Nature of Hearing Impairments (3) Basic principles of audiology: anatomy and physiology of hearing; nature and causes of hearing loss; methods and instrumentation for assessment of hearing level; interpretation of audiograms: selection and use of hearing aids; relation of audiologic 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. Research studies relating to psychology, social adjustment, and learning of deaf. Survey of professional literature in area of deaf child and adult. (Same as Audiology and Speech Pathology 4250.) F, W, Sp

4870 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

5190 Speech Development of Hearing Impaired (3) Theories of speech development of hearing impaired. Developmental approach in training perception and production of speech in hearing impaired persons. Prereq: Audiology and Speech Pathology 3560; Audiology and Speech Pathology 3710. W


5210 Language Development of Hearing Impaired I (3) Basic principles of transformational grammar, case grammar, and other formal systems as used to describe language and language development of hearing impaired. F

5220 Linguistics in the Education of the Hearing Impaired (3) Recent research and developments in linguistics related to hearing impaired. F


5240 Seminar in Language Remediation for the Hearing Impaired (3) Current and recent developments in educational methodologies and in research pertaining to teaching language to hearing impaired. Research and materials current in use of various sign language systems and adaptations. Emphasis on approaches which accommodate and assist integration of hearing impaired children in regular classrooms. W

5244 Orientation to Deaf-Blindness (3) Definition, types, etiology of deaf-blindness; impact of deaf-blindness on family dynamics and community resources for deaf-blind persons. F

5245 Rehabilitation of Deaf-Blind Persons (3) Aspects of deaf-blindness pertinent to vocational rehabilitation. Prereq: 5244 or consent of instructor. Sp

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

5290 Teaching Reading to Hearing Impaired (3) Specific methods necessary to teach reading to prelingually hearing impaired student. Prereq: 5210. W

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; W, Su; F


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

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 5590 or equivalent and consent of instructor. Sp

5821 Assessment of Hearing Impaired Learners (3) Types of diagnostic evaluations of hearing impaired children; screening, formal testing, continuous progress evaluation. Sp

EDUCATION OF THE MENTALLY RETARDED

4110 The Nature and Concept of Mental Retardation (3) Identification, description, and study. W, Sp

4120 Education of the Mentally Retarded Child (3) Philosophical and rationale of teaching and guidance of mentally retarded: methods and materials in special and regular classes. Prereq: 4110. Admission to Teacher Education. E

4440 High School Program for the Mentally Retarded (3) Trends, issues and research relating to core and work study programs. Prereq: Admission to Teacher Education.

4810 Student Teaching Mental Retardation (3) Prereq: Major in education of mental retardation. S/NC only. F, W, Sp

4811 Student Teaching Mental Retardation (9) Prereq: Major in education of mental retardation. S/NC only. F, W, Sp

4822 Student Teaching of the Educable Mentally Retarded (3) Observation and supervised practicum. S/NC only. A

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

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

5113 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 brain-injured child; skills for identifying educational, physical, and emotional characteristics; special educational techniques. Prereq: Admission to Teacher Education. F, Sp

4150 Education of Children with Crippling and Special Health Conditions (3) Educational needs and special characteristics, appropriate educational modifications and associated services. Prereq or coreq: 3333 or consent of instructor, admission to Teacher Education. F, W

4840 Educational Problems of the Cerebral Palsied Child at Home and School (3) Physical, social, and educational needs of cerebral palsied; evaluative techniques; related services. A
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.

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

4520 Language-Speech Handicapped Child in the Classroom (3) Recognition, understanding, observation, referral procedures, agencies, legislation, incorporation of speech improvement-language development activities into the regular classroom. Prereq: Students not majoring in speech pathology or audiology. F, Sp, Su

4740 Evaluation Exceptional Students (3) Mandates relative to evaluations; theoretical considerations and methods of evaluating exceptional students; basic statistical concepts relative to norm — and criterion—reference tested. Prereq: 3333 or consent of instructor, admission to Teacher Education. F, W, Sp

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

5092 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

5200 Nature and Needs of Mildly Handicapped (3) Identification, diagnosis, legal, professional definitions, environmental etiologies, and learning characteristics and educational settings. Professional roles and responsibilities of teachers. Prereq: 3333 or consent of instructor.

5201 Education of Mildly Handicapped (2) Methods for planning, implementing, and evaluating instruction; materials evaluation and adaptation to meet needs. Prereq: 5202.

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

5261 Instructional Systems for the Gifted and Talented (3) Instructional systems and strategies in terms of effectiveness with gifted children in various educational environments. Translate theory into practice. Prereq: 5260 or consent of instructor.

5262 Psychosocial Development of Gifted Children (3) Phenomena of talent development in context of home, neighborhood, and school. Practices which promotes development. Prereq: 5260 or consent of instructor.

5300 Nature and Needs of Moderately and Severely Handicapped (3) Identification of legal and professional definitions, biological and environmental etiologies, and learning characteristics and educational settings. Professional roles and responsibilities of teachers. Prereq: 3333 or consent of instructor.


5302 Instructional Systems for Exceptional Children (2) Neuromotor and sensory disabilities; physical special health conditions. Psychological functioning and how impaired functioning interferes with learning process. Prereq: 3333 and admission to teacher education.

5402 Instructional Systems for Physically Disabled Student (3) Investigation of instructional techniques and adaptations appropriate for physically disabled and healthy impaired students. Non-oral communication, diagnostic and educational settings, adaptive equipment, use of computers with disabled, handling and positioning disabled. Prereq: 3333 and admission to teacher education.

5801 Neuromuscular and Health Disorders in Children (3) Physical handicaps, mental disorders, social and health special health conditions. Psychological functioning and how impaired functioning interferes with learning process. Prereq: 3333 and admission to teacher education.

5802 Instructional Systems for Physically Disabled Student (3) Investigation of instructional techniques and adaptations appropriate for physically disabled and healthy impaired students. Non-oral communication, diagnostic and educational settings, adaptive equipment, use of computers with disabled, handling and positioning disabled. Prereq: 3333 and admission to teacher education.

5830 Seminar: Issues and Theories in the Education of the Exceptional Child (3) Current trends in education of exceptional children, application of philosophical approaches to education, analysis of current theories of integration as applied to exceptional children. Current research concerning education and/or rehabilitation of exceptional persons. Prereq: Curriculum and Instruction 5800 or Educational Psychology 5210 and consent of instructor. A

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

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

6010 Seminar in Educational Theories in Special Education and Rehabilitation (3) Education theories: education and rehabilitation of exceptional persons. Theory applications in educational settings. Prereq: Admission to doctoral program or consent of instructor.

6020 Seminar in Social Processes in Special Education and Rehabilitation (3) Social phenomena which influence impact of disability on person and on significant others. Implications for habilitation. Prereq: Admission to doctoral program or consent of instructor.

6030 Seminar in Assessment in Special Education and Rehabilitation (3) Procedures and issues in assessment: pupil or client identification, educational or rehabilitative intervention, and program or method evaluation. Prereq: 4740 or equivalent; introductory statistical methods.

6040 Seminar in Research in Special Education and Rehabilitation (3) Instruction in development and implementation of research. Independent research studies. Research proposals. Prereq: 9 hrs of research core and consent of instructor.

6100 Internship in College Teaching and Supervision (3-9) Supervised practice in college teaching and supervision. Prereq: Admission to doctoral program or consent of instructor. May be repeated. Maximum 9 hrs. S/NC only.

6200 Internship in Research in Special Education and Rehabilitation (3) Internship in supervised research experience. Prereq: Ten or more courses in educational research methods. May be repeated. Maximum 9 hrs. S/NC only.

6300 Internship in Institutional Leadership in Special Education and Rehabilitation (3-9) Advanced level experience in administration of practitioner. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs.

Technical and Adult Education

MAJORS

DEGREES

Adult Education

Agricultural Education

Business Education

Industrial Education

Vocational-Technical Education

Ph.D.

Professors:

G. C. Cheek (Head), Ph.D. Kansas State;
W. A. Cameron, Ph.D. Ohio State; J. I. Matthews, Ph.D. Arizona State; R. J. Woodin, (Emeritus), Ph.D. Ohio State; Adult Education; K. D. McCullough, Ph.D. Florida State;
J. M. Peters, Ed.D. North Carolina State;
Agricultural Education: D. G. Craig, Ed.D. Cornell;
G. W. Wiegers, Jr., Ed.D. Missouri.
Business Education: G. A. Wagoner (Emeritus), M.S. Indiana.

Distributeive Education: C. B. Coakley (Coordinator), Ph.D. Wisconsin;
R. W. Haskell, (Coordinator), Ph.D. Purdue;
C. P. Campbell, Ed.D. Maryland; J. L. Reed (Emeritus), M.S. Oklahoma State.

Associate Professors:

Agricultural Education: J. D. Todd (Coordinator), Ed.D. Agricultural Education; B. J. Raco, (Coordinator) M.S. West Virginia.

Industrial Education: R. Hanson, Ph.D. Purdue;
G. K. Latrobe, Ed.D. Tennessee;
A. E. Manning, Ed.D. Penn State;
C. G. Petty, Ph.D. Missouri.

Assistant Professors:

Industrial Education: R. Pierce, Ph.D. Ohio State;
T. L. Powell, M.S. Oklahoma.

Instructor:

C. W. Wright, M.T. Arizona State.

THE MASTER'S PROGRAM

The M.S. degree with a major in Vocational-
al-Technical Education is available with concentrations in agricultural education, business and office education, distribution education, general vocational-technical education, home economics education, industrial education, and technical education.

**Requirements:***

- **Concentration**: 18 hrs
- **Research**: 6 hrs
- **Electives**: 12 hrs
- **Thesis Option**: 9 hrs
- **Problems in Lieu of Thesis Option**: 9 hrs
- **Course Option**: 15 hrs

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

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1. Student must meet the service area entrance requirements for the concentration selected. General vocational-technical education requires 6 hrs Technical and Adult Education 5010 and 5015.
2. Formerly approved by graduate committee in area of emphasis outside of area of concentration.

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The Master of Science degree in Adult Education is offered for teachers, administrators, counselors, and community education specialists. The degree program has two options: a thesis option requiring a minimum of 45 hours, and a non-thesis option requiring a minimum of 51 hours. For each option, 9 hours must be completed in the behavioral sciences.

Each vocational service area (agricultural education, business education, distribution education, industrial education and vocational-technical education) offers similar programs leading to the Master’s degree. Both thesis and non-thesis options are available. Details regarding the Master’s programs of each of the service areas may be obtained from the coordinators of the service areas.

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**THE SPECIALIST PROGRAM**

The Ed.S. degree program is a cooperative undertaking involving all vocational-service areas. Options are available in agricultural, business, distribution, home economics, and industrial education and in general vocational-technical education.

**THE DOCTORAL PROGRAM**

The Comprehensive Ed.D. program in Vocational-Technical Education is designed to provide for achieving professional objectives, developing needed competencies, and gaining desirable experiences and understanding of vocational-technical areas and Adult Education.

The Technological and Adult Education doctoral curriculum consists of the following: professional education core, 9 hours; service area, 18 hours; vocational-technical education, 18-27 hours; cognate fields, 9-18 hours; research techniques, 15 hours (consult advisor for details); and dissertation, 36 hours. A minimum of 120 hours above the baccalaureate is required.

The Doctor of Philosophy degree with a major in Education includes concentrations and emphases as listed on page 56.

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**Curriculum and Instruction 4750 and Library and Information Science 4750.**

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

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

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

5010 History and Organization of Vocational-Technical Education (3) Vocational and technical education in public schools through analysis of social forces, legislation, and organization models.


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**5020 Placement, Follow-up and Evaluation Procedures in Occupational Education (3) Methods and procedures in establishing placement programs, curriculum revision.**

5030 Post-Secondary Education for Adults (3) Structure and functions of post-secondary, sub-university institutions, programs and clientele. Prereq: 5060 or consent of instructor. F, Sp

5040 Guidance and Pupil Personnel Services in Education (3) (Same as Educational Psychology 5040.)

5050 Supervision of Vocational-Technical Education (3) Program planning, coordination, instruction. Roles and functions of supervisors.

5055 Vocational School Administration and Management (3)

5070 Competency Based Vocational Education (3) Introductory, comparative, and practical approaches.

5080 Continuing Education in Vocational-Technical Education (3) Importance, objectives, historical development, psychological and sociological formulations, methods and techniques, research, evaluation.

5100 Occupational Program Development for Disadvantaged Persons (3) Academic, socioeconomic, cultural and/or other handicaps that prevent individuals from succeeding in regular vocational educational programs.

5110 Principles and Objectives of Vocational-Technical Education (9) Fundamental principles and contemporary objectives.


5150 Computer Operations and Educational Applications (3) Operating procedures and programming techniques. Hands-on experience in operating common microcomputers, writing, debugging, and running educational programs. Prereq: Teaching, administrative, or related experience in schools or special consent of instructor.

5155 Software Design for Microcomputers in Education (3) Advanced BASIC software design: operating System-CP/M, TRS-DOS and OSI, sequential and random I/O, analysis and operation of commercial educational programs, and teacher-designed programs. Prereq: 5150.

5160 Internship in Technological and Adult Education (3) Assignment in organization sponsoring programs in an area of technological or adult education. Prereq: Admission to Master’s program and consent of instructor. May be repeated. Maximum 9 hrs. S/NC only. F, W, Sp

5160-90-20 Educational Specialist Research and Thesis (3, 3, 3) Selection, analysis and completion of problems necessitating original investigation, beneficial to investigator and vocational-technical field. P/NoP only.

5740 Continuing Professional Education (3) Theories and concepts supporting design and management of educational programs for adults in professions. Prereq: 5060 or consent of instructor. F

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

6010 Curriculum Planning in Vocational-Technical Education (3) Prereq: Curriculum and Instruction 5410 or equivalent.

6020 Program Planning and Development in Vocational-Technical Education (3) Planning vocational-technical and work force state, local, and institutional programs; research in planning, advisory committees, planned change, administrative structures, and evaluation procedures.

6030 Evaluation of Vocational-Technical Education Programs (3)

6040 Seminar in Vocational-Technical Education (1) Required 3 consecutive quarters during residency. S/NC only.

6050 Administration of Vocational-Technical Education (3) Administrative principles and relationship to vocational and technical education.

6100 Research Development for Vocational-Technical Education (3) Advanced research methods for planning studies: proposal development, theoretical base development, research design, sampling and application of statistical techniques. Prereq: Two consecutive statistics courses, a research methods course and consent of instructor.

6111 Internship in Technological and Adult Education (3) May be repeated. Maximum 9 hrs.

6155 Advanced Programming for Educational Computing (3) Advanced programming and applications of program generating software for microcomputers in education. Transferability of software via networking and computer communication. Variability of commercial data base generating or managing software. Hands-on environment. Prereq: 5150, 5155 or equivalent.

6150 Special Topics in Technological and Adult Education (3) Emerging topics and contemporary trends in adult education. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs. Sp

ADULT EDUCATION

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

5460 Adult Development (3) Changes in characteristics of the adult over the life span and implications for adult education. F

5650 Program Planning in Continuing and Higher Education (3) Theory and method for planning adult education programs. W

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

6700 Seminar in Adult Education (3) Issues in adult education, theories and concepts, philosophical positions, research trends and methodologies. Prereq: Admission to doctoral program and consent of instructor. Sp

6700 Advanced Seminar in Adult Development (3) Life cycle theories, research on adult development, designing research for studies of life cycle. Prereq: 5460 or consent of instructor. W

6790 Adult Problem Solving and Learning (3) Contemporary research and theories in area of adult problem solving and learning. Prereq: 5460 and graduate level research methods course, or consent of instructor. F
4230-31-32 Problems in Agribusiness Education (1-6, 1-6, 1-6) May be repeated. Maximum 9 hrs.
4240-41-42 Seminar in Agricultural Education (1, 1, 1) Prereq: 4350 or consent of department head.
5210 Supervision of Student Teaching in Agricultural Education (3)
5220 Teaching Agricultural Mechanization in Vocational Agriculture (3) Prereq: 4350.
5230-31-32 Special Problems in Agricultural Education (3, 3, 3) May be repeated. Maximum 18 hrs.
5240 Current Literature in Agricultural Education (1, 3, 3) May be repeated. Maximum 6 hrs.
5250 Agricultural Education in Off-Farm Agricultural Occupations (3, 3) Developing occupational experience programs; course planning, teaching procedures. Prereq: 4350.
5260 Agricultural Education for First-Year Teacher (3) Adjustment to situation in which employed; group meetings in selected centers, and visits by instructor. Prereq: 4350.
5270 Adult Education in Agriculture (3)
5290 Supervised Occupational Experience in Agriculture (3) Prereq: 4350.

BUSINESS EDUCATION
5305 Methods and Materials for VOE Programs (3) Development of instructional aids, recent developments and research, individualized instruction, occupational clusters.
5306 Organization and Management of VOE Programs (3) Developing office occupations, guidelines in cooperation with business, community, and model office programs. Physical facilities, instructional aids, related instructional activities (clubs), enrollment, instructor and advisory committee.
5307 Measurement in Business Education (3) Evaluates methods and tools for all courses in business education and related areas of study in secondary and postsecondary business education.
5309 Evaluation of Research in Business Education (3) Prereq: Curriculum and Instruction 5610 or equivalent.
5310 Graduate Seminar in Business Education (3) Review of techniques for research and preparation of proposal for thesis or problem/project.
5311-12 Special Topics in Business Education (1, 1)
5313-14-15 Practicum in Business Education (2, 2, 2)
5320 Improvement of Instruction in Basic Business Courses (3) Issues, research findings, methods, and materials for improved instruction at both secondary and postsecondary levels.
5330 Improvement of Instruction in Typewriting and Clerical Programs (3) Research, principles of learning, issues and materials.
5340 Improvement of Instruction in Shorthand/Secretarial Subjects (3) Principles of learning, issues, research findings, and materials on secondary and postsecondary levels.
5350 Improvement of Instruction in Accounting and Data Processing Programs (3)
5360 Improvement of Instruction in Business Communications and Word Processing (3) Basics of and strategies for teaching written communications. Word processing and oral communications.
5390 Problems in Business Education (1-9) Variable topics. May be repeated. Maximum 9 hrs.
6300-10-20 Current Issues in Business Education (3, 3, 3)
6330-40-50 Advanced Studies in Business Education (3, 3, 3)
6360 Higher Education for Business (3)

DISTRIBUTIVE EDUCATION
4440 Supervised Distributive Experience (3-9) Minimum 200 hours experience for each 3 credit hours in approved distributive business; concurrent analytical project. May be repeated. Maximum 9 hrs.
4450 Areas of Distribution (3) Marketing, service technology, social skills, basic skills, and distribution as they affect distributive education curriculum in secondary and postsecondary programs.
4460 Organization and Operation of Distributive Education Programs (3) Background and development needs, federal and state legislation; curriculum implications; establishing, evaluating, reporting, and improving programs.
4470 Methods and Materials in Distributive Education (3) Prereq: 4460 or consent of instructor.
4480 Coordination Techniques in Distributive Education (3) Selecting training agencies; job analysis; selecting and training supervision; advisory committees; adult and other community services. Prereq: 4460, 4470.
5410 Administration and Supervision of Distributive Education (3) Operation of distributive education program and network of city or county supervisor. Understanding and appreciating problems from high school principal's and department head's point of view. Trends in distributive education; community surveys, state plans, teacher-coordinator qualifications, changing curriculum.
5416-26-36 Problems in Distributive Education: Retailing (3, 3, 3)
5420 Organizing and Teaching Adult Distributive Education (3) Planning, organizing, promoting, teaching, and evaluating continuing education programs in distributive education; utilizing trade associations, employment agencies, business groups, and advisory committees in implementation.
5430-31-32 Special Problems in Distributive Education (3, 3, 3) Individual research, conferences, and/or workshops in teaching and supervising high school, postsecondary, and adult programs.

HOME ECONOMICS EDUCATION
5510 Curriculum in Home Economics (3) Development of home economics educational programs, prereq: 4240 or equivalent.
5515 Evaluation in Home Economics Education (3) Purpose of evaluation in development of home economics programs; techniques used in evaluation. Techniques for determining progress of students; individual problems of evaluation.
5530-31-32 Problems in Home Economics Education (1-3, 1-3, 1-3) May be repeated. Maximum 3 hrs per course.
5540 Teaching Family Relationships and Parenthood Education (3) Content, materials and methods for teaching curricular objectives in family relationships and parenthood education. Prereq: Consent of instructor.
5545 Home Economics Related Occupational Programs (3) Advanced study in planning, establishing, implementing and evaluating home economics related occupational programs. Prereq: 4505 or consent of instructor.
5550 Home Economics Adult Education (3) Development and administration of community-based home economics program for adults. Prereq: Consent of instructor.
5555 Supervision of Home Economics in the Public Schools (3) For teachers with successful experience in vocational home economics in supervisory positions in vocational education. Program planning, organization, and administration. Field contacts with urban and rural programs.
5570-75 Seminar in Home Economics Education (3, 3) Research literature and techniques. Prereq: Consent of instructor.
5580 Teaching Home Economics in College (3) Methods, organization, and evaluation.
5581 The Problem Method of Teaching Home Economics (3) Underlying philosophy, skills and techniques. Observation and discussion.
5582 Furthering Good Human Relationships in the Classroom (3) Relationships between problems in human relations, basic needs of individuals, techniques of interpersonal relations and social values in developing more effective teacher education programs.

INDUSTRIAL EDUCATION
3830 History and Philosophy of Industrial Education (3)
3840-41-42 Part-Time Programs in Cooperative Industrial Training (3, 3, 3) Principles of organization, methods, and materials.
3850 Shop Organization and Management (3)
3860-61 Materials and Methods for Teachers of Shop and Related Subjects (3, 3)
3870 School Shop Safety (3)
4620 Special Topics in Drafting (3) Industrial practices in specialized areas of drafting selected for the individual student. Prereq: 6 hrs drafting.
4670 Manufacturing Processes (3) The manufacturing processes of industry and their relationship to careers. Prereq: 2620, 2641, 2660, 3651, or consent of instructor.
4671 Materials and Processes (3) Organic and inorganic materials and processes used to produce finished products. Content, curriculum and techniques of laboratory operation. Prereq: Consent of instructor.
4682 Power and Energy (3) Development, control, transmission, conversion, interrelationship of power sources; content, curriculum, and techniques of laboratory operation. Prereq: Consent of instructor.
4820 Foremanship Training by the Conference Method (3)
4830-31 Job Analysis (3, 3) Principles, practice, instructional methods.
4850-51 Curriculum Building in Trade and Industrial Subjects (3, 3) Content in trade, results of job analysis, check sheets and individual job sheets in both trade and related subjects. Prereq: 4850.
4860-81-82 Seminar in Industrial Education (3, 3, 3) Educational innovations, current events, problems, and other topics associated with the field of industrial education.
4880 Organization and Development of Vocational Clubs of America (VICA) (3) To give industrial education teacher experiences and understanding of organization and operation of VICA. Prereq: Undergraduate degree and 3 yrs teaching experience when taken for graduate credit.
4890-91-95 New Developments in Industrial Education (3, 3, 3) Developments, pressing problems, and recent trends in field of industrial education as presented by a coordinating instructor in conjunction with knowledgeable resource personnel.
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, public health, and recreation; (3) recreation specialist positions in various public, voluntary, private and commercial agencies and institutions; (4) public health positions in community health education, health planning and administration, and environmental health; and (5) safety education and service positions.

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. Programs leading to the Master of Public Health are also available in community health education, health planning and administration, and environmental health, and (5) safety education and service positions.

THE SPECIALIST PROGRAM
A Specialist in Education degree with a major in Safety Education and Service is available.

DOCTORAL PROGRAM
The Doctor of Education degree is offered in Health Education and in Physical Education. See further description under Health Education and Physical Education.

The Doctor of Philosophy degree with a major in Education includes concentrations and emphases as listed on page 56.

GRADUATE ASSISTANTSHIPS
Graduate assistantships are offered in health education, physical education, public health, 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 health, physical education, public health, safety classes and recreation classes, leading recreational activities, supervising public health or recreation field work students, and/or directing or helping to manage extracurricular programs. Students interested in these opportunities should file their applications before February 1. Letters should be addressed to: The School of Health, Physical Education, and Recreation, The University of Tennessee, Knoxville, Tennessee 37996-2700.

School of Health, Physical Education, and Recreation

Graduate programs are available to students in the School of Health, Physical Education, and Recreation in return for part-time services rendered. The services may consist of teaching health, physical education, public health, safety classes and recreation classes, leading recreational activities, supervising public health or recreation field work students, and/or directing or helping to manage extracurricular programs. Students interested in these opportunities should file their applications before February 1. Letters should be addressed to: The School of Health, Physical Education, and Recreation, The University of Tennessee, Knoxville, Tennessee 37996-2700.
cy Care (3) Satisfactory completion qualifies one for American National Red Cross Certification as Advanced First Aid for Emergency Care Instructor. (Applicant must be at least 21 years of age for certification.) Prereq: 3210 or valid Advanced First Aid and Emergency Care Certificate.

4412 Cardiopulmonary Resuscitation (2) Theory and skills to implement basic cardiac life support through cardiac arrest due to heart attack, drowning, electrocution, drug intoxication, venulectomy and other accidents. Educational and preventive aspects of controlling cardiovascular disease. F, W, Sp.

4429 Drug Abuse Education (3) Problems and suspected causes: pharmacology of drugs and effects on society and methods of drug abuse education.

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

4500-10.20 Field Practice in Health Education (3-5, 3-5, 3-5) Off-campus health education internship or field practice in educational or other agency with qualified professional. E

4710 Special Topics (1-6) For advanced students, teachers, school administrators, nurses and other paramedical school personnel. Lectures, demonstrations, films, field trips, and supervised research in special health problems. May be repeated. Su

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

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

5010 Problems and Practices in Health Education (3) Comprehensive study and analysis of history, philosophy, principles, problems and trends of and in health and health education.

5020 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 Health Education (3) Analysis of health instruction curricula. Planning and development of health education curricula.


5530 Health Education Program Surveys (3) Theoretical and practical work covering how, when, what and where of developing and implementing health education surveys in schools and other agencies/organizations.

5620 Organization and Administration of Health Education (3) Principles, practices and procedures of organizing and administering health education programs and activities.

5830 Special Topics (1-9) Designed for graduate students, inservice teachers and other health professionals. Topics selected to be based on one critical health issue. May be repeated.

5720-30-40 Graduate Workshop in Health Education (3-5, 3-6, 3-6) Graduates with specific health problems. Special supervised internship. May be repeated.

5810 Directed Independent Studies (1-3) Individual identification and study of health or health education problem/issue. Specific proposal to instructor before registration. May be repeated.

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

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

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

6210 Health Aspects of Gerontology (3) Biological, psychological, and sociological aspects of aging relating to health of individual. (Same as Public Health 6210.)

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

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

Safety

3520 Principles of General Safety (3) Deals with principles, practices, and procedures in general safety. Covers safety problems in school, traffic, recreation, industry, home, and other public areas. 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 non-driver. 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 use of multimedia, and multimedia and computer-assisted instruction. Emphasis placed on teaching safety skills and supervision. Prereq: 4410. F, Sp, Su

4430 Spots Safety (5) Accident prevention and injury control in sports activities: philosophy of sports safety; human environmental factors and interrelationships in sports and recreation; risk-taking and decision-making strategies; and contributions of sports medicine to safety. 3 hrs and 2 labs. Sp

4700 Special Topics (1-4) Study in selected disciplinary or professional areas of safety. May be repeated. Maximum 15 hrs.

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

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

5320 Behavioral Problems in Safety Education and Accident Prevention (3) Problems of behavior, causes of accidents, and application of principles of psychology in development of safe behavior in all segments of our environment. F

5330 Problems and Research in Accident Prevention (3) Analysis of safety problems found in wide variety of accidents that occur in community; findings of current research in behavioral sciences as related to variation incidence of accidents. Sp

5340 Organization, Administration, and Supervision of Safety Programs (3) National, state, and local level programs including administrative, instructional, and supervisory aspects. Emphasis on implementation of relevant programs. W

5530 Civil and Defense Education (3) Civil and defense problems: tornados, floods, fires, mass civil disorders, and nuclear and personnel attack by alien countries. Sp

5720-30-40 Graduate Workshop in Safety (3-5, 3-6) Deals with specific safety problems. Special safety problems in a concentrated period of time. Su

5800 Directed Independent Study (1-3) Individual identification and study of problem/issue in safety. Extensive reading and critical analysis of safety literature. Specific proposal to instructor before registration. May be repeated. Maximum 15 hrs.

5900 Special Topics (1-3) Advanced study in selected disciplinary or professional area of safety education/management. May be repeated. Maximum 15 hrs.

6010-20-30 Internship and Research in Safety (3, 3, 3) Allows the student opportunities for engaging in supervised research in schools and other agencies including thesis credits.

The Doctor of Philosophy degree with a major in Education includes concentrations and emphases as listed on page 56.

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

4005 Advanced Ballet Technique (5) Styles and methods of advanced classical ballet technique: multiple pirouettes, batterie, epaulement and advanced pointe work. Prereq: 4000. Available to dance majors and minors or with consent of instructor. May be repeated. Maximum 6 hrs.

4010 Advanced Modern Technique (2) Development, integration, and synthesis of previous dance vocabulary; emphasis on advanced practice and principles. Prereq: 4000. Maximum 6 hrs. Available to dance majors and minors or with consent of instructor. W, F

4020 Practicum in Dance Production (2) Prereq: Consent of instructor. W, A

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

4066 Advanced Composition (4) Application of compositional, production and administrative skills culminating in creation of two complete choreographic works. Prereq: 3062, 4020 A

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

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

4110 Adapted Physical Education (3) Classification of atypical students who require modified programs in physical education; activities and class organization suitable for required or special physical education classes.

Division of Physical Education/Collage of Education

DEGREES

Physical Education Education

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


Assistant Professors: P. A. Beitel, Ed.D. North Carolina (Greensboro); B. J. Mead, Ph.D. Purdue; W. J. Morgan, Ph.D. Minnesota.

The Physical Education Division offers the Master of Science degree in Physical Education, non-thesis programs. Both 45-hour programs require a minimum of 27 quarter hours of work in Physical Education including thesis credits.

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

The Doctor of Philosophy degree with a major in Education includes concentrations and emphases as listed on page 56.

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

4005 Advanced Ballet Technique (5) Styles and methods of advanced classical ballet technique: multiple pirouettes, batterie, epaulement and advanced pointe work. Prereq: 4000. Available to dance majors and minors or with consent of instructor. May be repeated. Maximum 6 hrs.

4010 Advanced Modern Technique (2) Development, integration, and synthesis of previous dance vocabulary; emphasis on advanced practice and principles. Prereq: 4000. Maximum 6 hrs. Available to dance majors and minors or with consent of instructor. W, F

4020 Practicum in Dance Production (2) Prereq: Consent of instructor. W, A

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

4066 Advanced Composition (4) Application of compositional, production and administrative skills culminating in creation of two complete choreographic works. Prereq: 3062, 4020 A

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

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

4110 Adapted Physical Education (3) Classification of atypical students who require modified programs in physical education; activities and class organization suitable for required or special physical education classes.
**Division of Physical Health**

**MAJOR**

Public Health  
M.P.H.  

- **Professors:** C. B. Hamilton (Chairperson), Dr. P. H. Oklahoma; J. Gorski, Dr. P. H. California (Los Angeles); B. C. Wallace, Ed.D. Colorado State.
- **Associate Professors:** J. L. McGuire, Ph.D. Michigan; R. J. Pursey, Ph.D. Iowa.
- **Assistant Professors:** J. Ellis, Ed. D. Tennessee; P. D. McConatha, Ph.D. Utah; V. W. Pressly, Ed.D. Tennessee.
- **Lecturers:** M. Duffy, M.D. Pennsylvania.

Graduate study with a major in Public Health leads to the Master of Public Health (M.P.H.) degree. Three professional preparation concentrations are available from the Division of Public Health. Preferential consideration for admission to degree status shall be given to those with an undergraduate grade point average of 2.8 and with one year of professional experience in a health-related occupation.

**THE MASTER'S PROGRAM**

The M.P.H. is a non-thesis program requiring completion of 57 quarter hours of coursework including 10 weeks of field practice. Field practice provides a full-time experience with an affiliated health agency or organization offering one or more health programs. Of importance, field practice allows the student to apply academic theories, concepts, and skills in a realistic setting. Students must complete 2/3 of their courses with an overall GPA of 3.0 prior to placement in the field.

4210 Introduction to Industrial Health (3) Fundamental activities in field of industrial health. Industrial health hazards and problems of concern to nurses, medical staff, management, engineers, and others in industrial health and safety fields. Prereq: consent of instructor. Not available for graduate credit toward occupational health concentration. M.P.H. F, Sp
4220 Communications for Better Health (3) Selective study of communication as it relates to health-care/empowerment. Consideration of logical progression of the problems, current and new information to practitioners; communications among members of the medical team, among health agencies, and use of mass media for communicating health information. W.

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

4700-10 Field Practice in Public Health (3, 3) Field practice in public health under supervision of public health profession. S/NC only. E

4730 Workshop in Public Health Education (3-6) For teachers, nurses, case workers, practitioners, and 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 identification and study of current problems in public health education. Extensive reading of literature required. E

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

5010-20-30 Workshop in Public Health (3-6, 3-6, 3-6) Designed to deal with specific public health problems in the community. Su

5070-80-90 Field Practice and Seminar in Public Health (3-3, 3-3, 3-3) Internship or field experience in approved organizational setting under supervision of designated field preceptor. Prereq: MPH major, one quarter advance notice and consent of major advisor. S/NC only. E

5110 Environmental health (3-5) Varied environmental factors with 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. F, Sp


5140 Occupational Health & Safety III (3-5) Understanding of activities in comprehensive practice of industrial hygiene control. Industrial hygiene control procedures and processes. Prereq: 5120 and 5130 or consent of instructor. Sp

5150 Industrial Toxicology (3) Elements of industrial toxicology as they relate to the improvement of occupational safety and health. Prereq: Consent of instructor. W

5170 Industrial hygiene Instrumentation (3) Instruments and methods in evaluating industrial environment for personal exposure to chemical and physical stresses which can affect health of workers. Lecture, demonstrations and lab. Prereq: 5120 or consent of instructor. W

5210 Special Topics (3) Instructional or research topics to be assigned. Prereq: Consent of instructor. May be repeated. S/NC only. Maximum 4 hrs.

5220 Health and Sickness (3) Formulation of models of positive health within life cycle and within community; types of sickness affecting individuals and groups. Su, Sp

5400 Biostatistics (4) Application of descriptive and inferential statistical methods to health-related problems and programs. Use and interpretation of vital statistics in health-related research. Prereq: Introductory statistics or consent of instructor. F, Sp


5420 Administration of Public Health (3) Administrative concepts and methods in health care delivery systems and public health practice. Governmental involvement in health, legal responsibilities, and managerial concepts/techniques. E

5440 Methods and Materials in Public Health Education (4) Theory and application of instruction techniques and materials in community health education. 3 hrs and 2 labs. W

5540 Factors in Problem Solving for Community Health Practice 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; explores 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 science is examined with special attention to roles and functions. Consideration of philosophy and motivation and differences between health education service and health education program for community learning levels. 1-2 hr lecture-seminar session per week. F

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

5705 Introduction to Health Planning (4) Health planning concepts and methods emphasizing systems oriented health planning practice. Major elements of planning: formulation and conceptualization of problems, plan design, evaluation and implementation. F

5710 Community Health Planning (4) Concept of community health related as processes of community partnership, participation, cooperation and self-reliance. Weekly seminars and community experiences; various methods for identifying and assessing health problems and capabilities of selected communities. Analyze health problems of community, arrive at community diagnosis and apply selected health planning methods to develop program for addressing identified community health problems. Prereq: 5705. W

5715 Advanced Health Planning (4) Advanced study of health planning functions affording opportunities for either simulated or actual application of planning concepts, techniques, and skills to specific situations. Exercises and projects in health plan development, project review, grant preparation, health economic issues/analysis, health policy identification, state and local legislation, community surveying, or resource inventorying. Prereq: 5705 or consent of instructor. W

5725 Emergency Medical Services (3) Planning, organizing, and coordinating emergency medical resources as systems. Comparison of medical services. EMS systems from accident or acute illness occurrence through critical care services. Applicable tours of local emergency facilities. Prereq: Consent of instructor. W

5730 Health Policy and Law (3) Development of public policy in health arena: legislative process and implementing regulations by administrative agencies. Role for health professionals in influencing public policy. Opportunity to individually investigate specific health law of interest. Prereq: 5420 or consent of instructor. Su

5760 Organization Theory for Health Services (3) Analysis of administrative and organizational theory related to bureaucratization, division of labor and delegation of authority; management of health agencies and organizations. Management processes of planning, operating and controlling delivery of health services. Case discussion and problem-solving exercises demonstrate managerial functions and skills. E

5765 Health Facilities Administration (3) Role of health facilities in U.S. health care delivery system: operation and management of community hospital. Administrative considerations related to government, medical staff relationships, quality control, management of costs, and departmental structure. Prereq: 5760 or consent of instructor. W

5770 Long-Term Care Administration (3) Concepts and theoretical foundations essential to leadership role for long-term care health administrators. Operation and management of nursing homes. Prereq: 5765 or consent of instructor. Sp

5810 Financial Management of Health Programs (3) Financial management of health programs, emphasis related to health services programs. Fundamentals of budgeting, cost, financing, rate setting, financial reporting and control. Cases and problems for application opportunities. Prereq: 5420 or consent of instructor. Su

5840-50-60 Directed Independent Studies (1-3, 1-3) Individual in-depth study of selected issues. Prereq: consent of instructor. May be repeated. Maximum 9 hrs. E

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

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

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

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

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

Division of Recreation

MAJOR

DEGREE

Recreation

M.S.

Professor:

G. E. Hayes, (Chairperson) Ph.D. North Texas State.

Assistant Professor:

K. L. Knick, Re.D. Indiana.

K. L. Knick, Re.D. Indiana.

The Recreation Division offers the Master of Science degree in Recreation (thesis and non-thesis programs) with concentrations in general recreation, leisure and sports administration, and therapeutic recreation.

4130 Recreation Administration (3) Introduction to recreation administration, including planning, personnel, program evaluation, and public relations. Prereq: 3140, 3200, 3880, or consent of instructor. F, Sp

4200 Survey of Recreation for Special Populations (3) Responsibility of recreation professionals to respond to the special needs of the elderly, physically handicapped, emotionally handicapped, and sick. Prereq: 3140, 3200, 3880, or consent of instructor. F

4310 Camp Administration (3) Program planning and organization, personnel management, camp site development and maintenance, camp operation for administrators and supervisors. W

4500 Specialized Study in a Selected Area of Recreation (1-9) Comprehensive study in a selected specialized area within the broad field of recreation. For recreation students only. Prereq: Consent of instructor. May be repeated with consent of division. Maximum 9 hrs. E

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

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

Division of Recreation/College of Education 73
5130 Interpretations of Leisure (3) Concepts of leisure including social, psychological, cultural, and philosophical; recreative uses of leisure. Prereq: 3140 or consent of instructor. F

5140 Leisure Service Delivery Systems (3) Various systems—public, private, and commercial—involved in provision of leisure services for community at large. Prereq: Consent of instructor. F

5150 Current Issues in Recreation (3) Identification and consideration of broad issues—social, environmental, ethical—which currently have greatest impact on use of leisure, and implications for recreation administrator. Prereq: Consent of instructor. Sp

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 or instructor. W

5250 Implementation of Recreation Services for the III 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 (1-6) Application of research methodology and computer literacy in selected areas of recreation related research. Presentations of students’ research studies. May be repeated. Maximum 6 hrs. S/NC only. F, W, Sp

5340 Administration of Recreation Funds (3) Development and management of budgets for recreation agencies with special emphasis on obtaining federal funds appropriated specifically for recreation, management of revenue received, and exploration of funding alternatives. Prereq: 4130. Sp

5350 Organizational Policies for Recreation (3) Advanced study in the analysis of organizational policies and functions of management in recreation. Prereq: 4130. W

5360 Management and Operation of Recreation Facilities (3) Management process as it pertains to operation of recreation facilities. F

5440 Problems and Projects in Recreation (1-9) 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

W. T. Snyder, 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 pages 8-9.

OFF-CAMPUS GRADUATE INSTRUCTION BY VIDEOTAPE

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 contact is established periodically between the professor and the off-campus class to allow full discussion and questions. 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). Graduate courses have also been made available to engineers in industrial plants. Such courses are offered to students using classroom facilities at local community colleges.

The remotely-taught courses offered by UTK carry full graduate credit toward the Master's degree under authorization of the regional accrediting agency, the Southern Association of Colleges and Schools.

YEAR-IN-JAPAN M.S. PROGRAM

This is a unique program allowing American engineering students to develop some understanding, both scientific and cultural, of Japan. It allows an M.S. candidate to obtain a degree from UTK while carrying out research at a Japanese university. The program requires approximately two years, one year being spent in Japan and the remaining period being spent at UTK to fulfill the course requirements and to write the thesis or project report, as appropriate to the particular department. The program is administered in the framework of each department's regular graduate program except that the research is done in Japan.

Although the language of communication in Japan would be English, cultural understanding is one of the important objectives of the program and as such a participant would be asked to begin Japanese language study. At the option of the department, up to 6 hours of graduate credit may be allowed for language study, either at UTK or in Japan.

Financial support for living expenses in Japan and for the roundtrip transportation can usually be arranged through fellowships from the Japanese Ministry of Education.

Engineering Experiment Station

W. T. Snyder, Director

The Station is organized to conduct investigations in fundamental engineering science and to aid in the development of the state's resources and industries as far as funds available will permit.

The Station may also make special arrangements with any person or company to study any technical question within the capacity of its resources, and to report the results to the company requesting the study. In such case, the whole expense will be carried by the parties requesting the investigation.

Departments of Instruction

Chemical Engineering

MAJORS

DEGREES

Chemical Engineering

M.S., Ph.D.

Professors:
J. J. Perona (Head), Ph.D. Northwestern, P.E.;
D. C. Bogue, Ph.D. Delaware; E. S. Clark, Ph.D.
California (Berkeley); L. W. Crawford, Ph.D.
Cincinnati; O. L. Cliberson (Emeritus), Ph.D.
Texas; J. I. Fearon; Ph.D. Akron; G. C. Frazier, Jr.,
D.Eng. Johns Hopkins; J. M. Holmes, Ph.D.
Tennessee; H. W. Hou, Ph.D. Wisconsin;
H. F. Johnson (Emeritus), Ph.D. Yale; C. F. Moore,
Ph.D. Louisiana State; J. W. Prados (Vice
President for Academic Affairs), Ph. D. Tennessee;
C. D. Scott, Ph.D. Tennessee; C. O. Thomas,
Ph.D. Tennessee; J. S. Watson, Ph.D. Tennessee.

Associate Professors:
P. P. Bienkowski, Ph.D. Purdue; D. B. Bruns, Ph.D.
Houston; C. H. Byers, Ph.D. California (Berkeley);
R. M. Counce, Ph.D. Tennessee; T. L. Donaldson,
Ph.D. Pennsylvania; A. C. Sheth, Ph.D.
Northwestern.

Assistant Professor:
F. Weber, Ph.D. Minnesota.

Lecturer:
D. W. Lang, Ph.D. Tennessee.

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

W. T. Snyder, Director

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.
2. One or two minors or collateral work, 9 to 18 hours total in engineering, chemistry, mathematics, physics, or other related fields.

75
4. Active participation in graduate seminars conducted by the department. Resident students must register for 5010 every quarter offered.

5. Reading ability, by means of a written examination, in one foreign language of technical or commercial significance.

Language must be selected from the following list, which is not intended to be comprehensive and may be amended from time to time by vote of the departmental faculty: Chinese, French, German, Japanese, Korean, Russian, and Spanish. Foreign students whose native language is one of those on the approved list will not be required to take an examination.

4110 Chemical Engineering Data Analysis (3) Random and stochastic processes; statistical properties of sampling distribution systems; elements of probability; discrete and continuous distributions; statistical characterization of products and processes; empirical models; and statistical process control. Prereq: 3420, Math 3150. F.W.Su.

4130 Introduction to Optimization (3) Principles and applications of optimization techniques to chemical process design; unconstrained optimization, equality constrained optimization, inequality constrained optimization, and dynamic programming. Prereq: Math 2840.


4290 Introduction to Chemical Process Economics (3) Methods of cost estimating; analysis of product pricing based upon debt and equity financing methods; use of economic analyses to deal with uncertainties; a detailed case study. Prereq: 4110.

4410 Design of Separation Processes (4) Design of multicomponent distillation systems, including layout of separation train, choice of operating variables; heat and mass balances; design of a separation system, including control, equipment, and control systems. Selected problems emphasizing other separation methods, heat economy in complex systems, low temperature processes, equipment selection and optimization. Prereq: 3050, 3440-50, 3610. W.Su.


4430 Special Problems in Design and Economics (4) Extension of 4420 for student participation in the American Institute of Chemical Engineers. Selected student contest problem; other advanced design projects. Prereq: 4420.

4450 Hydrocarbon Processing (3) Study of specialized characterization of physical properties of fossil fuel raw materials and products, and of processes for conversion of fossil fuel raw materials into products needed in industrial energy, industrial raw materials, and consumer products. Prereq: 3440, 3450, 3610.

4480 Coating Processing to Liquid Fuels (3) Characterization of various methods; modeling of conversion processes and estimation of maximum yields; water and oxygen requirements; pyrolysis, catalytic hydrocarbon; reactor design considerations; review and critique of selected articles from both the current literature and patents. Prereq: Consent of instructor.

4530 Chemical Reactor Fundamentals (3) Brief review of homogeneous reaction kinetics; idealized homogeneous reactor models, both for closed and flow systems; corrections for non-ideal residence times; temperature zone, identification of scaling parameters; catalyst effectiveness factors and conversion in fixed bed catalytic reactors. Prereq: 3420, Chemical 3430. W.Su.

4540 Fluid-Solid Operations (3) Heat and mass transport in fixed and fluidized beds; applications include adsorption, ion exchange crystallization. Prereq: 3440-50.

4620 Advanced Process Dynamics, Simulation and Control (3) Development of process models, experimental identification, computer simulation of processes and control strategies, and analog versus digital process control. Design using advanced control concepts such as feedback, cascade, and multivariable control. Advanced control system design for difficult control processes. Laboratory experience. Prereq: 3620 or equivalent background in basic control theory and differential equations.

4730 Mass and Energy Flow in Biological Systems (3) Basic physicochemical and organizational principles applied to biological systems. Derivation of general equations of biomass and energy transfer. Thermodynamics of transport and equilibrium in biological phenomena. Discussion of Volterra's equation and biological clocks. Prereq: Consent of instructor.

4740 Introduction to Transport Phenomena in Biological Systems (3) Application of principles of transport phenomena to biological systems. Transfer of chemical energy and various cellular active transports; structure and rheology of physiological fluids, membrane and interfacial phenomena; analysis and design of artificial organs. Prereq: 3440, 3450 or consent of instructor.

4750 Microbiological Process Engineering (3) Application of chemical engineering principles and design concepts to microbiological processes; continuous culture of microorganisms, food processing and pharmaceutical processes. Prereq: 3440, 3450, or consent of instructor.

4760 Principles of Biochemical Separation (3) Fundamental aspects and similarities of modern biochemical separation methods; classroom demonstrations, design of production and analytical systems. Prereq: Consent of instructor.

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

5010 Graduate Seminar (1) Prereq: Admission to graduate program. May be repeated. S/NC only. E

5050 Engineering Analysis (3) Analytical formulation and solution of differential, integral, and polymer engineering problems involving deformation of solids, heat transfer and motion of fluids. (Same as Metallurgical Engineering 5050 and Polymer Engineering 5050.)

5060 Approximate Methods in Chemical Engineering (3) A survey of chemical engineering problems requiring approximate solutions, introduction to some approximate methods. Prereq: 5050.

5120 Heat Convection (3) Analysis of heat convection in fluids under viscous and turbulent flow conditions, emphasizing analytical approaches and numerical simulations of momentum and heat. Prereq: 5050.

5130 Methods of Optimization (3) Principles and applications of various mathematical programming techniques to chemical process design and control; variational method, maximum principle, dynamic programming, and geometric programming. Prereq: 4130.

5210 Process Dynamics (3) Analysis of recycle operation, steady state simulation and optimization of typical processes.

5250 Chemical Process Industry Economics (3) Analysis of economic components of chemical processes, internal economics of chemical enterprise, decision making for investment in capital facilities. Prereq: 4120-30, 4420.

5310 Thermodynamics of Heterogeneous Equilibrium (3) Phase rule; equilibrium between phases; condensation reactions of multicomponent phases; ideal and nonideal solutions. Prereq: 3040.

5320 Statistical Thermodynamics (3) Basic concepts of statistical mechanics and application to evaluation of thermophysical properties. Prereq: 5130.

5420 Applications in Fluid Mechanics (3) Navier-Stokes equations and fundamental concepts; applications in chemical engineering and polymer engineering: packed and fluidized beds, multi-phase flows, flow of polymer melts in simple geometries, basic principles in solid mechanics. Prereq: Undergraduate course in fluid mechanics or consent of instructor. (Same as Polymer Engineering 5420.)

5430 Rheology and Polymer Processing (3) (Same as Polymer Engineering 5430.)

5510 Chemical Reactor Design (3) Nonideal flow patterns in chemical reactors; diffusion and reaction in two phase systems; introduction to heterogeneous catalysis and reactor stability. Prereq: 4530.

5610 Stagewise Mass Transfer Operations (3) Equilibrium stage, concepts applied to mass transfer operations, emphasizing nusseltan and multicomponent systems.

5620 Differential Mass Transfer Operations (3) Differential mass transfer operations; falling film, packed tower and rotating contractors; mass transfer in homogenous and heterogeneous multicomponent systems; current theories of mass transfer; mass heat and momentum transfer analogies. Prereq: Mathematics 2840.

5800 Special Topics in Chemical Engineering (3) Special topics of current interest to chemical engineers. May be repeated. Maximum 9 hrs.

5915 Measurement Science I (3) (Same as Nuclear Engineering 5915.)

5925 Measurement Science II (3) (Same as Nuclear Engineering 5925.)

5935 Measurement Science III (3) (Same as Nuclear Engineering 5935.)

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


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

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

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

6320 Stochastic Processes in Chemical Engineering (3) Applications of techniques by residence time distribution, Markov chains, autoregressive moving average, and fuzzy concept for analysis of chemical engineering problems. Prerequisite: 5510, 5610.

6510 Applied Chemical Reaction Kinetics (3) Chemical reactions in gas and liquid phases, heterogeneous catalysis, catalyst effectiveness and role of transport in kinetics. Emphasis on development of phenomenological description although mechanistic models are discussed. Prerequisite: 5510.

6520 Catalytic Reactor Design (3) Principles of kinetics, heat and mass transfer applied to design and analysis of heterogeneous catalytic reactors. Prerequisite: 6510.

6710 Process Dynamics (3) Development of dynamic models of process equipment from conservation and rate equations, testing of models by frequency, step, and pulse response methods. Prerequisite: Consent of instructor.

6900 Advanced Topics of Chemical Engineering (3) Advanced topics of current interest to chemical engineers. May be repeated. Maximum 9 hrs.

Civil Engineering

MAJORS

M.E. M.S. Ph.D.

Environmental Engineering

Environmental Science

EMERITUS PROFESSOR:

C. R. Walker, S.M. Massachusetts Institute of Technology, P.E.

PROFESSORS:

W. F. Gracco (Head), Ph.D. Michigan State, P.E.
M. S. Bronzini, Ph.D. Pennsylvania State, P.E.
E. G. Burdette, Ph.D. Illinois, P.E.; A. Chatterjee, Ph.D. Illinois Institute of Technology, P.E.
D. H. North, Ph.D. Illinois, P.E.; W. T. David, Ph.D.
Ph.D. Tennessee; J. W. Fortey, Doctorate, d'Universite de Toulouse (France).
D. W. Goodpasture, Ph.D. Illinois, P.E.
K. W. Heathington, Ph.D. Northwestern, P.E.
W. H. Hightower, Ph.D. Purdue, P.E.
J. B. Humphreys, Ph.D. Texas A&M, P.E.
H. L. Johnson, Tennessee, P.E.; R. A. Minar, Ph.D.

ASSOCIATE PROFESSORS:

W. F. Brandes, M.S. Illinois, P.E.; B. J. Frederick, B.E., Clarkson College of Technology, P.E.
G. D. Reed, Ph.D. Arkansas, P.E.; R. F. Tiry (Emeritus), B.S., Marquette, P.E.

ASSISTANT PROFESSORS:

R. M. Bennett, Ph.D. Illinois; E. C. Drumm, Ph.D. Arizona, P.E.; R. B. Robinson, Ph.D. Iowa State, P.E.

LECTURERS:


The Department of Civil Engineering offers degrees leading to the Master of Science, Master of Engineering, and Doctor of Philosophy with a major in Civil Engineering concentrating in environmental engineering, structural engineering, soil engineering and materials, transportation engineering; to the Master of Science in Environmental Engineering and the Master of Science in Environmental Science with concentrations in water quality, air quality, and solid waste.

MASTER OF SCIENCE PROGRAM

The Master of Science programs in Civil Engineering, Environmental Engineering, and Environmental Science are offered to graduates of recognized undergraduate curricula. Departmental requirements to provide that for a major in Civil Engineering, the Bachelor's degree must be in civil engineering, or certain undergraduate programs must be taken before admission to candidacy for the Master of Science in Civil Engineering.

Civil Engineering: The Department of Civil Engineering offers two options for the Master of Science degree in Civil Engineering.

Option I: A minimum of 45 quarter hours, including at least 9 hours of thesis, is required.

Option II: A minimum of 48 quarter hours, including a 3-quarter-hour special problem is required. The special problem will culminate in a written report which must be approved by the student's major professor.

Environmental Engineering: For a Master of Science in Environmental Engineering, normally a bachelor's degree in a field of engineering is required. For a student who does not have an engineering background, the following minimum prerequisite courses will be required: 1310, 1320, 1330; Engineering Science and Mathematics 2720, 3110, 3311, Environmental Engineering 3120, 3330, 4520; and Mathematics through the equivalent of 2860. In general, these must be completed before courses for graduate credit can be taken.

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

Option I: The student must present a minimum of 45 quarter hours of approved environmental engineering course work. The major shall include a minimum of 9 quarter hours of thesis and 18 quarter hours credit of approved environmental engineering course work. A minor may be selected but is not necessarily required.

Option II: The student must present a minimum of 48 quarter hours of approved graduate courses. The major shall include a minimum of 27 quarter hours of approved environmental engineering course work. A minor may be selected but is not necessarily required.

Option I or II must be approved by the student's major professor. A student's program must include a minimum of 15 quarter hours of advanced environmental engineering design courses selected from a list provided by the student's committee.

Environmental Science: For a major in Environmental Science, the bachelor's degree may be in fields other than engineering. In some cases prerequisite undergraduate courses may be indicated, and in general these must be taken before courses for graduate credit can be taken. Specifically, prerequisites include Mathematics through 2860, Engineering Science and Mechanics 3110 and Environmental Science 3120 and 3330.

The Department of Environmental Engineering offers only a thesis program for work toward the Master of Science degree in Environmental Science. The student must present a minimum of 45 quarter hours of approved graduate courses. The major shall include a minimum of 9 quarter hours of thesis and 18 quarter hours credit of approved environmental engineering course work. A minor may be selected in a program such as ecology or microbiology.

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

MASTER OF ENGINEERING PROGRAM

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

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 90 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 the thesis or dissertation credit, at least 9 hours of which must be 6000-level courses.

3. Supporting courses in related scientific and engineering fields, amounting to approximately 36 quarter hours, subject to approval by the student's faculty committee. These related fields will normally include such disciplines as mechanics, chemistry, mathematics, microbiology, physics, and other engineering fields. A minimum of 12 quarter hours of mathematics will be required beyond the civil engineering undergraduate requirements.

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

5. Upon completion of at least one-half of all course work, each student must pass a comprehensive examination.

6. After completion of the dissertation, prior to graduation, each student must pass a final examination conducted by a faculty committee.
4120 Concrete Design (3) Reinforced concrete continuous beams, floor slabs and column footings and retaining walls. Prereq: 4110 and 4410.

4240 Structural Design (3) Plate girders, composite steel and concrete beams, connections and details, and analysis of simple and industrial buildings. Prereq: 3230 and 4410. 2-3 hr periods. W, Sp.

4260 Photogrammetry (3) Methods of plotting maps from aerial photographs, stereoscopic plotting instruments, applications. Prereq: 2260 or Forestry Summer Camp for forestry majors.

4420 Analysis of Framed Structures (3) Maximum forces due to moving loads; uses of influence lines; lateral forces due to earthquake and wind; analysis of pre-stressed concrete, trusses, and space frames. Coreq: 4410. (Formerly: Analysis of Framed Structures) moving loads; uses of influence lines; lateral forces due to earth, wind; analysis of portals, building frames and space frames. Coreq: 4410. W.

4430 Construction Methods and Equipment (3) Fundamental operations in construction and selection of equipment; production rates, balancing of equipment, and cost estimates. Prereq: 3716. F, W.


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

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

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; secondary stresses in 5120. W, F.

5150 Matrix Formulation of Structural Problems (3) Review of matrix algebra, vectors, stability considerations, stiffness and flexibility analysis of plane trusses, general members and structures composed of general members. Prereq: 2510 and 4140 or consent of instructor.

5160 Analysis and Design of Plate Structures (3) Bending and buckling of plates; analysis and design of bridge and building floors and structural plate components. Prereq: 5110. F.

5170 Introduction to Structural Dynamics (3) Analysis of free and forced vibrations, and transient response of structures having many degrees of freedom, elastoplastic behavior considered for structural systems; approximate design methods developed. Prereq: 5120. 5180. 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, or Engineering Science and Mechanics 5660. Civil Engineering is the primary department. Sp, A.

5220 Pavement Design (3) Pavement loads; pavement design, design and maintenance. Prereq: 4310 and 3710. Sp.

5240 Advanced Properties of Materials: Cement and Concrete (3) Permeability and durability; volume changes and creep; electromagnetic properties of concrete, special types of concrete; causes of failure. Prereq: 4710. W.

5270 Planning and Transportation (3) Preparation of transportation and elements of comprehensive development plans. Preparation of various transportation modes and between transportation and other community features. (Same as Planning 5270.) W.

5310 Engineering Practice (3) Valuation and feasibility studies; depreciation and useful life, engineering economics. F.

5320-30 Engineering Practice Applied to Administration of Engineering Projects (3, 3) Engineering administration; planning and industrial projects; cost estimates and methods of financing. W, Sp.

5410 Construction Contract Law and Administration (3) General principles applicable to construction contracts and construction related sales contracts. Emphasis on use of demand in preparation, award, and administration of construction contracts. Case study method of instruction. Prereq: 5420 or consent of instructor.


5520 Advanced Foundations (3) Planning subsurface investigations; bearing capacity and settlement of foundation soils; pullout tests; pile foundations; drilled piers; foundation design with the pressuremeter. Prereq: CE4220.


5560 Shear Strength and Stress Strain Behavior of Soil (3) Stress strength of fine grain soil from perspective of idealized, simple daily. Drained and undrained shear strength and stress strain behavior of real soils. Consolidation theory. Coreq: 4220.

5570 Soil Mechanics—Seepage (3) Saturated flow through embankments, filter design criteria, seepage forces and velocities, subdrains, and embankment failures. Prereq: 4310 or consent of instructor. Sp.

5590 Numerical Models for Geologic Materials (3) Numerical models to represent the stress/strain-volume relationships for soil, rock, and concrete; nonlinear elastic models, classical plasticity models; critical state and capped plasticity models; multi-directional surface models. Results from laboratory tests. Prereq: CE4310 or consent of instructor.

5610 Behavior of Steel Structures (3) Behavior of structural steel members due to static and fatigue loading; relation between strength and current specialization for design. Prereq: 3230. W.

5730 Prestressed Concrete (3) Properties of prestressing materials and anchorage systems; methods of pretensioning and posttensioning; analysis and design of members and continuous structures. F.

5740 Behavior of Reinforced Concrete Members (3) Ultimate strength and behavior of reinforced concrete members; relation between research results and current specifications for design. Prereq: 4120. W.

5760 Structural Reliability (3) Application of probability theory and statistics to evaluating the reliability of structures; development of safety factors and probability based design codes. Prereq: 5230, 4110, Statistics 3450.

5770 Advanced Structural Reliability (3) Monte Carlo methods; reliability of structural members and systems; load modeling and load combination. Prereq: CE3760.

5800 Urban Systems: Engineering and Management (1) The management of various urban systems usually under city manager and/or city engineer. Organization, finance, personnel administration, purchasing and equipment management and dealing with engineering consultants as each deals with municipal public works. Prereq: Graduate standing in Civil or Environmental Engineering or consent of instructor. W, A.

5805 Urban Systems: Engineering and Management II (3) Continuation of 5800. Management and engineering of urban streets, including lighting, cleaning and snow removal, water supply and waste-water drainage, solid waste, air pollution and regulations. Prereq: 5800. Sp, A.

5810 Traffic Engineering—Characteristics (3) Driver-vehicle-roadway system—level-of-service concept of capacity. Coreq: Statistics 3450. 2 hrs and 12-hr lab. F.

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 12-hr lab. W.


Environmental Engineering/College of Engineering

Freeways (3) Effect of street systems upon urban growth and development; classification and function of street systems, including cross sections, intersections, utility considerations, parking, effect of mass transportation; channelization; marketing, lightening, and speed assignment; traffic control system. Prereq: Consent of instructor. Su

5860 Urban Transportation Planning (3) Prediction of traffic demands and vehicular flows; land use planning; parking needs. Prereq: 5810. F

5870 Public Transit Planning (3) Person movement by bus, rapid, rail and taxicab transit. Nature of public transit; its various roles and how they fit community's need; user preferences; modal split models; total social, political, economic and technical impacts of public transit. Prereq: 4600 or graduate standing. Sp, A

5880 Highway Safety I (3) Transportation safety, highway safety. Legislation, federal-state-local relationships, current highway safety standards. Prereq: Graduate standing or consent of instructor.

5885 Highway Safety II (3) Effect of current tort law upon highway safety activities; roadside safety design; cross-section, barriers, guardrails and energy attenuators; identification and correction of high accident locations and system deficiencies. Prereq: 5880 and graduate standing in Engineering.

5890 Traffic Accident Reconstruction (3) Proper traffic accident reconstruction as basis for determining accident prevention or control programs. Many contributing factors to an accident; proximate and secondary accident causes as they relate to road way 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, students who are enrolled in civil engineering students in non-thesis program. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs. S/NC only. E

5910-20-30 Special Topics (1-5, 1-6, 1-6) Topics relate to current developments in civil engineering not included in other courses. May be repeated.

5915 Measurement Science I (3) (Same as Nuclear Engineering 5915.)

5925 Measurement Science II (3) (Same as Nuclear Engineering 5925.)

5935 Measurement Science III (3) (Same as Nuclear Engineering 5935.)

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

6110 Research Development (3) Development of research activities to meet public and private needs by becoming competitive in attracting research funding. Course cannot be used to satisfy 6000-level course requirement in doctoral programs. Prereq: Graduate standing and consent of instructor.

6120 Research Management (3) Management strategies for research programs/projects. Long range and day-to-day management requirements. Course cannot be used to satisfy 6000-level course requirements in doctoral programs. Prereq: 6110.

6530 Soil Dynamics (3) Behavior of soils and soil-structure systems under time dependent loadings; water in soils and rocks; principles of seismic refraction techniques; effects of earthquakes and vibrating machines on soils and foundations; dynamic borehole logging and determination of soil parameters. Prereq: CE4220, ESM470 or ESM570.

6610 Behavior of Steel Bridges and Buildings (3) Behavior, analysis, and design of plate girders, columns and composite members subject 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; application of semi-rigid frame and plastic hinge limit analysis. Prereq: 5120 and 5740. Sp, A

6760 Behavior of Reinforced Concrete Slabs (3) Behavior, analysis and design of reinforced concrete slabs; finite element solutions. ACI Code methods; yield line theory. Prereq: Introduction to Engineering Science and Mechanics 6310. Sp, A

6800 Statewide Passenger Transportation Planning (3) Comprehensive multimodal transportation plan, intercity traffic models, functional classification, programming and design; role of government in transportation policy decisions, as they affect air and highway investments. Prereq: 5860. W, A

6880 Planning Models for Transportation System I (3) Analytical analysis of trip generation, trip distribution, and trip assignment. Mathematical, statistical, and computer science techniques: Modal split, trip distribution, and trip assignment. Statistical techniques analytical ideas. Scaling into a given urban transportation planning process. State-of-the-art and the new modeling techniques. Prereq: 5860 or 5870; Mathematics 3150 and Statistics 3450. W, A

6890 Planning Models for Transportation Systems II (3) Analytical analysis of modal split, trip distribution, and trip assignment. Mathematical, statistical, and computer science techniques in modeling process. Models integrated for urban transportation planning process. Prereq: 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. E

Environmental Engineering

4000 Environmental Protection (3) Managing of water resources, solid wastes and hazardous wastes; air environments, solid wastes, commercial insects and rodents, food, and evaluation of physical energy to prevent impairment of health, to promote efficiency and comfort, and to safeguard balances in natural ecosystems. Principles of environmental protection; design and practice without detailing design of practice methods.

4930 Environmental Engineering Chemistry (3) Fundamentals of chemistry which relate to generation, formation analysis, and removal of environmental contaminants. Prereq: Chemistry 1310 and senior standing.

4150 Urban Water Management (3) Introduction to urban water management; evaluation of optimum water policies; formulation of system constraints and analysis of decision-making process; management of storm water for beneficial use. Prereq: 3330. Sp

4210 Water Resources Engineering Design (3) Planning and design of multipurpose dam project, including reservoir, dam, and discharge control works. Considerations of dam safety and environmental impact. Microcomputer applications. Prereq: 3330 or consent of instructor. F, Sp

4220 Water Resources Engineering Development (3) Multiobjective evaluation procedures for comparing and selecting among water resources project alternatives; achieving project optimality; single- and multi-purpose projects; environmental assessment procedures; risk assessment methods for making water resource project decisions; and selecting among water resources development alternatives; achieving project optimality; single- and multi-purpose projects; special topics in new developments in water resources engineering; prerequisite: 3330 or consent of instructor. W

4330 Hydrologic Design (3) Application of frequency and regression analysis to hydrologic design of water resources systems; unsteady surface runoff and streamflow modeling; urban peak runoff design using kinematic wave theory; evaluation of effects of land use changes on streamflow quantity and quality. Prereq: 3330. W


4520 Elements of Water and Wastewater Treatment Systems Design (3) Unit operations and processes employed in physical, chemical and biological treatment of water and wastewater. Application of unit operations and processes in design of water and wastewater treatment plants. Prereq: Engineering Science and Mechanics 3110 or consent of instructor. Sp, Su

4525 Water and Wastewater Treatment Plant Design (3) Detailed process design of water and/or municipal and industrial wastewater treatment plants; design of sludge handling systems, ultimate disposal of residuals. Prereq: 4520 or consent of instructor. W

4530 Environmental Engineering Laboratory (3) Standard analytical techniques for evaluation of specific air and water and solid waste pollutants. Prereq: 4030 or consent of instructor. W

4600 Solid and Hazardous Waste Management (3) Magnitude and characteristics of solid and hazardous wastes; collection systems; disposal systems including landfill, incineration, composting, fixation, resource recovery, and proposed new technologies; current and future regulations. Prereq: Junior standing.

4700 Air Pollution—Air Resources Management (3) Introductory course on concepts of air pollution; analysis of relationship among emission sources, meteorology and air quality, government and industrial pollutants; engineering approaches for air pollution control.

4802 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.

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

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

5230 Open Channel Hydraulics (3) Opens channels and properties; principles and applications of uniform and gradually-varied flow; unsteady flow/flood routing; dam break flood analysis, spatially-varied flow. Microcomputer applications. Prereq: Engineering Science and Mechanics 3110 or consent of instructor.

5232 Sediment Transportation (3) Sediment properties and measurements, bed loads and suspended load movement, erosion, scour, transportation and deposition of sediments by flowing water; siltation 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 engineering designs; major flood risk reduction elements; and other flood damage reduction elements; interdiscipli

5261 Basic Principles of Remote Sensing (3) Appli

5262 Remote Sensing Data Acquisition (3) Active and passive sensors, their areas of special application and limitation; description of remote sensing platforms, including airborne, satellite, and ground-based remote sensing systems; mission planning. Prereq: 5261 or consent of instructor. Sp


5301 Stormwater Modeling I (3) Interpretation of hydrologic data using methods of systems analysis. Hydrologic components are analyzed as linear and nonlinear systems integrated into mathematical models.
5302 Stormwater Modeling II (3) Continuous streamflow models; predicting hydrologic modeling methods of stochastic hydrology, including flow frequency and time series analysis. Hydrologic design of water resources systems using stochastic methods; influence of hydrologic variables on stochastic processes; groundwater flow; numerical solutions of flow equations; Dupuit approximations, analog and numerical methods, Hele-Shaw, and graphical solutions. Prereq: Engineering Science and Mechanics 3110 or consent of instructor.


5330 Descriptive Hydrology (3) Occurrence and description of elements of hydrologic cycle, effects on earth and relation to humans. Not for civil engineering majors.

5400 Introduction to Environmental Systems (3) Models of air and water quality, water resources, solid waste disposal, and location of central facilities; exposure to current literature on environmental management problems; optimization of these systems. Prereq: Grad standing. Civil Engineering 4800 or consent of instructor. Sp

5501 Water and Wastewater Treatment Theory I (3) Thermodynamics of unit operations employed in sanitary engineering. Prereq: 4520. W

5502 Water and Wastewater Treatment Theory II (3) Theory of physical, chemical, and biochemical processes employed in sanitary engineering. Prereq: 4520. W


5530 Environmental Engineering and Natural Systems Behavior (3) Seminar in selected issues of environmental engineering science research relating to natural system behavior. Eutrophication, trace metals and trace organics. Prereq: Graduate standing or consent of instructor.

5551 Water Quality Management (3) Water quality control objectives, methods, and philosophies; water quality criteria; effect of various uses on water quality; receiving water characteristics and waste assimilation capacity; regulatory standards; economic considerations. Prereq: 4520. W

5582 Microbiology for Sanitary Engineers (3) Microorganisms and microbiological processes utilized in the treatment of industrial and municipal wastes. Prereq: Microbiology 1100. W

5615 Solid Waste Resource Recovery (3) Analysis and design of resource recovery processes and operations that apply to municipal and industrial waste. Prereq: 4600. W


5710 Air Pollution Control Engineering (3) Emission control systems for industrial and power generation processes; selection sampling methods, air pollution dispersion of pollutants. Prereq: Graduate standing. F

5715 Ambient Air Monitoring (3) Physical and chemical properties of ambient air. Air pollution monitoring, survey network design. Quality control of air monitoring data. Use of air monitoring data in air quality management programs. Prereq: Consent of instructor.

5720 Air Pollution Particle Collection Theory (3) Mechanics of particles suspended in gaseous medium including particle motion, impaction, and aerodynamic capture of particles. Prereq: Engineering Science and Mechanics 3110. W

5725 Air Quality Modeling and Impact Assessment (3) Techniques to assess the air quality impact of major transportation projects and industrial air pollution sources. Application of atmospheric dispersion models and evaluation of meteorological and air quality data. Prereq: Graduate standing, Computer Science 3150. Sp

5730 Air Pollution Control Device Design (3) Design and evaluation of systems used to control emission of gaseous and particle air pollutants. Comprehensive design of specific devices and systems. Prereq: 5720. Sp

5735 Industrial Source Sampling (3) Sampling methods for gaseous and particulate air pollutant emissions from industrial processes. Prereq: Graduate standing; 2 hrs and 1 lab. Su

5745 Ambient Air Chemistry (3) Reaction mechanisms for production of secondary air pollutants from anthropogenic primary pollutants and naturally occurring precursors. Prereq: Consent of instructor.


5900 Special Problems in Environmental Engineering (1-9) To fulfill the special problem requirement in the non-thesis program. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs. N/C only. E

5910-20-30 Special Topics (1-6, 1-6, 1-6) Problems and topics related to current developments in field of environmental engineering not included in other courses. May be repeated. E

5990 Environmental Engineering Seminar (1) Phases of interdisciplinary engineering including reports on current research at The University of Tennessee, Knoxville. Course credit not applicable to graduate degree program. Prereq: Active graduate standing in environmental engineering. May be repeated. N/C only. F, W, Sp

6510 Industrial Waste Unit Operations and Processes (3) Laboratory and pilot plant development of physical, chemical and biological variables for treatment of industrial wastes and residuals. Utilization of these studies in design. Prereq: 5501, 5502, 5503, 5593. 1 hr lab. 1 lab.

6520 Industrial Waste Management (3) Sources and characteristics of industrial wastes, recycling, waste reduction, energy recovery, resource recovery, and treatment options, ultimate disposal of residuals including thermal processes, land application, recovery and encapsulation; design oriented. Field trips. Prereq: 5501, 5502, 5503.

6530 Rate Processes in Environmental Pollution (3) Application of scientific principles concerning movement and fate of chemicals at interfaces of three geospheres of environment (air, water and earthen solids). Development of intuitive sense to enhance problem solving. Prereq: 5501, 5503 or consent of instructor.

6910-20-30 Special Topics in Environmental Engineering (3, 3, 3) Selected advanced problems of current interest in environmental engineering. Prereq: Consent of instructor. E

NOTE: Prerequisite to all graduate courses: Consent of instructor.

Electrical Engineering

MAJOR DEC DEGREES

Electrical Engineering

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

Professors:
concentration in the Master's program. Students from fields other than Electrical Engineering who have met the admission standards will be admitted only as non-degree students until a program of study is developed by the student and his/her faculty advisor. This is filed with the E.E. Department Graduate Committee. The program of study should include recommended undergraduate courses and graduate courses in Electrical Engineering.

DEGREE REQUIREMENTS

Specific degree requirements which must be met 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 5750-50 which require 5710 as a prerequisite should register for 5710 in the fall quarter.

2. Nine quarter hours of graduate credit in mathematics consisting of Mathematics 4710, 4550, and 4250, or 4510-20-30. Other approved 4000-5000 level mathematics courses must be submitted for any of the above course material covered in undergraduate work.

3. An additional 18 quarter hours of 5000-level work in electrical engineering or 9 quarter hours of 5000-level work in one area of electrical engineering and 9 quarter hours of 5000-level work in another area approved by the student's Master's committee.

4. The 18 quarter hours of 5000-level work in electrical engineering must be divided equally between two different electrical engineering areas.

5. Master's thesis, totaling 9 quarter hours or more.

6. A final oral examination covering the thesis and related course work.

DOCTORAL PROGRAM

The Ph.D. degree with a major in Electrical Engineering may be pursued in the areas of circuit theory, computers, electro-optics, communication theory, electromagnetic theory, plasma engineering, power systems, solid-state electronics, and control systems.

Specific departmental requirements for the Ph.D. degree include the following:

a. A Master of Science or Master of Engineering degree.

b. A minimum of 72 quarter hours of course work beyond the B.S. degree excluding thesis, research, and dissertation credit.

c. A minimum of 36 quarter hours of work in electrical engineering at the 5000 and 3000 levels.

d. A minimum of 12 quarter hours of 6000-level course work. At least 3 quarter hours of this work must be in area other than the student's major area.

e. A minimum of 18 hours of mathematics, including Mathematics (or Physics) 5610-20-30 and 9 hours of mathematics at the 4000 level or above.

Courses required in electrical engineering undergraduate curriculum cannot be used in either the M.S. or Ph.D. programs. In addition, 4000-level courses in electrical engineering may not be used if 5000-level courses are available in the same area.

3. A minimum of 36 quarter hours credit in doctoral dissertation.

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

5. Satisfactory performance on both a qualifying and comprehensive examination. The qualifying examination is prepared by the electrical engineering faculty and consists of a 3-hour written examination in each of four areas. Areas (1) mathematics and transform methods, and (2) basic passive and active networks are required of all Ph.D. students. Areas (3) and (4) are usually chosen from the doctoral committee divisions in the department and cover material from undergraduate courses and first year graduate courses. A student who fails the qualifying examination must take and pass the examination the next time it is offered to remain in the Ph.D. program. The qualifying examination is normally taken after the completion of 36 hours of graduate course work or immediately after completion of a Master's degree. A minimum of 27 hours of graduate course work must be completed after the student has taken the qualifying examination the first time.

The comprehensive examination is prepared by the doctoral committee and consists of a 3-hour written examination in the student's major area, a 2-hour written examination in a related area, and an oral examination. The comprehensive examination is normally taken at least six months after passing the qualifying examination. Part of the comprehensive oral examination will be a defense of a formal written dissertation proposal. The comprehensive examination and the dissertation proposal accepted by the student's doctoral committee before the student is reported as ready for admission to candidacy for the Ph.D. degree.

6. Participation in departmental seminars.

Many of the electrical engineering courses are offered in the evening. Engineers working in industry are encouraged to participate in research and/or research work in areas pertinent to atmospheric and space flight are also available at the Space Institute, Tullahoma.

3010 Transient Analysis (3) Analysis of transient response of linear and nonlinear systems; Laplace transform methods and classical differential equation methods for system analysis; complex frequency concept and pole-zero charts; applications to engineering problems. Prereq: 3030.


3050 Basic Field Theory (3) Forces between charges, electric and magnetic fields. Gauss's law and divergence, potential and line integrals, material bodies, polarization, magnetic circuits, Maxwell's equations, dynamic potentials. Prereq: Mathematics 2860. 3 hrs including biweekly lab.

3060 Propagation I (3) Propagation of waves in transmission lines and in other guiding systems. Impedance, reflection and interferometric analysis of waves, standing wave and traveling wave measurements. Introductions to impedance matching, transmission line filtering, microstrip circuit construction, graphical and computer aided design methods. Prereq: Mathematics 2860. 3 hrs including biweekly lab.

3080 AC Power I (3) Magnetic circuits, iron cored coils; transformers, construction, calculation of performance from equivalent circuit, parameters for equivalent circuit, 1-phase and 3-phase connections, "per unit" notation; induction motors, constructional features, analysis of performance using equivalent circuits, 1-phase and 3-phase applications. Prereq: 3030, Physics 2310.

3090 Energy System Operation (3) Power system components and system structure. Basic analysis techniques in load flow calculations, power system stability, faults, and system production. Prereq: 3080.


3110 Basic Electrical Engineering—Circuits and Fields (3) For non-electrical engineering majors. Prereq: Mathematics 2850, Physics 2510-30. 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.

3150 Logic Design of Digital Systems (3) Introduction to boolean algebra and design of combinational circuits. Presents gate and flipflop characteristics. Design of clocked sequential circuits and other systems containing memory. Introduction to minicomputer architecture and system components to include basic structure and functions, input, output, and control systems. Instruction set capabilities and machine language programming. Prereq: 2030 or Computer Science 2710. 3 hrs including biweekly lab.

3190 Plasma I (3) Engineering applications of physical electronics, plasma effects and devices. Topics include electrostatic precipitators and plasma light sources, laser operation and applications (electro-optics), and MHD, controlled thermonuclear and other techniques of advanced power production. Prereq: Physics 2310-20-30. 3 hrs including biweekly lab.

3270 Linear Systems Analysis (3) Steady-state and transient response; frequency response, 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.

3210 Basic Electronics I (3) Band theory fundamentals, theory and applications of p-n junctions and power supplies; theory of operation of field-effect transistors and applications in simple circuits. Prereq: 2030. 3 hrs including project laboratory.

3220 Basic Electronics II (3) Physical operation of bipolar transistors and vacuum tubes with applications in basic amplifiers. Integrated circuit fundamentals. Prereq: 3210. 3 hrs including project laboratory.

3230 Basic Electronics III (3) Frequency and transient response of open-loop transistor amplifiers. Fundamentals of integrated-circuit operational amplifiers and applications in basic feedback configurations. Basic digital switching circuits. Prereq: 3220. 3 hrs including project laboratory.

4020 Direct Energy Conversion (3) Background physics; conversion devices including photovoltaic power sources, thermoelectric generations and heat pumps, magnetohydrodynamics, fuel cells, related aspects of d.c.-a.c. inversion and energy storage. Prereq: 3810, 3030.

4080 Microwave Circuits and Electronics (3) Scattered wave descriptions of circuits, to include isolators and amplifiers, couplers and power dividers, circulators, phase shifters, loading and interconnection of systems. Power generation, amplification by vacuum devices and by solid state (bulk and junction) devices. Microwave switching, filtering and multiplexing. Prereq: 3585. 3 hrs including biweekly lab.

4090 Propagation II (3) Metal tube, dielectric rod, and...
4480 Kinetic Theory (3) Electron beams in reactive medium: microwave travelling-wave tubes and recently-developed gyrotrons and free-electron lasers. Plasma applications: plasma-wave mixers, gyrotrons, gyro-kinetic waves, and electromagnetic guns. Plasma applications concern plasma injectors for thermonuclear fusion machines and study of plasma containment in magnetic field. Prereq: Senior or graduate standing.


4500 Electro-optics Detection and Instrumentation (3) Sensitivity, resolution (frequency response) and noise concepts of and practical engineering data for both single and multiple channels. Optics in optical communication systems; and temporal media (e.g. photodiodes) will be given. The last third of the course will be devoted to selection of preamplifiers and detector systems (e.g. laser light scattering, optical data processing, holographic interferometry).


4570 Electro-Acoustics (3) Wave equation for sound, radiation of sound, transducers, feedback control. Loudspeakers, horns, speaker systems, phonograph recording and reproduction, tape recording and reproduction, noise reducing systems. Prereq: Senior standing.

4600 Analog Signal Processing Circuits for Electronic Instrumentation (3) Operational amplifiers, instrumentation amplifiers and other integrated circuits in signal conditioning. Design of attenuators, function generators, active rectifiers, and synchronous demodulators. Analysis of interfacing problems between analog and digital signal-processors. Prereq: 3830. 3 hrs including project laboratory.

4610 Analog-Digital Systems (3) Principles of analog computing components. Applied to analog computing to include problem set-up and scaling. Characteristics of analog computers are presented. Various digital computers are developed. Presents comparators, digital to analog conversion, and analog to digital conversion techniques. Prereq: 3810 and 3830. 3 hrs including biweekly lab.


4630 Digital System Organization and Design (3) Consider system organization of digital systems including microcomputer and microprocessor architectures and comparisons. Characteristics of ALU and CPU structures, storage systems (RAM, ROM, and PROM buildings). Design of computer and the other a microcomputer, are developed. Control unit organization to include serial-parallel modes of operation, synchronous/asynchronous timing systems, and state programming of control functions. Prereq: 3810. 3 hrs including biweekly lab.

4680 Bioelectric Instrumentation (3) Nature and origin of bioelectric potentials, transducers, amplifier requirements, remote transmission. Prereq: 3810. 3 hrs including project laboratory.

4680 Electrooptic Amplifiers (2) Feedback amplifier principles. Wideband linear amplifiers. Audio and radiofrequency power amplifiers. Prereq: 3830, 3720. 3 hrs including project laboratory.

4690 Communications Electronics (3) Receiver and transmitter circuits for communications. Prereq: 3040, 3830. 3 hrs including project laboratory.

4700 Digital Integrated Electronics (3) Comparators, logites, flip-flops, registers, counters, memories, analog switches, A/D and D/A conversion, clipping, clamping and sweep circuits. Prereq: 3830, 3810. 3 hrs including project laboratory.

4740 Integrated Circuits (3) Processing and fabrication of active and passive components for monolithic and hybrid circuits. Design techniques for linear and digital circuits. Prereq: 3830. 3 hrs including project laboratory.

4780 Synchronous Machines (3) Construction and application, analysis of performance from equivalent circuits (e.g., photodiode machines). Park's transformation to the 2-axis model and use in transient studies; extension of 2-axis concept to generalized theory of electrical machines. Prereq: 3560.

4790 Controllable Motor Drives (3) A combination of lectures and hands-on lab to study the design and application of various control techniques for controllable ac and dc motor drives. Prerequisites: Electricity and Electronics, Fundamentals of Power System Analysis, and Power System Stability.
5230 Advanced Electrical Machinery Applications (3) Linear motors; pole amplitude modulation and other control techniques; variable frequency operation. Prereq: 5210.

5240-50 Control Systems Design I, II, III (3, 3, 3) Analysis and design of continuous and digital control systems using modern techniques. Feedback theory; system modeling; stability analysis; system response analysis; design of estimator and observer; system design and controller design for engineering properties of control systems. Coreq: 5070 or equivalent.

5271 Modern Systems Theory I (3) Introduction to linear systems theory. State-space model, linear dynamical systems, state transition map, matrix exponential, controllability, observability, realization theory, pole placement, observers, stability theory for linear systems. Prereq: Consent of instructor.

5281 Modern Systems Theory II (3) Optimal estimation theory. Probability theory and stochastic processes, uncertain dynamical systems, estimation and filtering theory. Wiener filtering, the Kalman filter and its extensions. Prereq: 5271 or consent of instructor.


5315 Plasma Diagnostics I (3) Classical plasma diagnostic techniques for low temperature plasmas. Active and passive techniques for characterizing plasmas. Active and passive perturbing techniques including Lang-muir, capacitive, magnetic and calorimetric probes, and perturbing spectroscopic techniques. Prereq: 4445 or consent of instructor. (Same as Nuclear Engineering 5315.)

5320 Plasma Diagnostics I (3) Classical plasma diagnostic techniques for low temperature plasmas. Active and passive perturbing techniques for characterizing plasmas. Active and passive perturbing techniques including Langmuir, capacitive, magnetic and calorimetric probes, and perturbing spectroscopic techniques. Prereq: 4445 or consent of instructor.

5325 Plasma Diagnostics II (3) Active and passive non-perturbing diagnostic techniques for fusion-related plasmas. Laboratory safety, electrostatic energy analyzers, particle probes, RF emission measurement, photon biophotonic, ferro-ferromagnetic and Thomson scattering, neutron and reaction products. Prereq: Consent of instructor. (Same as Nuclear Engineering 5325.)

5335 Plasma Diagnostics Laboratory (3) Data from at least four diagnostic instruments in the UTK Plasma Science Laboratory. Langmuir probes, capacitive probes, RF emission detection, retarding potential energy analyzers, charge-exchange neutral detectors, spectroscopic measurements, microwave interferometry, and other methods. Prereq: 5315 and 5325. (Same as Nuclear Engineering 5335.)


5500 Application of Quantum Electronic Devices (3) Colorado devices for linear and frequency experiments. Lasers in communication and instrumentation systems. Specific application examples: plasma diagnostics, Raman emission spectros copy, optical harmonic generation, holography, models, working, and biological and medical uses. Prereq: 5340 and Mathematics 4710 or equivalent.

5570 Advanced Direct Electrical Energy Conversion I (3) Theory, latest devices, and applications for production of electrical power for electric power and thermaloelectric and photovoltaic effects. Prereq: 4020 or Mechanical Engineering 4150 or equivalent, or consent of instructor.

5580 Advanced Direct Electrical Energy Conversion II (3) Theory, latest devices, and engineering applications for production of electrical energy by gaseous means of thermoelectric, magnetohydrodynamic, and electro-gadgets. Prereq: 4020 or Mechanical Engineering 4150 or equivalent, or consent of instructor.

5590 Advanced Direct Electrical Energy Conversion III (3) Prereq: 5370 and 5380, or equivalent.

5410 Power System Networks (3) Sequence impedances for transmission lines, machines, and transformers. Formation of system network characteristics such as Zbus, Ybus, and others. Computer methods. Prereq: Graduate standing or consent of instructor.


5440 Distribution System (3) Electric power distribution with particular reference to utility systems. System growth and planning, operation and regulation. Prereq: 4410, 4420 or 4430. Project laboratory included.

5460 Selected Topics in Power Systems (3) To meet special needs of students. Possible topics: power systems reliability, interconnected system theory, power plant operation, electrical transients in power systems, and power system relaying. Prereq: Consent of instructor. May be repeated with consent of department.

5510-20-30 Advanced Analog Electronics (3, 3, 3) Physical operation of modern electronic devices with emphasis on semiconductor devices such as diodes, bipolar transistors, J-FETs, and MOSFETs. Small-signal equivalent circuits and noise models of active devices. Design and analysis of linear wide-band low-noise feedback amplifiers and radio-frequency amplifiers using discrete and integrated circuits, voltage/current and current regulators, including switching regulators. Use of specialized electronic systems in analog signal processors. Advanced topics in analog electronics from current literature. Prereq: 4370, 4600, 4880, 4740 or consent of instructor. Coreq: Mathematics 4510 or 4710. Project laboratory included.

5540 Thick-Film Hybrid Microcircuits (3) Processing and design basic techniques for prototype production of hybrid thick-film integrated circuits; from circuit formation and two-axis model, transient behavior of insulated and interconnected rotating machines. Prereq: Consent of instructor.


5740 Digital Processing of Signals (3) Analysis of discrete signals; sampling theorem and its implication; frequency domain design of digital filters; quantization effects, processing of digital signals; discrete Fourier transform. Prereq: 4100 or equivalent.


5770 System Identification (3) Various identification schemes: deterministic, stochastic, and hierarchical methods. Applications in all areas of engineering and science. Prereq: Consent of instructor.

5800 Power Transmission Lines (3) New and unconventional power transmission lines. Prereq: Vector line parameters for overhead and underground lines. Corona and radio interference of high voltage transmission lines. Prereq: 4410-20-30 or equivalent.

5810-20 Electromagnetic Fields (3, 3) Vector analysis, Maxwell's equations, special relativity, plane waves, reflections, waves in anisotropic media, guided waves, rectangular and cylindrical wave guides, radiation from elementary sources. Coreq: Mathematics 4510 or 4710.

5815 Fundamentals of Physics and Engineering (3) (Same as Nuclear Engineering 5815.)

5825 Plasma Engineering (3) (Same as Nuclear Engineering 5825.)

5830 Linear Antennas and Antenna Arrays (3) Hertzian dipole, linear antennas, impedance loop antennas, receiving antennas, linear arrays. Prereq: 5820.

5835 Fusion Technology (3) (Same as Nuclear Engineering 5835.)


5850 Microwave Electronics (3) Vacuum electronic and semiconductor electronic oscillators and amplifiers.
Frequency swept oscillators. Energetic electron beams, mode coupling in loaded beams, modern traveling wave tubes, and parametric devices, transistor time devices. Prereq: 5820 or equivalent. Sp

5860 Electromagnetic Wave Propagation (3) Waves, rays and beams in generalized propagation media; power flow and field quantities in generalized media, equivalence relations. Introduction to canonical problems and applications of modern geometrical theory of diffraction (GTD) for electromagnetic waves: geometric optics approximation, accountings of far fields and near fields due to edge and surface diffractions, beam modes, computation of radar cross-section. Coreq: 5820 or equivalent. W

5870 Introductory Microwave Networks (3) Scattering and transfer representations for multiports, unilateral and bilateral microwave and millimeter wave devices, component and system parameter measurement by modern network analyzers. Design of multiports, integration of high frequency multiport designs with analyzer measurements. F

5910 Special Topics and Special Course Topics in Electrical Engineering (3-9) Open to students with graduate standing. Special projects and special course topics taught by members of the graduate faculty. Sp

5915 Measurement Science I (3) (Same as Nuclear Engineering 5915).

5925 Measurement Science II (3) (Same as Nuclear Engineering 5925).

5930 Digital Image Processing (3) Theory and techniques of spatial and momentum interrelations of fields and their representation, image representation and transforms, image enhancement, restoration, reconstruction, image processing techniques, image description, scene analysis, and scene matching. Prereq: 4380 or consent of instructor.

5935 Measurement Science III (3) (Same as Nuclear Engineering 5935).

5940-50 Advanced Small Computer Systems (3, 3) Real-time applications, memory and CPU organization, software interface, and peripheral devices of microcomputer and microprocessor system are studied. Project-oriented: supported by hardware and software interface design. Prereq: 5175 or 4850. (Same as Computer Science 5940-50.)

5990 Graduate Seminar in Electrical Engineering (1-3) Topics of particular seminar sequences may include those of interest or research in department. Open to students with graduate standing. Cannot be included in 36 hrs of course work required for Master's. May be repeated with consent of department. S/N only.

8000 Doctoral Research and Dissertation (3-15) P/NP.

6240-50 Advanced Systems Theory I, II, III (3, 3, 3) Advanced topics in modern theory. Topics vary. 6240—Game theory, dual control problem, information structure and control, hierarchial systems, reliable control, uncertainty and communication, network analysis, systems theory, systems defined on groups. 6250—Qualitative analysis of systems, nonsingular nonlinear systems analysis, stability theory. Need not be taken in sequence. Prereq: 5271-61 or consent of instructor.

6270-80 Special Topics in Systems Methodology (3, 3, 3) Advanced topics of current interest to system analysis and design of new developments as found in current literature. Prereq: Consent of Instructor.


6550-10 Electrical Conduction in Gases and Plasma Physics (3, 3) (Same as Physics 6550-10.)

6530 Advanced Topics in Image Pattern Analysis (3-9) Discussion of new developments as found in current literature. Prereq: 5670-80, Computer Science 5640-50 or consent of instructor.

6610-20-30 Microwave Networks (3, 3, 3) Scattering and transfer representations. Narrow band and wide band synthesis of networks containing lumped and distributed components, interface matching and response equalization. Low noise, low distortion and high designs of amplifiers and oscillators. Topical selection from reciprocal and non-reciprocal devices, directional devices, high frequency switches and multi-frequency applications. Further selected topics from current practice in optimization and in distortion control. Network analyzer measurement techniques and integration of measured data with design procedures. Prereq: Consent of instructor.


6670-80-90 Asymptotic Techniques in Wave Propagation (3, 3, 3) Selected topics on electromagnetic waves with spatial and temporal dispersion and with fluctuation. Geometric theory of diffraction for electromagnetic waves, supported by results from canonical approximations of geometrical optics and physical optics. Field and power flux scattering radiative transport in tenuous particulate media; multiple scattering theory; coherence and mode spread. Fluctuations of fields and of surface scattering. Prereq: Consent of instructor.


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.


Engineering Administration

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

5960 Project in Engineering Administration (3) Study and formal report of engineering administration topic, normally performed in last quarter of work toward degree. For M.S. in Engineering Administration cadidates only. May be repeated. Maximum 3 hrs credit to be applied toward degree. Must register for 5900 until project is complete. S/N only. E

Engineering Science and Mechanics

MAJOR

Engineering Science

M.S., Ph.D.


Research Professor: T. F. Moriarty, Ph.D. Illinois, P.E.

Associate Professors: J. E. Caruthers*, Ph.D. Georgia Institute of Technology; R. C. Engels*, Ph.D. Virginia Polytechnic Institute; A. Matthews, Ph.D. Illinois, P.E.; J. Myers, Ph.D. Indiana University; W. E. Scott, Ph.D. Johns Hopkins; M. O. Soliman, Ph.D. Tennessee, P.E.; J. S. Steinback, Ph.D. University of Chicago; J. Wasserman, Ph.D. Illinois, P.E.

Assistant Professors: J. A. M. Boulet, Ph.D. Stanford; W. F. Jones, Ph.D. Clemson.

*U.T.S.I. faculty members.

Graduate programs leading to the degrees of Master of Science and Doctor of Philosophy will be available to graduates of recognized curricula in engineering, mathematics, or one of the physical or biological sciences. Program concentrations include solid mechanics, fluid mechanics, knowledge engineering, and biomedical engineering. In the biomedical and engineering science concentration, interdisciplinary programs are arranged to meet individual needs of students. 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's major professor may be selected from a department other than the Department of Engineering Science and Mechanics.

The knowledge engineering program, which is offered only at UTSI, uses computer systems in collaboration with human experts to assimilate and efficiently manage and analyze increasing body of knowledge. The thrust of the program is to educate engineers and scientists in the development and application of knowledge-based expert computer systems to engineering problems. A departmental plan is required in addition to The Graduate School application. The names and addresses of four references must be included with the departmental application.

A. The flexibility and interdisciplinary aspect of the program concentrations are intended to be of particular interest to prospective
students currently employed in research, development, or design activities and whose interests in ongoing education (either full-time or part-time) lie at one of the interfaces between science and engineering, or can best be met by interdisciplinary study in engineering. The department's course offerings and research activities are also intended to meet the needs of students who seek preparation for employment in engineering areas requiring specialization in mechanics, or in related interdisciplinary studies such as biomechanics.

THE MASTER'S PROGRAM

Two M.S. options are offered: option I requires a thesis, while option II does not. The second plan is 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 Option I a minimum of 45 quarter hours, including the thesis is required. Option II a minimum of 48 hours is required. The requirements include the following:

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<tr>
<th>Hours</th>
<th>Credit</th>
<th>Option I</th>
<th>Option II</th>
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<tbody>
<tr>
<td>Mathematics</td>
<td>9</td>
<td>9</td>
<td>27*</td>
</tr>
<tr>
<td>Engineering courses</td>
<td>18</td>
<td>27*</td>
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(Major concentration; may include but is not restricted to courses offered by the Engineering Science and Mechanics Department.)

Related courses (May include additional courses in mathematics, computer science, or the physical and life sciences as well as engineering courses.)

Thesis

A final examination is required under both options, covering graduate course work and the thesis (if any).

*Engineering courses under Option II may include advanced laboratory work or work in other areas, for example Engineering Science and Mechanics 5910 or analogous courses in other departments.

THE DOCTORAL PROGRAM

Specific departmental requirements for the Ph.D. degree include:

1. A minimum of 108 quarter hours credit beyond the Bachelor's degree, exclusive of credit for the Master's thesis. These shall include a minimum of 36 quarter hours credit in Doctoral Research and Dissertation and a minimum of 72 quarter hours credit in other courses.

2. A minimum of 36 quarter hours in engineering graduate courses, exclusive of thesis and dissertation credit. These courses will normally be numbered 5000 and above, with at least 12 quarter hours of 6000-level courses, which constitute one or two areas of concentration selected by the student. The number of courses in this group to be taken will depend on the program selected by the student and the approval of his/her advisory committee.

3. A minimum of 18 quarter hours in mathematics or computer science in courses numbered 4000 and above, exclusive of a first course in ordinary differential equations.

4. A minimum of 9 quarter hours of courses numbered 5000 and above, offered in departments other than mathematics, computer science, and the student's major department and which are not included in the areas of concentration under item 2.

5. Active participation in graduate seminars and colloquia.

6. Two doctoral examinations must be passed to be admitted to candidacy for the Ph.D. in Engineering Science.

After being admitted as a potential candidate for the Ph.D., a qualifying examination must be taken at the first offering after the student has either completed a Master's degree or completed 36 quarter hours of graduate credit. The purposes of qualifying examination are:

(a) To determine the qualifications of the student to continue the Ph.D. program, and
(b) To identify the areas of strengths and weaknesses to guide the student's graduate course work and research.

The qualifying examination will be administered by the department's Graduate Studies Committee. The examination will be written and/or cover at least four graduate level subject areas. One of the subject areas will be mathematics, and the others will be designated by the student subject to the approval of the department's Graduate Studies Committee.

The comprehensive examination is to be taken by students within 6 credit hours of completion of graduate course work required for the Ph.D. degree. This examination is to be administered by the student's advisory committee and must consist of both a written and oral portion.

7. After successfully passing the qualifying and comprehensive examinations, the student must prepare the Ph.D. dissertation research proposal to the student's advisory committee and receive committee approval of the proposal before being admitted to candidacy for the Ph.D.

8. A final examination on the student's dissertation and related fields will be taken by the student after completion of the Ph.D. dissertation and course requirements.


3410 Introduction to Biomedical Engineering (4) Designed to introduce the facets and opportunities of biomedical engineering, and to provide basic terminology and background knowledge for further courses in the field. Subjects include anatomy, physiology, biomedical, mathematical models of body systems. Coreq: Basic Engineering 3240 or consent of instructor.

3420 Introduction to Clinical Engineering (3) Applications in clinical/hospital setting: description, analysis, and design of health care delivery systems; hospital organization and structure, clinical use of biomedical equipment; principles of safety engineering in the hospital and applicable codes, standards and regulations. Prereq: 3410, Physics 2320, or consent of instructor.

3700 Dynamics (4) Kinematics of rigid bodies; mass moments of inertia; friction; principle of rigid bodies using force, mass, acceleration; work-energy, impulse-momentum. Not for departmental graduate credit. Prereq: 2705 or Basic Engineering 1320, Mathematics 2840.

3710 Intermediate Dynamics (3) Three-dimensional dynamics of particles and rigid bodies: dynamics of bodies with varying mass; central force motion; Lagrange's equations. Prereq: 3700, Mathematics 2850.

4020 Computer-Aided Design (3) Use of computer graphics and analysis programs for design of selected systems, structures, and components. Evaluation of design alternatives. Prereq: 3700, 3710.

4520 Biomedical Fluid Mechanics (3) Discusses objectives, review foundations and present developments in biomedical and fluid mechanics. Properties of human blood and blood vessels of circulatory system, mechanical circulation. Applications to areas of hemodynamics, thrombus, and fluid dynamics of heart assist devices. Prereq: 4500 or a course in fluid mechanics or consent of instructor.

4539 Biomechanics (3) Discusses objectives, review foundations and present developments in areas of mechanical properties of living tissues, biomechanics of injury and prosthesis, material compatibility of prosthetic devices and biomechanical problems related to impact. Prereq: 3311 or 4500 or consent of instructor.

4540 Fracture-Safe Design (3) A critical review of mechanical properties of materials that are indicative of fracture resistance, including transition temperature, R-curves, stress intensity factors, and J-integral. Use of the use of design charts. Prereq: 3310 and Metallurgical Engineering 2110. (Same as Metallurgical Engineering 4540.) 3 hrs or 2 hrs and 1 lab.

4580 Principles of Nondestructive Testing (3) (Same as Physics 4580.)

4590 Magnetic Induction Phenomena (3) (Same as Physics 4590.) Physics is the primary department.

4610 Experimental Stress Analysis (3) Basic concepts; theory, techniques, and instrumentation of resistance strain gages; theory and techniques of brittle coating method; introduction to other stress analysis methods. Prereq: 3310, Electrical Engineering 2020 or 3110. 2 hrs and a 3-hr lab.

4620 Dynamic Data Acquisition (4) Instrumentation of measuring systems for dynamic events and responses; signal conditioning; oscillographs, oscilloscopes, magnetic tape recording; telemetry and data transmission; data processing. Prereq: 3311, 4710, Electrical Engineering 3120. 3 hrs and a 3-hr lab.

4630 Introductory Photomechanics (3) Introduction to photoelasticity, photoelastic coating method. Moire method; interferometers, stress and strain gages. Prereq: 3310, Physics 2320. 2 hrs and a 3-hr lab.

4670 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 fundamental physical laws and mathematical methods of analysis with emphasis on application to realistic engineering problems. Prereq: 3110, 3311, and Mathematics 3150.

4850 Elementary Structural Matrix Methods (4) (Same as Architecture 4850 and Civil Engineering 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 (115) P/NP only. E

5002 Non-Thesis Graduation Completion (3-15) Required for the non-thesis student not otherwise registered during any quarter when such a student uses university facilities. The credit of degree is completed. May not be used toward degree requirements. May be repeated. S/JC only. E
5110-20 Fluid Dynamics (3, 3) Kinematic, transport and momentum equations; fluid flow in channels and pipes; development of rate deformation laws; mass, momentum and energy conservation relationships; non-dimensional numbers; the Navier-Stokes equations; exact solutions, potential flow and boundary layer approximations, coupled heat transfer models; discussion of numerical methods. Must be taken in sequence. Prereq: 5800.


5250 Introduction to Finite Element Structural Analysis (3) Finite element analysis techniques for structural mechanics and elasticity. Two and three-dimensional forms of interpolation, shape functions and numerical quadrature. Equation solving, substructuring, skyline solvers, matrix iteration techniques. Applications to plates and shells, including use of representative computer programs. Prereq: ESM 5200.

5310-20-30 Advanced Mechanics of Materials (3, 3, 3) Advanced topics in mechanics of materials: three-dimensional transformations for stress and strain, unsymmetrical bending, composite materials, thick wall pressure vessels, beams on elastic foundation, beam columns, introduction to elementary theory of elasticity. Must be taken in sequence. Prereq: 5320.


5410-20 Theory of Elasticity (3, 3) Equations of equilibrium; strain-displacement relations, compatibility. Concepts of equilibrium and compatibility in three dimensions. Applications: prismatic bars, disks, thick-walled tubes, plates with holes; stress concentration; elasticity and composite, spatial stress functions, plane stress and plane strain in rectangular and polar coordinates. Must be taken in sequence. Prereq: 5800.

5440 Theory of Linear Viscoelasticity (3) Viscoelastic constitutive relations; isothermal boundary value problems, wave propagation in viscoelastic materials; stability problems; determination of viscoelastic properties. Prereq: 5800.


5510 Advanced Biomechanics (3) Terminology, physiology, and analytical methods for mechanics of living tissue. Continuum mechanics analysis of living tissue and of hard and soft tissue, biological fluid flows. Flow properties of blood, rheology of blood in micro vessels; bioviscoelasticity of fluids and solids, mechanical properties of blood vessels; skeletal, heart and smooth muscle; bone and cartilage. Research paper. Prereq: 5800.

5610 Photoelasticity (3) Polarized light; basic principles of photoelasticity; experimental techniques and equipment. Application of photoelastic stress analysis; three-dimensional photoelasticity; application. Prereq: Mathematics 4610.

5710-20 Advanced Dynamics (3, 5) Kinematics and dynamics of particle motion in three dimensions. Rotating coordinate systems; Lagrange's equations, kinematics and dynamics of rigid bodies; Hamilton's principle. Engineering applications of perturbation theory; contact transformation; Poisson and Lagrange's equations. Must be taken in sequence. Prereq: 3710, 4710, Mathematics 4610.


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.

5755 Advanced Engineering Acoustics (3) Theory and application of acoustic analysis; vibration of continuous systems, plane waves, transmission phenomena, spherical acoustic waves. Applications: resonators, filters, absorption mechanisms, microphones, ultrasonics, sonar transducers; speech and hearing, architectural acoustics. Prereq: 4710 or 4780.

5800 Introduction to Continuum Mechanics (3) Cartesian tensors; basic continuum mechanics concepts; stress and strain, deformation, Conservation laws for mass, momentum, energy, and potential fields. Applications in solid and fluid mechanics. Prereq: Bachelor's degree in science or engineering.

5810 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, buckling, vibrations, and dynamics. Prereq: BS in engineering or consent of instructor.


5910 Special Topics in Engineering Mechanics (3) Mechanics problems related to recent developments. Prereq: Consent of instructor. May be repeated with consent of department.

5915 Measurement Science I (3) (Same as Nuclear Engineering 5915.)

5925 Measurement Science II (3) (Same as Nuclear Engineering 5925.)

5935 Measurement Science III (3) (Same as Nuclear Engineering 5935.)

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

6110-20 Advanced Topics in Fluid Mechanics and Convective Transfer (3, 3) Advanced topics in convective momentum, heat and mass transfer, advanced boundary layer analysis, stability, transient, turbulence, closure models; Navier-Stokes equations, closure procedures including time- and volume-averaging, large scale structures, high speed flow, reacting, non-reacting, excitation, ionization. Applications in propulsion, lasers, aerodynamics. Must be taken in sequence. Prereq: 5120.


6210-20-35 Advanced Topics in Computational Fluid Dynamics (3, 3, 3) Advanced topics in computational fluid mechanics using modern concepts in approximation theory; theoretical analysis of accuracy, convergence, stability for smooth and non-smooth solutions including shocks; two and three-dimensional, compressible viscous and inviscid flows; Euler and complete Navier-Stokes descriptions; mixed subsonic-supersonic flows. Various algorithm construction, flow generation and solution, approximate factorization, flux vector splitting, finite volume, generalized coordinates and adaptive grids; steady flows including second-order turbulence closure. Thin layer and parabolic Navier-Stokes equations; multi-dimensional, turbulent and reacting flows, Computer projects. Must be taken in sequence. Prereq: 5230.

6310 Theory of Plates (3) Classical theory of bending plates of various shapes; thick plate; plates of variable thickness; buckling and large deflection problems. Prereq: 3710.

6320 Analysis and Design of Thin Shell Structures (3) Geometry of surfaces, derivation of thin shell theory for arbitrary shell geometry; selected applications of theory in structural engineering. Prereq: 5510 or Civil Engineering 5160.


6410 Theory of Elastic Stability (3) Practical stability methods and applications to conservative and non-conservative systems. Methods of adjacent equilibrium, incremental and variational principles. Problems in perfect plastic solids; finite plastic deformations; piecewise linear plasticity. Applications. Prereq: 5340.

6610 Advanced Photoelasticity (3) Scattered light three-dimensional photoelasticity; dynamic photoelasticity; photoplasticity and photoviscoelasticity, holographic-photoelasticity. Recent developments. Prereq: 5610.

6910 Special Topics in Engineering Mechanics (3) Advanced problems of interest in mechanics, worked either as group or individually. Prereq: Consent of instructor. May be re-scheduled with consent of department.

NOTE: not all of the above courses will be offered in any one year.
emphasizes engineering design and professional practice common to industrial manufacturing.

Bachelor of Science in Industrial Engineering

- Requires 18 hours of course work in an industrial engineering core, 9 hours of technical electives, 9 hours of industrial engineering design electives, and 9-hour thesis or design project.

The Master of Science Program

A graduate program leading to the degree of Master of Science is open to graduates of an A.B.E.T.-accredited undergraduate curriculum in industrial engineering or to graduates of other technical curriculum who have an approved list of prerequisite courses. 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, engineering management, manufacturing and production systems, human factors engineering, information systems, and reliability and quality control, and traditional industrial engineering. Either one of 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 culminating year in a five-year baccalaureate-master program which emphasizes engineering design and professional practice. Admission requirements include those presented above plus the requirement of a Bachelor's degree from an A.B.E.T.-accredited industrial engineering program. This 45-hour program consists of 30 hours of coursework in an industrial engineering core, 9 hours of technical methods electives, 9 hours of industrial engineering design electives, and 9-hour thesis or design project.

Any 4000-level course required in the Bachelor of Science in Industrial Engineering program at The University of Tennessee may not be used for graduate credit in the M.S. or M.E. graduate program in Industrial Engineering.


4060 Production Systems Planning and Control I (3) Theory and applications of forecasting, capacity and materials planning, production systems design and inventory control. Prereq: 3010-20. Not available for graduate credit for industrial engineering students.

4070 Production Systems Planning and Control II (3) Theory and application of master scheduling. Materials requirements planning systems, lot sizing and safety stock, distribution requirements planning. Prereq: 4060.

4080 Forecasting Methods in Industrial Engineering (3) Application of technological forecasting techniques to industrial engineering problems. Includes moving averages and exponential smoothing, linear and polynomial regression models, autocorrelated timeseries analysis. Prereq: 3070 and other selected industrial forecasting methods. Prereq: 4080.

1150 Project Control with CPM and PERT (3) A study of project planning and control based primarily on "critical path" techniques, including resource allocation, time-cost tradeoff algorithms, and computer programs. Prereq: 3430.


2200 Production Facilities Design (4) Plant layout, service areas, inventory control application, and operating procedures design. Prereq: 3630, 3510-20, 4060, 4520.

2230 Scheduling Systems (3) Performance measures for job shop and flow shop scheduling, including both static and dynamic conditions, as well as techniques for generating scheduling schedules. Deterministic and probabilistic dispatching conditions. Prereq: 3520.

2450 Work Measurement Applications (3) Application of learning curves, queuing theory, standard data and incentive systems to the design of industrial work situations.

2520 Engineering Economy (3) Methods and problems in selection or replacement of equipment. Decisions among engineering alternatives, including capital recovery, economic life of equipment, and rate of return on investment. Not available for graduate credit for industrial engineering students.

4210 Case Studies in Engineering Economy (3) Extensive use of engineering economy principles to actual problems faced by competitive firms and regulated industries. Case studies taken from literature for basic discussion. Each class assignment is made which involves working with local companies to evaluate make or buy options, leasing versus cash purchases, equipment replacement studies, energy source economies. Prereq: 4520.

4590 Simulation (3) Generation of outcome of complex random process by computer. Models of complex systems using available simulation languages. Simulation as design tool in industrial systems. Prereq: 3430 and Computer Science 3150.

4600 Determined Time Systems (3) Work design and measurement using predetermined time system; method timing, basic motion time study, or work factor. Theory and application. Prereq: 3630.

4610 Human Factors in Work Design II (3) Human capabilities and limitations affecting work pace layout, work environment, design of tools and equipment, and communications and response in the human-machine systems. Prereq: 3600, 3630, or consent of instructor.

4830 Health Systems Engineering (3) Hospital management systems and means by which they may be improved through application of modern industrial engineering principles and techniques.

4870 Mini-Computer Applications in Industrial Engineering (3) Introduction to computer hardware and human-computer interfaces, emphasis on small computers as element of larger system; applications and limitations of small computers in solving industrial engineering problems. Prereq: Senior standing.

4910-20-30 Special Industrial Engineering Topics (3, 3, 3) Prereq: Consent of instructor. May be repeated.

4950 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) PrN only. E

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

5100 Advanced Work Design Applications (3) Advanced work methods analysis, design and improvement of work systems, human factors, use of learning curves, queuing theory and wage incentive systems. Prereq: 3630, Statistics 3450.

5110 Industrial Engineering Methods and Control Techniques (3) Management control systems through IE techniques. Quantitative and qualitative systems: mathematical analysis, forecasting, inventory systems, wage and salary development, and production and inventory control. System development and application. Prereq: 4060. Not for credit for students with a fourth undergraduate degree in Industrial Engineering.


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 facilities. Prereq: Production facilities planning or consent of instructor.


5260 Information Systems Design (3) Systems engineering approach to information systems design. System model, analysis, and evaluation of information systems. Information objectives and design criteria. Optimization and simulation in system design.

5280 Production and Inventory Systems (3) Application of computer technology and inventory systems. Closed form solutions, search techniques, and use of available computer codes. Prereq: 5700, Coreq: 5710.

5301 Accounting for Engineers Managers (3) The underlying philosophical and structural framework of accounting is reviewed from the perspective of cost control and economic analysis. Emphasis is placed on the costing structure and the implications of this structure for the engineering manager. The course provides an understanding of traditional financial statements and the relationships among the controlling elements in engineering decision making, knowledge of the computerized accounting data base, and the use of accounting systems in cost estimating.

5302 Structure, Organization, and Control of the Enterprise (3) Explores the relationship between organizational structure, behavior and productivity. The impact of organizational size, technology, external environment, and age on structure and productivity are included. Characteristics of a bureaucracy, its appropriation, and structure are presented. Emphasis is placed on the controlling elements in engineering decision making, knowledge of the computerized accounting data base, and the use of accounting systems in cost estimating.

5303 Analysis and Control of Product Distribution (3) Theories, principles, methods, and tools for analyzing marketing and distributing technological products and services. The impact of rapidly changing technology on traditional
5304 Motivation and Supervision for Engineering Management (3) Explores the relationship between motivational forces and productivity in high technology environments. Includes techniques and tools of managerial and engineering management applied to technical organizations. Prereq: permission of instructor. May be repeated. Maximum 3 hrs. S/NC only.

5305 Productivity and Quality Engineering (3) Productivity and quality measurement systems are related and analyzed using linear models and multivariable systems. Emphasis is on the development of management systems which promote or inhibit productivity or quality improvements are examined.

5306 Theory and Practice of Engineering Management I (3) A comparison of classical management principles and theory with the environment, needs, and practices of research and development and other scientific organizations. Cases are used to illustrate contemporary problems and environments. Emphasis is on developing a management style which meets organizational and technical demands through highly trained subordinates.

5307 Theory and Practice of Engineering Management II (3) Explores the topics of engineering management presented in management I. Emphasis is placed on integrating theory with practice.

5308 Organizational Behavior & Managerial Decisions (3) Theories of individual and group behavior and their applications to managerial decision making processes. Understanding the role of various "people" categories and the managerial decision making processes in the normal mode are established. Case studies are used to illustrate the behaviors and organizational behavior and to suggest corrective action.

5309 Project Management (3) The management and control of multifaceted engineering and technological projects. Includes coordination and interactions between client and various service organizations. Topics covered include the selection of project managers and project management teams, planning, organizing, and scheduling the projects, evaluating project progress and management, typical problems associated with various phases of the project. Case studies are utilized to illustrate theories and concepts.


5540 Industrial Development (3) Factors other than mechanical or chemical which enter into successful establishment of manufacturing enterprise. Cost and location studies and market analysis to determine the correctness of the project. Prereq: permission of instructor. May be repeated. Maximum 3 hrs. S/NC only.

5600 Human Factors Engineering (3) Human characteristics which influence design of tools, equipment, environments, and products. Modeling of human activity as a system or process controller. Prereq: Consent of instructor.

5610 Human Factors Engineering III (3) Human operator, performance characteristics, and environmental requirements. Formal description of human operators' transfer characteristics through queueing models and describing operator as information processor. Prereq: 5600.

5700 Optimization Methods in Industrial Engineering (3) Operations research. Analytical techniques required in 5710, 5720, and 5730, Classic optimization theory, N-dimension geometry and calculus of variations, selected areas of operations research. Prereq: Computer Science 3150 and matrix algebra.

5701 Operations Research Applications (3) Survey of operations research techniques with emphasis on application to industrial engineering problems. Prereq: Mathematics 2860 (or equivalent), Statistics 3450, computer programming. Available for credit only to students without a B.S. degree in industrial engineering.


5720 Queuing Models and Simulation (3) Theory and application of various queuing models and simulation methods employed to evaluate complete queueing systems. Data analysis and hypothesis testing related to pertinent waiting line probability density functions. Prereq: 5700, 5360.

5730 Game Theory and Random Processes (3) Operations research including game theory with applications to decision making in competitive environment, and random processes, both continuous and discrete in nature. Theory of decision processes, optimal inventory, machine, and decision making. Prereq: 5360.

5830 Health Systems Engineering II (3) Health systems for analysis, control, and improvement of function and total health system. Prereq: 4830.


5900 Design Project (1-9) Design problem and models and simulation methods are used to develop design project result in nonthesis program. Enrollment limited to industrial engineering students in non-thesis program. May be repeated. Maximum 9 hrs. S/NC only.

5910-20-30 Special Topics in Industrial Engineering (3) Special topics in industrial engineering. Prereq: permission of instructor. May be repeated. Maximum 3, 3, 3 hrs. S/NC only.

6700 Nonlinear Programming (3) Optimization techniques for problems in systems which are dynamic and behave nonlinearly subject to various constraints. Applying optimization theory to solve nonlinear optimization problems. Variable metric methods, search methods, constrained nonlinear programming, and penalty function methods. Prereq: 5700.


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.

Materials Science and Engineering

MAJOR

DEGREES

Metallurgical Engineering

M.S., Ph.D.

Polymer Engineering

M.S., Ph.D.

Professors:
J. E. Sproul (Head), Ph.D. Tennessee; D. C. Bogue, Ph.D. Delaware; B. S. Boneh, Ph.D. Massachusetts Institute of Technology; H. J. Green, Ph.D. Tennessee; R. Brooks, Ph.D. Tennessee; R. A. Buchanan, Ph.D. Stanford; V. Vardell, Ph.D. California (Berkley); D. A. Canonic, Ph.D. Lehigh; J. F. Fellers, Ph.D. Akron; J. L. S. Lin, Ph.D. Kansas; C. D. Lucas, Ph.D. Illinois; J. R. Heitger, Ph.D. Polytechnic Institute; C. J. McLaughie, Ph.D. Kentucky; J. K. Mackenacker, Ph.D. Cornell; B. F. Oliver, Ph.D. Pennsylvania State; P. J. Phillips, Ph.D. Newark, New Jersey; E. E. Stansbury, (Emeritus), Ph.D. Cincinnati.

Associate Professors:
W. G. Becker, Ph.D. Illinois; J. Bentley, Ph.D. University of Salford (England); C. G. Brown, Ph.D. Virginia; D. M. Kroger, Ph.D. Vanderbilt; W. J. Lackey, Ph.D. North Carolina State; C. T. Liu, Ph.D. Brown University; A. J. Pedraza, Ph.D. National University (Argentina); C. L. White, Ph.D. Michigan Tech. University.

Lecturer: George D. Wignall, Ph.D. Sheffield (England).

Graduate programs are offered leading to the degrees of Master of Science and Doctor of Philosophy in Metallurgical Engineering or Polymer Engineering.

THE MASTER'S PROGRAM

Minimum departmental requirements include the satisfactory completion of:

1. A major consisting of 24 quarter hours of graduate courses in metallurgical engineering or polymer engineering. The Polymer engineering major must include Polymer Engineering 5110, 5230, 5310, 5430, and 5120.

2. One or two minors or collateral work, 9 to 18 hours total in engineering, chemistry, mathematics, physics, or other related fields. All course work offered for the Master of Science degree is subject to the approval of the student's faculty committee.


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 papers, and graduate courses.

THE DOCTORAL PROGRAM

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

Departmental requirements consist essentially of the satisfactory completion of:
1. Graduate courses in materials science and engineering, metallurgical engineering, or polymer engineering amounting to approximately 36 quarter hours, at least 12 of which must be in 600 series courses. The polymer engineering major must include Polymer Engineering 5110, 5210, 5230, 5310, 5420, and Chemistry 5140.
2. Supporting courses in related scientific and engineering fields amounting to approximately 36 quarter hours, subject to approval by the student's faculty committee. These related fields will normally include chemistry, mathematics, physics, and engineering.
3. The comprehensive examination, usually given in two parts, and covering such topics as materials science and engineering, metallurgical or polymer engineering operations and processes, thermodynamics, technology, mathematics, physics, chemistry, and other related fields.
4. Active participation in graduate seminars conducted by the department. Resident students must register for the appropriate 5010 every quarter offered.

PROGRAM AREAS IN MATERIALS SCIENCE AND ENGINEERING

Both the metallurgical and polymer engineering programs are flexible and interdisciplinary in nature. Students may be admitted from a wide range of disciplines; these include physics, chemistry, chemical engineering, mechanical engineering, electrical engineering, materials engineering, and engineering science programs. Prospective students should consult materials science and engineering faculty concerning development of individual special programs compatible with their backgrounds and goals.

Areas of concentration or specialization within the metallurgical engineering program include physical metallurgy of structure-property relations, materials processing, materials joining, materials characterization, failure analysis, and mechanical, physical, and chemical behavior of materials.

Areas of concentration or specialization within the polymer engineering program include rheology and polymer processing, polymer morphology, polymer structure-property relationships, mechanical, physical, and chemical behavior of polymers, and compositor materials.

PROGRAM OPTIONS IN POLYMER SCIENCE AND ENGINEERING

In addition to the polymer engineering program described above, M.S. and Ph.D. degrees with specialization in polymer science and engineering are possible through two joint programs. One program has a process engineering emphasis and is carried out jointly with the Chemical Engineering Department. The second program is joint with the Chemistry Department and has a chemistry emphasis.

The specialization program with the Chemical Engineering Department requires, for the M.S., 4200, and a thesis in the field, completion of Polymer Engineering 4910, 5110, 5310, 5420, and either 5230 or 5430 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. students in the joint specialization program with the chemistry department require a thesis or dissertation in the field. Materials science and engineering departmental requirements include completion of Polymer Engineering 4910 and 4920, Chemistry 5531 and 5140, plus active participation in the Polymer Seminar. Ph.D. students must also pass a special written examination as well as complete the above requirements.

UK-TOKYO COOPERATIVE PROGRAM IN POLYMER ENGINEERING

The UK-Tokyo Program provides a means for Japanese research professors to teach part-time in the graduate program, and provides a joint Japanese-US program for the admission of Japanese students into the polymer engineering graduate program. A faculty of committee from Japanese universities make recommendations for students and a UK committee acts on them.

Materials Science and Engineering

3110 Engineering Materials I (4) Introductory course correlating the atomic, crystal, and microstructure of solids with mechanical, physical, and chemical properties of engineering significance. 3 hrs and 1 lab.

3120 Engineering Materials II (3) Extension of 2110 with emphasis on control of mechanical properties of materials by specification of composition, thermal, and mechanical treatment; correlation of resultant properties with service performance. Suggested for mechanical, civil and industrial engineering students.

3130 Engineering Materials III (3) Extension of 2110 with emphasis on control of electrical and magnetic properties of materials by specification of composition, thermal, and mechanical treatment; correlation of resultant properties with service performance. Suggested for electrical engineering students.

3140 Engineering Materials IV (3) Extension of 2110 with emphasis on materials processing, specification, and evaluation. Suggested for mechanical and industrial engineering students.


3160 Engineering Materials VI (3) Extension of 2110 or 2030 with emphasis on materials of significance in nuclear engineering, nuclear reactor construction materials, nuclear fuel materials, and interaction of radiation with solids to produce changes in engineering properties. Suggested for nuclear and mechanical engineering.

3170 Engineering Materials VII (3) Extension of 2110 to biomedical applications of materials. Engineering materials in biomedical applications; metals, polymers, and ceramics; prosthetic devices; dental applications; corrosion problems; failure analysis; fabrication. Prereq: 2110 or equivalent.

4510 X-Ray Diffraction and Its Applications (4) Lectures and laboratory work in the basic principles and applications of X-ray diffraction theory, powder technique, precision lattice constants, chemical analysis and phase identification, preferred orientation. 3 hrs and 1 lab.

Metallurgical Engineering

3050 Production Metallurgy (3) Roasting, smelting, and refining. Gas liquid equilibria, slag-metal processes and solution behavior, correlation with phase constitution, kinetics of reactions, rate laws, activated complex theory, adsorption and catalysis and applications. Prereq: 3040, Chemical Engineering 3410 and 3420 or equivalent. 3 hrs and 1 lab.


3220 Diffusion and Annealing (3) Introduction to solid state kinetics; point defects, solid solutions, diffusion equations and mechanisms, annealing of cold worked structures. Prereq: Mathematics 2640.

3310 Biomedical Applications of Materials for Life Scientists (3) Principles of engineering materials; metals, polymers, and ceramics; methods of fabrication of components; corrosion; applications of prosthetic devices and dental materials. Prereq: Chemistry 1110-20 or equivalent.

3520 Materials Behavior and Chemical Process Equipment Design (3) Mechanical, metallurgical and chemical considerations in design of chemical processing equipment. Prereq: Materials Engineering 2030 or equivalent; 3150; and Chemical Engineering 3420.

3710 Metallurgical Applications in Manufacturing Technology (3) Fabrication methods and principles of mechanical/thermal processing for finished and semifinished articles: casting, powder metallurgy, plastic forming, joining, heat treatment. Prereq: 2110 or equivalent.

4240 Engineering Materials Design (3) Property control through composition, microstructure, heat treatment and transformation in ferrous alloys. Plain carbon steels, alloy steels, and tool steel processing for property selection and service requirements. Prereq: 3230 or consent of instructor.

4250 Design and Analysis (3) Design and laboratory sessions on analysis of materials, requirements and performance in engineering structures and components. Prereq: Senior standing.

4540 Fracture-Safe Design (3) (Same as Engineering Science and Mechanics 4540)

4730 Mechanical Metallurgy I (4) Elastic behavior; description of stress, strain, and stress-strain relations; plane stress vs. plane strain loading; failure by yielding; stress concentration and notch sensitivity; ductile fracture; brittle fracture due to geometry and loading rate. Prereq: First course in Materials Science and Engineering Science and Mechanics 3311. Also suggested for mechanical engineering and engineering science students.

4740 Mechanical Metallurgy II (4) Brittle fracture due to metallurgical and environmental factors; fatigue, residual stresses; creep and stress rupture; effect of microstructure; finite plastic strain and plastic-stress strain relations; fabrication by forging rolling deep drawing; formability testing. Prereq: 4730 or Mechanical Engineering 3850 and first course in Materials Science or consent of instructor. Suggested for engineering science and mechanical engineering students.

4760 Casting and Welding (3) Principles and processes of casting and welding; heat transfer, solidification, segregation, gas-metal and slag-metal interaction, thermal treatments, associated stresses. Prereq: 3120 or 3230. 3 hrs and 1 lab.

5000 Thesis (1-15) P.N.P only. E.

5010 Graduate Seminar (1) Prereq: Admission to graduate program. May be repeated. S, N.C. Only. E.

5050 Engineering analysis (3) (Same as Chemical Engineering 5050).

5110 Dissolutions (3) Theoretical and experimental analysis of line defects and their interactions in solids. Prereq: 4730 or consent of instructor.

5120 Plastic Deformation (3) Geometry and mecha-
nisms of plastic deformation of single crystals; slip and twinning; working hardening; effects of temperature and alloying on short-term loading. Prereq: 5110.

5140 Diffusion in Solids (3) Theory and experimental analysis of transport of atoms and molecules in solids. Prerequisite: 5110.

5150 Plastic Deformation I (3) Plastic deformation of polycrystalline materials; theoretical and experimental analysis of texture formation resulting from deformation and annealing. Prereq: 5120.

5150 Polycrystalline Materials; theoretical and experimental analysis of texture formation resulting from deformation and annealing of point defects.

5150 Phase Transformations I (3) Thermodynamic considerations of driving force and interface formation in phase transformations. Prerequisite: 5130.

5150 Polycrystalline Materials; theoretical and experimental analysis of texture formation resulting from deformation and annealing of point defects.

5150 Phase Transformations I (3) Thermodynamic considerations of driving force and interface formation in phase transformations. Prerequisite: 5130.

5150 Polycrystalline Materials; theoretical and experimental analysis of texture formation resulting from deformation and annealing of point defects.

Polarization in one- and two-component systems. Classical experimental observations relating to phenomena of plastic deformation of single crystals; slip and twinning; working hardening; effects of temperature and alloying on short-term loading. Prereq: 5110.

5150 Polycrystalline Materials; theoretical and experimental analysis of texture formation resulting from deformation and annealing of point defects.

5150 Phase Transformations I (3) Thermodynamic considerations of driving force and interface formation in phase transformations. Prerequisite: 5130.

5150 Polycrystalline Materials; theoretical and experimental analysis of texture formation resulting from deformation and annealing of point defects.

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5150 Phase Transformations I (3) Thermodynamic considerations of driving force and interface formation in phase transformations. Prerequisite: 5130.

5150 Polycrystalline Materials; theoretical and experimental analysis of texture formation resulting from deformation and annealing of point defects.
Mechanical and Aerospace Engineering

MAJORS

Aerospace Engineering  M.E., M.S., Ph.D.
Mechanical Engineering  M.E., M.S., Ph.D.

Professors:


Associate Professors:


Assistant Professor:

P. E. George II*, Ph.D. Purdue, M. Keyhani, Ph.D. Ohio State.

Space Institute, Tullahoma.

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, flight mechanics, aeroacoustic, stress analysis, propulsion, heat transfer and fluid mechanics, and thermodynamics. In addition to the general policies and requirements of The Graduate School, each student must satisfactorily complete a program of work which has been approved by the student's committee. Specific program requirements are given below.

MAJOR OF ENGINEERING PROGRAMS

Entrance into the Master of Engineering program is restricted to qualified graduates of A.B.E.T.-accredited undergraduate curricula in mechanical or aerospace engineering. At least one-third of the program of study must be classified as engineering design. The student's advisor will assist in planning the program of study to ensure that it includes the necessary design content.

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 who satisfy the necessary prerequisites.

MASTER'S PROGRAM OPTIONS

Three program options are available:

Thesis Option: The requirements of this option are that the student must satisfactorily complete a program of study that includes:

1. A minimum of 36 quarter hours of course work which includes at least 18 quarter hours of graduate (5000-level or above) courses in mechanical and/or aerospace engineering and normally 9 quarter hours of course work (4000-level or above) in mathematics.
2. A minimum of 9 quarter hours of credit in the thesis.
3. Participation in the departmental seminar programs.
4. Submission and defense of a written thesis which demonstrates the ability to conduct and report on an independent investigation.
5. Passing a final examination on all work submitted for the degree.

Course Option: This option is restricted to those students who have had the equivalent of a thesis experience. The evaluation of the work experience and the final selection of the student's program of study are left to the student's committee. The requirements of this option are that the student must satisfactorily complete a program of study that includes:

1. A minimum of 45 quarter hours of course work which includes at least 27 quarter hours of graduate (5000-level or above) courses in mechanical and/or aerospace engineering and normally 9 quarter hours of course work (4000-level or above) in mathematics. No more than 3 quarter hours of engineering course work may be below the 5000 level.
2. Participation in the departmental seminar programs.
3. Passing a comprehensive written final examination on all course work submitted for the degree. The student's committee will be of sufficient size to include all the study areas reflected in the course program.

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 programs.
4. Passing a comprehensive written final examination on all course work submitted for the degree and an oral examination on all work (including problems) submitted for the degree.

THE DOCTORAL PROGRAM

Admission into the doctoral program will be granted to those applicants who have demonstrated superior achievement in their engineering backgrounds. The student must satisfactorily complete an approved program of study which normally includes:

1. A minimum of 72 quarter hours credit beyond the Bachelor's degree, exclusive of credit for the M.S. thesis or problems.
2. A minimum of 36 quarter hours of credit in doctoral dissertation.
3. A minimum of 18 quarter hours in mathematics in courses numbered 4000 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

3110 Applied Engineering Thermodynamics (3) Energy and laws governing energy transformations; thermodynamic properties; applications to engineering problems.

3311 Engineering Thermodynamics (3) Energy and laws governing energy transformations; thermodynamic properties.

3330 Engineering Thermodynamics (3) Properties of gasses and mixtures; chemical reactions; equilibrium; applications to mechanical engineering problems.

3410 Fluid Flow (3) Development of continuity, momentum and energy principles for fluid systems; applications of mechanical and aerospace engineering problems.

3440 Heat Transfer (3) Heat transfer processes, heat conduction, thermal radiation.
University of Tennessee, Knoxville. May be repeated. S/NC only.

5990 Special Topics in Mechanical Engineering (1-3) May be repeated.

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

6110-20 Advanced Topics in Fluid Mechanics and Heat Transfer (3-3) Advanced theory and application 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. May be repeated. Maximum 9 hrs per course.

6130-40 Advanced Radiation Heat Transfer (3, 3) Radiation heat transfer in absorbing, emitting and scattering media; interaction of thermal radiation with conduction and convection heat transfer; radiation heat transfer in hypersonic flow; radiation characteristics of luminous flames and nonequilibrium gases; scattering by planetary atmosphere. Prereq: 5110-20-30; Mathematics 4550.

6210-20 Advanced Topics in Solid Mechanics, Systems and Controls (3, 3) Advanced theory and applications in solid mechanics, controls, and mechanical systems of interest in mechanical engineering. May be repeated. Prereq: Consent of instructor.

6420 Selected Topics in Thermodynamics (3) Comparison of macroscopic and microscopic approach; equilibrium of pure substance; metastable states. Prereq: Consent of instructor.

6500 Thesis (1-15) P/NP only. E

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

5110 Fundamentals of Aerodynamics (3) Kinematics and dynamics of perfect fluids; potential flow about a body; conformal mapping; hodographs. Prereq: 4220 or Mechanical Engineering 5310, Mathematics 4250.

5120 Experimental Methods in Fluid Mechanics (3) Experimental techniques with laboratory experiments; hot wire anemometry and turbulence measurements, flow visualization, wind tunnel tests (supersonic and subsonic), water table experiments, supersonic flow measurements, boundary-layer measurements. Prereq: 4210-20-30 or Mechanical Engineering 5310.

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 of the several areas of aerospace interest. Prereq: 5210 for 5150; 4240, 5310 or 5410 for 60-70. Consent of instructor.

5110 Fundamentals of Aerodynamics (3) Kinematics and dynamics of perfect fluids; potential flow about a body; conformal mapping; hodographs. Prereq: 4220 or Mechanical Engineering 5310, Mathematics 4250.

5240 Dynamics of Viscous Fluids (3, 3) One-dimensional flow; waves; small-perturbation theory; slender body theory; similarity rules; method of characteristics. Prereq: 4210 for 5210, and 5210 to 5220.

5260 Selected Topics in Aerodynamics (3) Transonic, supersonic, and hypersonic flow theories. May be repeated. Maximum 9 hrs.


5310 Magnetohydrodynamics (3) Electromagnetic field theory; chemical kinetics, thermodynamic and thermophysical properties of gas plasmas; 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: 5220. Recommended: 5240.


5990 Special Topics in Aerospace Science (1-4) University of Tennessee, Knoxville. May be repeated. S/NC only.

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

6110-20 Advanced Topics in Fluid Mechanics and Heat Transfer (3-3) Advanced theory and application 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. May be repeated. Maximum 9 hrs per course.

6130-40 Advanced Radiation Heat Transfer (3, 3) Radiation heat transfer in absorbing, emitting and scattering media; interaction of thermal radiation with conduction and convection heat transfer; radiation heat transfer in hypersonic flow; radiation characteristics of luminous flames and nonequilibrium gases; scattering by planetary atmosphere. Prereq: 5110-20-30; Mathematics 4550.

6210-20 Advanced Topics in Solid Mechanics, Systems and Controls (3, 3) Advanced theory and applications in solid mechanics, controls, and mechanical systems of interest in mechanical engineering. May be repeated. Prereq: Consent of instructor.

6420 Selected Topics in Thermodynamics (3) Comparison of macroscopic and microscopic approach; equilibrium of pure substance; metastable states. Prereq: Consent of instructor.

6500 Thesis (1-15) P/NP only. E

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

5110 Fundamentals of Aerodynamics (3) Kinematics and dynamics of perfect fluids; potential flow about a body; conformal mapping; hodographs. Prereq: 4220 or Mechanical Engineering 5310, Mathematics 4250.

5120 Experimental Methods in Fluid Mechanics (3) Experimental techniques with laboratory experiments; hot wire anemometry and turbulence measurements, flow visualization, wind tunnel tests (supersonic and subsonic), water table experiments, supersonic flow measurements, boundary-layer measurements. Prereq: 4210-20-30 or Mechanical Engineering 5310.

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 of the several areas of aerospace interest. Prereq: 5210 for 5150; 4240, 5310 or 5410 for 60-70. Consent of instructor.

5110 Fundamentals of Aerodynamics (3) Kinematics and dynamics of perfect fluids; potential flow about a body; conformal mapping; hodographs. Prereq: 4220 or Mechanical Engineering 5310, Mathematics 4250.

5240 Dynamics of Viscous Fluids (3, 3) One-dimensional flow; waves; small-perturbation theory; slender body theory; similarity rules; method of characteristics. Prereq: 4210 for 5210, and 5210 to 5220.

5260 Selected Topics in Aerodynamics (3) Transonic, supersonic, and hypersonic flow theories. May be repeated. Maximum 9 hrs.


5310 Magnetohydrodynamics (3) Electromagnetic field theory; chemical kinetics, thermodynamic and thermophysical properties of gas plasmas; 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: 5220. Recommended: 5240.


5990 Special Topics in Aerospace Science (1-4) University of Tennessee, Knoxville. May be repeated. S/NC only.
quarter hour master's thesis must be submitted which demonstrates research or design capabilities.

The student must pass a final examination covering the thesis and graduate course work.

An alternate program is available for the Master of Science degree which involves engineering practice rather than a thesis. The student must complete a program of study which includes the following:

1. Thirty-six quarter hours of course work similar to the requirements for the regular Master of Science program (see above).
2. Twenty-four quarter hours of Nuclear Engineering 5980. A student usually registers for 6 hours of Nuclear Engineering 5980 each quarter and investigates problems assigned by a member of the faculty. At the end of each quarter the student submits a written report and makes an oral presentation of the work.
3. Final examination covering graduate course work and practice school problems.

MASTER OF ENGINEERING PROGRAM

A graduate program in Nuclear Engineering leading to the degree of Master of Engineering is available to those graduates with an accredited engineering degree or one which satisfies A.B.E.T. basic level criteria.

In addition to Graduate School requirements the following degree requirements must be met:

1. Thirty-six quarter hours of course work, 18 of which must be in graduate nuclear engineering.
2. A minimum of 9 hours of design project, thesis, or 24 hours of Nuclear Engineering Practice (5980). Documentary proof of significant engineering experience may be submitted in lieu of the design project, thesis or Nuclear Engineering Practice, but in this case 45 hours of course work are required.
3. Nine hours of course work submitted must be from 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, basics sciences, or engineering sciences.
5. A candidate must pass a final oral examination on all work presented for the degree.

THE DOCTORAL PROGRAM

Students in the field of nuclear engineering desiring to study for the degree of Doctor of Philosophy must have a Bachelor of Science or Master of Science degree from a recognized university, with a major in engineering or physics, and present at least a B average. All candidates will be required to demonstrate general competence in a comprehensive examination in the areas of engineering science, mathematics, and physics. At the same time, all candidates will be required to demonstrate special competence in nuclear design.

Specific course requirements for the Ph.D. degree in Nuclear Engineering include:

1. A minimum of 72 quarter hours credit beyond the Bachelor's degree, exclusive of credit for the M.S. thesis or Nuclear Engineering Practice.
2. A minimum of 36 quarter hours of credit in doctoral research.
3. A minimum of 45 quarter hours in nuclear engineering courses numbered 5000 and above (or the equivalent), with at least 12 quarter hours of new graduate credits. These are exclusive of thesis or dissertation credit.
4. A minimum of 18 quarter hours in mathematics, computer science, or statistics in courses beyond the equivalent of the sophomore year.
5. A minimum of 36 quarter hours in courses numbered 5000 and above from a department other than nuclear engineering.

The choice depends on the student's overall program and should expand his/her knowledge in a given field.

6. A reading knowledge of one foreign language will be determined by the student's doctoral committee.

4110-20-30 Introduction to Nuclear Reactor Theory (3, 3, 3) Nuclear structure: radioactive decay laws, neutron interaction, fission process, chain-reaction systems; diffusion equations including multigroup diffusion theory, neutron moderation; reactivity coefficients; perturbation theory. Prereq: Physics 3730 or consent of instructor. F, W, Sp

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, analog computers; diffusivity 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

4445 Introduction to High Temperature Plasma Physics (3) (Same as Electrical Engineering 4445.) Electrical Engineering is the primary department.

455 Principles of Fusion Reactors (3) (Same as Electrical Engineering 4445.) Electrical Engineering is the primary department.

4465 Introduction to Fusion Technology (3) (Same as Electrical Engineering 4465.) Electrical Engineering is the primary department.


4710 Energy Transport (4) Development of differential and integral energy conservation equations; conduction, convection, and radiation heat transfer; applications to nuclear reactor fuel elements and heat exchangers. Prereq: Electromagnetism 4455.) Electrical Engineering is the primary department.

4720 Reactor Thermal Design (4) Hydrodynamics and heat transfer in boiling systems; boiling crisis; 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: 4190. Sp

4810 Radiation Shielding (3) Types of radiation sources, gamma-ray and neutron attenuation, biological effects of radiation, shield 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; design and protection systems. Prereq: 4110. F

4840 Nuclear Reactor Safety (3) Presentation of reactor safety concepts and criteria; credible accidents; fission product detection 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) P/NC only. E

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

5110-20-30 Transport Processes in Nuclear Engineering (3, 3, 3) Momentum and heat transport; development of conservation equations; elementary engineering (3, 3, 3) Momentum and heat transport; development of conservation equations; elementary

5210 System Dynamics (3) Transient analysis, Laplace transforms, frequent 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 neutronic and non-neutronic processes. Dynamics, stability, control of power reactors and power reactor systems. Prereq: 5210, 4130 or equivalent. W


5310-20-30 Nuclear Systems Reliability (3, 3, 3) Systems reliability analysis as applied to nuclear systems. Qualitative and quantitative methods. Coreq: Statisitics 3450. F; W; Sp

5315 Plasma Diagnostics I (3) (Same as Electrical Engineering 5315.) Electrical Engineering is the primary department.

5325 Plasma Diagnostics II (3) (Same as Electrical Engineering 5325.) Electrical Engineering is the primary department.

5335 Plasma Diagnostics Laboratory (3) (Same as Electrical Engineering 5335.) Electrical Engineering is the primary department.

5410 Nuclear Fuel Cycle Analysis (3) Alternative fuel cycles, symbiotic reactor systems and appropriate reactor systems; resource utilization, potential growth rates and system design considerations. Impact of selecting alternative systems from technical and economical viewpoints. Prereq: 4130 or equivalent. W

5420 Reprocessing and Waste Disposal (3) Basic processes related to solvent extraction of nuclear fuel isotopes and advanced reactor fuels. Disposition of radionuclides: reprocessing, site selection and environmental effects. Prereq: 4130 or equivalent.

5710-20-30 Nuclear Design (3, 3, 3) Analytical techniques for neutronic aspect of nuclear reactor core design. Multigroup discrete ordinate theory, multigroup PN theory, integral transport theory, perturbation theory, and others. Generation of required multigroup constants formulated with available point data and Nordheim treatment in slowing down region and group constants formulated with available point data and neutron, gamma, and space-radiation shielding problems. Natural space radiators, energy source radiators, dose conversion, probability. Selected neutron, gamma, and space-radiation shielding problems. Prereq: Consent of instructor. Sp

5740 Reactor Shielding (3) Application of analytic solutions of Boltzman transport equation to shield design problems. Sources; point sources, discrete ordinates, moments methods; numerical solutions, adjoint calculations, and invariant imbedding cases studied. Prereq: 4810. F


5815 Fundamentals of Fusion Physics and Engineering (3) (Same as Electrical Engineering 5615.) Nuclear Engineering is the primary department.

5820 Plasma Engineering (3) Integration of plasma physics models, fusion engineering design criteria, and fusion technology constraints into design of fusion plasma experiments and reactors. Requirements of fusion reactors; particle, momentum, and energy balance equations; burn dynamics; power balance; fuel cycles; heating and fueling requirements; plasma wall interaction; and simulation of various fusion reactor plasmas. Prereq: 5810. W

5825 Plasma Engineering (3) (Same as Electrical Engineering 5825.) Nuclear Engineering is the primary department.

5830 Fusion Technology (3) (Same as Electrical Engineering 5830.) Nuclear Engineering is the primary department.

5835 Advanced Nuclear Systems (3) Application of fusion reactor design: vacuum and magnetics systems; materials and irradiation; plasma heating, fueling, and impurity control; first wall, blanket, shield, and neutronics; electrical systems; maintenance, environment; and review of major reactor design studies. Prereq: 5820. Sp


5970 Special Topics in Nuclear Engineering (3) Lectures and recitation on recent advances in nuclear engineering. Prereq: Consent of instructor. May be repeated with consent of department.

5980 Nuclear Engineering Practice (3-12) Experiences in solving and reporting on engineering problems. Prereq: Approval of Nuclear Engineering Department. May be repeated. Only Alternative Plan students may take this course. S/NC only. E

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

6110-20-30 Selected Topics in Reactor Theory (3, 3, 3) Transport theory, control rod theory, and perturbation theory. Selected topics from literature. Prereq: Consent of instructor. F, W, Sp

6140 Radiation Shielding (3) Advanced topics in radiation shielding. Monte Carlo techniques and space-radiation problems. Natural space radiators, energy source radiators, dose conversion, probability. Selected neutron, gamma, and space-radiation shielding problems. Prereq: Consent of instructor. Sp

6510 Nuclear Reactor Noise Analysis (3) Modern system theoretical methods for evaluating reactor performance descriptions from operating data. Prereq: 4610 and Electrical Engineering 5740 or equivalent.

6610 Plasma Engineering II (3) Continuation of 5820. Detailed modeling of plasma breakdown, start up, burn dynamics; heating and fueling, plasma wall interactions, disruptions, current drive, and stability and control. Prereq: 5820. F

6820 Fusion Reactor Design (3) Basic plasma performance requirements for fusion power systems; engineering and technological constraints and requirements; integration of physics, engineering, and technological factors to determine fusion reactor parameters. Prereq: 6810. W

6830 Special Topics in Fusion Engineering (3) Selected advanced topics in plasma engineering and fusion reactor engineering and technology. Different subject matter each quarter. May be repeated with consent of department. Prereq: 6820. Sp
College of Human Ecology

Nancy Belck, Dean
Jay Stauss, Associate Dean
Jane Savage, Associate Dean
Karl Weddle, Assistant Dean

Graduate studies in Human Ecology prepare the student for teaching, research and public service in colleges and universities or managerial positions in government, business and industry. Within the College of Human Ecology, the Master of Science degree is offered in Child and Family Studies, Home Economics, Interior Design, Food Science, Food Systems Administration, Nutrition (including Public Health Nutrition), and Textiles and Apparel (see departmental sections for further information); the Doctor of Philosophy is offered with concentrations in Child Development, Family Studies, Food Science, Nutrition Science, and Textiles and Apparel. For additional information, contact Jay Stauss, Associate Dean, College of Human Ecology, The University of Tennessee, Knoxville, TN 37996-1900, Phone: (815) 974-6276.

Admission Requirements: A completed file for review includes a College of Human Ecology application, Graduate Record Examination (GRE) scores for the verbal and quantitative sections and completion of three Graduate School Rating forms by individuals who can attest to your potential for graduate education. Forms may be obtained from the Dean’s office. Interior Design students are required to submit a portfolio of their undergraduate or graduate work consisting of 15-20 slides which represent their best creative accomplishments from a studio experience. The M.S. in Home Economics requires an undergraduate degree in Home Economics.

Academic Common Market: The ACM is an interstate agreement among southern states for sharing academic programs. If you are a resident of one of the participating states and qualify for admission, you may enroll in certain programs on an in-state tuition basis. Potential students for the doctoral program in Human Ecology who are residents of Alabama, Arkansas, Kentucky, Louisiana, Mississippi, South Carolina, Virginia, or West Virginia are eligible. Students planning to enter the Master’s program in Food Systems Administration who are residents of Arkansas, Kentucky, South Carolina, and Kentucky; and students planning to enter Nutrition who are residents of Alabama, Arkansas, Georgia, Kentucky, South Carolina, and Virginia are also eligible for in-state tuition.

THE MASTER’S PROGRAM

The M.S. in Home Economics is a college-wide multi-disciplinary program. Thesis (45 hours) and non-thesis (51 hours) options are offered.

The program includes 6 hours in research methodology, 9-12 hours in program planning and implementation (Agricultural Extension, Home Economics Education, other areas of Education), 3 hours in the integrative nature of home economics, and 18 (thesis) to 30-33 (non-thesis) hours in home economics subject matter. At least one course is to be from each department in the College. A written and oral comprehensive examination is required in the non-thesis option. Other M.S. programs available: Child and Family Studies; Food Science; Food Systems Administration; Nutrition; (including Public Health Nutrition) Textiles and Apparel; and Interior Design (see Department of Instruction for details).

THE DOCTORAL PROGRAM

Graduate study leading to the Doctor of Philosophy Degree is available in the Departments of Child and Family Studies, Nutrition and Food Sciences, and Textiles, Merchandising and Design. A major challenge of the doctoral program in Human Ecology is to draw upon the basic research generated from the natural sciences, social sciences, humanities and the arts, to provide a holistic perspective that contributes to the ultimate aim of improving individual and family well being. For example, the physiological chemist may study metabolic-dietary interrelationships, and psychologists may study child behavior. But, it is within human ecology that the nutrient needs of the growing child are considered, along with the factors that affect the child’s acceptance of different foods. Within the College of Human Ecology, research from one discipline is enhanced by encompassing and utilizing the findings of research from other disciplines. The doctorate is a research degree granted only to individuals who demonstrate proficiency in conducting original research. Course requirements for the degree are determined by the student’s faculty committee, based upon College and departmental requirements and student needs and interests. The Graduate School sets minimum requirements for the doctoral degree (see pages 23-24) and the College has the following minimal requirements:

1. Selection of a concentration and fulfillment of the requirements as directed by the major professor and approved committee.
2. Minimum 117 quarter hours in courses beyond the baccalaureate degree (exclusive of Master’s thesis credits).
4. Minimum 15 quarter hours of 6000 level course work (not including dissertation).
5. Successful completion of written comprehensive examinations as provided by each department’s procedures and the student’s doctoral committee.
6. Original research project, which culminates in a dissertation; maximum 42 quarter hours of dissertation credit may be applied to the degree.
7. Final oral examination in defense of the dissertation. The doctoral committee shall determine whether a reading knowledge of a foreign language is required.

THE PH.D. CONCENTRATIONS

Child Development or Family Studies: The doctoral program in Child and Family Studies prepares scholars in the fields of child development and family studies. The strength of this doctoral program is based on three major components: the integration of child development and family studies within the context of human ecology and related areas, specialization in child development or family studies, and an emphasis on...
becoming proficient producers and consumers of research. A doctoral program that is concurrently specialized and integrative in nature reflects the complexity of the disciplinary subject matter, provides a broader context to formulate theoretical questions, and transcends the empirical literature for addressing those questions.

Requirements are:
1. Minimum 19 credits in Child and Family Studies required for courses: 5410, 5510, 5210, 5450, 5550, 5910;
2. Minimum 15 credits in 5000- and 6000-level courses in Child Development or Family Studies, with at least 6 credits in 6000-level courses in addition to the required courses described in #1;
3. Minimum 9 credits in a cognate area;
4. Minimum 12 credits in statistics, with at least 3 of these credits in advanced statistics;
5. Minimum 3 credits of specialized research methods;
6. Predoctoral research project approved by student and faculty.
7. Minimum 3 credits of college teaching methods;
8. Elective credits selected by the student in consultation with adviser.

Student Progress: Monitored by tenured faculty; reviews held at the end of the first year for full-time students—end of second year for part-time students. Comprehensive exam after completion of a minimum of 50 hours toward the approved program. See department guidelines on Evaluation Policy and Procedures.

**Food Science or Nutrition Science:** Students enrolled in the Food Science concentration specialize in either the physico-chemical or socio-cultural aspects of food in relation to people and their environment. Students are expected to develop strength in nutrition and other fields by taking courses in a collateral area. Food systems administration, food technology, education, and the natural and behavioral sciences are among the potential collateral areas. The Nutrition Science concentration enables students to study the science of nutrition from the cellular level to the application of nutritional principles by people in a changing environment. Students are expected to acquire advanced training in food science, chemistry, biology, and other natural and behavioral sciences. The doctoral program emphasizes the human nutrition, experimental nutrition (small animals), and intermediary metabolism. Requirements for both concentrations are:

1. Twenty-four hours with major emphasis in food science or nutrition including 9 hours at the 6000-level (exclusive of dissertation and seminar);
2. NFS 5070, 5075, 5100, 5150 and 5155.
3. Minimum 4 hours of NFS 6900. Attendance at a seminar is required for all full-time students.
4. Minimum 12 hours of statistics, computer science and research methods.
5. Minimum 9 hours in a cognate area.
6. Students who have not had college teaching experience are required to take C&I 5090 (Fall Quarter Seminar for GTAs) and NFS 5800 (3 hrs) for a faculty-supervised problem in college teaching.

Student Progress: It is the responsibility of the student's committee to monitor the progress of the doctoral student.

**Textiles and Apparel:** Students take one course in methods to provide a foundation for the integration of textiles and apparel, around the context of the near environment. A department research seminar is required which exposes students to research being conducted in the various areas of study in the department. Textiles and Apparel concentration requirements are:

1. Thirty-six hours in textiles and apparel, including 9 hours at the 6000-level, exclusive of dissertation;
2. T&A 5120 or 5250; 5170; 5180; 6110; 6520.
3. Minimum of 3 hours of T&A 6500 Research Seminar. Attendance at seminar is required for all full-time students.
4. Minimum 12 hours chosen from statistics, computer science and research methods.
5. Minimum 12 hours in a cognate area.

**Departments of Instruction**

**Child and Family Studies**

**DEGREES**

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<tr>
<th>MAJORS</th>
<th>Child and Family Studies</th>
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<td></td>
<td>M.S. Human Ecology</td>
<td>Ph.D.</td>
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**Professors:**

**Associate Professors:**
- J. H. McInnis, Ph.D. Florida State; G. Peterson, Ph.D. Brigham Young University; J. Staus (Associate Dean), Ph.D. Washington State; S. Twardosz, Ph.D. Kansas.

**Assistant Professors:**
- J. Allen, Ph.D. Purdue; L. Bivins, Ph.D. Ohio State; C. Bluestein, Ph.D. Minnesota; C. Catron, Ed.D. University of Oregon; J. K. Abel, Ph.D. Purdue; G. Pettit, Ph.D. Indiana University; D. Tagano, Ph.D. Virginia Tech; J. G. Weddle (Assistant to the Dean), Ph.D. Tennessee.

The Department of Child and Family Studies encompasses two primary concentrations: child development and family studies. Integration of these areas creates a unique perspective for the study of individuals and families. Each graduate student's program of study is carefully planned in consultation with a faculty committee to establish a program consistent with the individual goals of the student. All programs are characterized by a broad array of coursework, varied research experiences, and opportunities for experiences in applied settings. Students at the doctoral level receive substantial preparation in statistics and research methodology. Interested students should contact the Department Head.

Admission Requirements: Admission to the program is contingent upon faculty evaluation of the candidate's preparation, graduate GPA, rating forms, and work experience.

**THE MASTER’S PROGRAM**

An individual program of study may be designed by the student in collaboration with his or her major professor and committee. The program may have a concentration in one or both of the following areas:

1. Textile/Apparel Studies.
2. Child and Family Development.

All students, regardless of individual emphasis should follow these guidelines:

- One theory course in the major concentration of child, or family (i.e., PSY 5210 or 5410).
- At least one graduate course in each of the two concentrations in child and family development.
- At least one-hour of credit from the research seminar, CFS 5910.

Non-theory courses have these requirements in addition to 1-3 above:

- At least one course in interpretation of statistics and methodology such as Educational Psychology 5210 or 5220.
- A comprehensive written examination. One of the 45 credit hours required for the M.S., 24 hours must be in the major field with 18 of these at the 5000 and 6000 level, a minimum of 30 hours must be at the 5000 and 6000 level. At least 9 hours in one minor area or at least 9 hours in a collateral area.

Thesis students have these requirements in addition to 1-3 above:

- At least one course in statistics such as Stat 5211, or Stat 5220.
- At least one course in methodology such as CFS 5530. Students are required to complete an acceptable thesis and oral examination.

**4500 Adult Development and Aging (3)** Adult life in our society. Adjustment to internal and environmental changes through middle and aged years. Prereq: 2110 or Home Economics 1510 or equivalent background in adult development or consent of instructor.

**4500 Advanced Child Development (3)** Survey of selected theories pertinent to child development with emphasis on research literature and research methodology. Prereq: 4 hrs psychology and 6 hrs child development or equivalent. Consent of instructor.

**4400 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: 2210 or Home Economics 1510 or consent of instructor. W

**4400 Family Interaction (3)** Dynamics of family interaction at different points in the life cycle. Includes dynamics of families, family relationships, the nuclear family, and family interaction within community; formal and informal support systems within community. Prereq: 3510.

**4610 Child in the Community (3)** Needs of children; community agencies meeting these needs; visits to agencies contributing to the welfare of children. Prereq: 2110 or Home Economics 1510 or equivalent. W

**4610 Administration of Programs for Young Children (3)** Planning and operating a program; staff development; financial, personnel, and budgeting, and administrative problems. See course description for prerequisites. Prereq: 3350 or 4110.

**4710 Contemporary Developments (1-3)** Student or staff-initiated course for study of special topic(s) pertinent to the field of study. Must be approved by students and instructor with departmental approval. Elective credit only. Prereq: Consent of instructor.
5480 Marital Dyad (3) Theory and research related to quality of marital relationships: communication, power, marital satisfaction. Prereq: 5410 or equivalent or consent of instructor.

5510 Survey of Research in Human Development (3) Research literature; locating, abstracting, reporting 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; basic methodology of behavioral sciences. Recommended as elective or background thesis work in this area. Prereq: 9 hrs child and family studies, 3 hrs. lectures and 1 hr. discussion.

5540 Program Models in Early Childhood Education (3) Description, analysis, and evaluation of various preschool program models. Prereq: 5520 or equivalent or consent of instructor.

5550 Supervision in Preschool Programs (3) Guidance of students working in nursery school and day care centers. Guiding students through seminar discussions, individual conferences, and various evaluation techniques. Prereq: 5540. 3 hrs and 1 2-hr lab.

5560 Assessment of Development and Learning in Young Children (3) Procedures for formal and informal assessment of development and learning; use of young, non-handicapped and handicapped children. Critical issues in assessment and evaluation of appropriateness of procedures, and interpretation of results for curriculum improvement. Supervised practicum assessment. Prereq: 5510 or equivalent or consent of instructor.

5610 Theories of Management in the Family Environment (3) Fundamental management concepts, development and application to current family situations.

5640 Teaching Child and Family Studies (5) Seminar and practicum in techniques for teaching child development and family relationships. Prereq: Consent of instructor. SP only.

5660 Organizational Principles for Caregiving/Teaching Environments (3) Selection of appropriate problem-solving strategies, scheduling of daily routines, assignment of staff responsibilities, staff evaluation and feedback, arrangement of physical environment and selection of play materials. Day care centers, classrooms, residential facilities for retarded, and homes for elderly. Organization to provide information and remediating group problems and facilitate program implementation. Prereq: Consent of instructor. SP

5700 Special Topics in Child Development (3) Research on a specific topic. Prereq: 6 graduate hrs in child and family studies or consent of instructor. May be repeated. Maximum 9 hrs.

5710 Independent Study in Child Development (1-3) Individual study. Prereq: 12 graduate hrs in child and family studies or consent of instructor. May be repeated. Maximum 6 hrs.

5730 Advanced Study in Infant Development (3) Theory and research concerning normative and nonnormative development during the first two years of life: cognitive, emotional, social and physical aspects. Prereq: 5510 or equivalent or consent of instructor.

5740 Advanced Study in Early Childhood Development (3) Theory and research concerning normative and nonnormative development during preschool years of life: cognitive, emotional, social and physical aspects. Prereq: 5510 or equivalent or consent of instructor.

5750 Advanced Study in Adolescent Development (3) Theory and research regarding normative and nonnormative adolescent development: physical, cognitive, moral, social, familial, sexual, and personality. Prereq: 4350 or equivalent or consent of instructor.

5800 Special Topics in Family Studies (3) Research and theory related to current issues in family studies. Variable topics. Prereq: 12 graduate hrs in child and family studies or consent of instructor. May be repeated. Maximum 3 hrs.

5810 Independent Study in Family Studies (1-3) Individual study of specific topics in family studies.

PreReq: 6 graduate hrs in child and family studies or consent of instructor. May be repeated. Maximum 6 hrs.

5910 Research Seminar (1) Presentation and critique of research projects. Prereq: Departmental major or consent of instructor. S/NC only. Sp, Su.

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

6110 Advanced Special Topics in Child Development (3) Advanced study of research and theory related to current issues in child development. Variable topics. Prereq: 12 graduate hrs in child and family studies or consent of instructor. May be repeated. Maximum 6 hrs.
6100 Seminar (1-3) May be repeated. S/NC only.

Home Economics Education
The graduate program in Home Economics Education is administered by the College of Education with home economics education being one of the five service areas within the Department of Technological and Adult Education. The department offers the M.S., Ed.S., and Ed.D., degree programs with a concentration in home economics education. Inquiries may be addressed to Home Economics Education, Jessie Harris Building. (See pages 67-69 for staff, program descriptions, and course offerings).

Nutrition and Food Sciences

MAJORS

Food Science

Nutrition

Food Systems Administration

Human Ecology

DEGREES

M.S.

M.S.

M.S.

Ph.D.

Professors:

R. E. Beauchene, Ph.D. Kansas State;

B. R. Carruth (Head), Ph.D. Missouri;

M. P. Penfield, Ph.D. Tennessee; J. R. Savage (Associate Dean), Ph.D. Wisconsin; J. T. Smith, Ph.D. Missouri; M. A. Smith (Memphis), Ph.D. Tennessee.

Associate Professors:

F. E. Andrews, Ph.D. Ohio State; G. W. Disney, Ph.D. Tennessee; N. L. Marable, Ph.D. Massachusetts; D. S. Sachan, Ph.D. Illinois; M. N. Traylor, M.P.H. California (Berkeley).

Assistant Professors:

J. B. Britts (Memphis), Ph.D. Tennessee;

M. D. Brooks (Memphis), M.S. Alabama;

M. R. Evans, Ed.D. Tennessee; B. Haughton, Ed.D. Columbia; P. Redlinger, Ph.D. Kansas State;

J. D. Skinner, Ph.D. Oregon State.

In the Department of Nutrition and Food Sciences, Master of Science programs are available in Nutrition, Food Science, and Food Systems Administration. Within the Nutrition program, a student may choose to study nutrition science or public health nutrition.

Admission Requirements: Admission to the Nutrition and Food Sciences programs is dependent on completion of undergraduate course work in nutrition, food science, mathematics, economics, human physiology, microbiology, chemistry, biochemistry, and analytical chemistry. For Food Systems Administration, undergraduate coursework in quantity food production and food service system administration is required.

The Master’s Program

In Nutrition students studying nutrition science may choose a thesis or a non-thesis option. Students emphasizing public health nutrition must choose the non-thesis option. Students in the Food Science or Food Systems Administration programs may select either the thesis or non-thesis option.

Thesis Option: The program will consist of a minimum of 45 hours with at least 24 hours of coursework in the department. Nine hours of thesis are required and may be applied toward the 45 hours. Nine hours outside the department is recommended. A minimum 30 hours at the 5000 and 6000 level is required.

An oral examination over the thesis and coursework is given at the time of the program. Non-Thesis Option: The program will consist of a minimum of 45 hours with at least 30 hours of coursework in the department. Nine hours in one area outside the department are required. A minimum of 30 at the 5000 and 6000 level is required.

A written comprehensive examination is given at the end of the program. Students studying public health nutrition are required to complete one quarter of supervised field experience in a health agency.

4020 Introduction to Sensory Evaluation of Foods (3) Sensory evaluation methods. Prereq: 4010 or 9 hrs of food technology and science. Plant and Soil Science 3610 or equivalent. 2 hrs and 1 lab.

4040 Food in Contemporary Society (3) Consumers' options, responsibilities, and potential influence with respect to food supply.

4050 Food Preservation (3) Application of basic principles and research findings to food preservation in home. Prereq: 3015 and 4 hrs microbiology. 2 hrs and 1 lab.


4140 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: 4130. Designed for senior students in the coordinated undergraduate program in dietetics.

4150 Community Nutrition (3) Nutrition problems and services in the community; supervised field experiences. Prereq: 3120 or 3160. Sp.

4180 Environmental Effects on Nutrition (3) Effect of natural and synthetic food toxins, drugs both social and therapeutic, and extreme environmental conditions upon nutrient availability, utilization, and requirements of humans. Prereq: 6 hrs natural science.

4190 Diet and Drug Therapy (3) Effect of drug therapy on absorption and utilization of nutrients, and effect of diet on absorption, utilization, and toxicity of drugs. Prereq: 3160 or consent of instructor. W.


4220 Food and Lodging Information Systems (3) Design of information systems for decision making in hotel-motel complex; computer application in hospitality industry. Prereq: 3220, Accounting 2130; Computer Science 1410; Marketing 3120, a statistics course, or consent of instructor. W.

4240 Food Systems Personnel Development (3) Development of training programs and personnel management policies for food systems personnel. Prereq: 3220. W.

4250 Food Systems Managerial Cost Control (3) Cost analysis for food and beverage operations; use of financial statements for decision making in food service systems. Prereq: 3220, a statistics course, Accounting 2110, Economics 2520. W.

4260 Food and Lodging Physical Plant Planning and Maintenance (4) Fundamentals of mechanical systems and building components of food and lodging physical plant; organization and principles of property management. Prereq: 3220, 4210. Accounting 2130, Computer Science 1410, Marketing 3120, a statistics course. 3 hrs and 1 lab. W.

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

5020 Non-Thesis Graduation Completion (3-15) Required for non-thesis student not otherwise registered during any quarter when such a student uses university facilities and/or faculty time before degree is completed. May count toward degree requirements. May be repeated. S/NC only. E.

5040 Food Behavior of the Individual (3) Development of and changes in choices of food and food habits of individual. Prereq: 4000, 3 hrs of nutrition, or consent of instructor. Sp or Su.

5050 Foodways in the United States (3) Current foodways of selected subcultures in United States and historical basis for their development. Prereq: 4000, 3 hrs of nutrition, or consent of instructor. W, Sp.

5065 Hydrocolloids, Pigments, and Structural Polysaccharides in Relation to Food Science (3) Physical and chemical characteristics; behavior in food. Prereq: 4010, 3140-50 or equivalent.

5070 Sugars, Starches, and Lipo-saccharides in Relation to Food Science (3) Physical and chemical characteristics: behavior in food. Prereq: 4010, 3140-50 or equivalent.

5090 Advanced Physiological Chemistry (4) Bioenergetics and related metabolism of nutrients. Prereq: 3140 or equivalent. F.

5095 Advanced Physiological Chemistry (4) Nutritional factors in relation to body fluids, gas transport, and endocrine function. Prereq: 3140. W.

5100 Community Nutrition (3) Nutrition problems and practices in community; supervised field work. Prereq: 3160 and consent of instructor. 3 labs. F.

5110 Community Nutrition (2) Observations and participation in nutrition in community and state agencies. Prereq: 5116 and consent of instructor. 3 labs. W.

5120 Community Nutrition (3) Nutrition programs of state and federal agencies; preparation of material for nutrition education; supervised field work. Prereq: Consent of instructor. 3 labs. Su.

5125 Field Study in Community Nutrition (1-12) Personal participation and analysis of state or regional nutrition program. Location of independent study to be selected in consultation with instructor. Prereq: 5115 and consent of instructor. S/NC only. Sp.

5130 Mental Retardation or Other Developmental Disorders of Childhood (3) Core course required of all full-time students in training at Child Development Center, UT Center for the Health Sciences, Memphis. Prereq: Consent of department head. F, W, Sp.

5135 Nutrition in Mental Retardation and Developmental Disabilities (1-12) Interdisciplinary diagnosis and treatment of developmentally-handicapped child. Role of nutritionist, clinical experience and lectures at Child Development Center, Center for the Health Sciences, Memphis. Prereq: Consent of department head.

5140 Experimental Methods in Nutrition (3) Use of small animals in experimental nutrition. Prereq: 3140-50-60, 3410. 2 hrs and 1 lab. F.

5145 Human Metabolic Research (3) Basic principles of planning, conducting, and interpreting human
metabolic studies. Prereq: 3150 and 6 hrs 5000-level nutrition courses. 2 hrs and 1 lab.

5150-55 Human Nutrition (3, 3) Functions of carbohydrates, proteins, fats, minerals and vitamins. Nutritional requirements of humans throughout life span. Prerequisites of laboratory and professional requirements. Prereq: 3150 and 5100. W; Su

5160 Physiological Bases for Diets in Disease (3) Developments in dietary treatment of disease in which nutrition plays a major role. Prereq: 4130 or equivalent. Su


5170 Survey Methods in Human Nutrition (3) Food consumption, food practices and nutritional status of population groups. Prereq: 5150-55. 2 hrs and 1 lab.

5175 World Food Supply and Human Nutrition (3) Food supplies and food practices as related to human nutrition throughout world. Regional, national and international agencies concerned with food and nutrition problems. Prereq: 5150 or consent of instructor. Sp

5180 Nutrition and Aging (3) Nutritional problems of aging individual, nutritional requirements, dietary intakes, and effect of nutrition on rate of biological aging. Prereq: Consent of instructor. W

5185 Adolescent Nutrition (3) Application of nutrition principles to assess and control effects of diseases on growth and health maintenance; nutrition assessment and counseling. Prereq: 4130 or consent of instructor.

5210-20 Experimental Quantity Food Study (2, 3) Analysis of food production, holding environment, and service problems related to quality of food prepared in volume. Management resources. Prereq: 3210, 3220, or consent of instructor. F, Su

5230 Methods of Food Systems Research (3) Research methods applicable to food systems administration. Prereq: 3210 or equivalent. W, A

5240 Experimental Design of Food System Facilities (3) Environment in which food is prepared, held, and served in volume. Prereq: 4210.

5250 Food Systems Evaluation (3) Management resources in food systems. Standards for control. Prereq: Consent of instructor. Sp


5270 Administration of Food Service Delivery Systems (3) Advanced applications of administrators in maintaining desired qualitative and quantitative standards in food service delivery system. Prereq: 3250 or consent of instructor. W, A

5280 Human Resource Planning and Development for Food Service Industry (3) Identification of human resource needs; program planning and evaluation for personnel in food service industry. Prereq: 4240, 5230, or consent of instructor. Sp

5310 Clinical Training in Health Care Agencies (3) Instructional and supervisory techniques in clinical settings by nurses and dietitians for training of entry-level health care providers. Prereq: Nursing 4760 or consent of instructor. Sp

5340 Foods and Nutrition: Physicochemical Principles (3) Thermodynamics; physicochemical properties of proteins, carbohydrates and lipids; chemistry of colored states of practical importance; specialized kinetics of enzymatic processes. Prereq: 3140 or equivalent. Sp, A

5360 Instrumental Methods in Research (3) Theory and application of instrumentation for analysis of food and biological materials. Prereq: 3150, 2 hrs and 1 lab. F

5380 Field Experience (3-9) Experience in food-related industry or agency under supervision of faculty member. Prereq: Consent of instructor.

5760 Current Programs and Trends (1-3) Recent advances in nutrition and food sciences; implications for professionals. Prereq: Consent of instructor. May be repeated.

5800 Problems in Nutrition and Food Sciences (1-3) Advanced study in nutrition and food sciences. Prereq: Consent of instructor. May be repeated.

5900 Seminar (1-3) Prereq: Consent of instructor. May be repeated. Maximum 3 hrs. S/NC only.

5910 Graduate Seminar in Public Health (1-2) (Same as Public Health 5900, Nursing 5900, Physical Education 5900, and Social Work 5900) S/NC only.

6000 Doctoral Research and Dissertation (3-15) Prereq: Consent of instructor. May be repeated.

6010 Food Dispersions (3) Physical characteristics of solutions, colloidal dispersions, and suspensions in relation to treatments applied. Prereq: 5040 or 5050: or consent of instructor. F, W

6110 Proteins and Amino Acids (3) Lectures, reports, and discussions. Prereq: 5150-55. Sp, A

6120 Mineral Metabolism (3) Lectures, reports, and discussions of functions of minerals in physiological processes. Prereq: 5150-55. Sp, A

6130 Lipid Metabolism (3) Lectures, reports, and discussions. Prereq: 5150-55. Sp

6140 Vitamin Metabolism (3) Lectures, reports, and discussions. Prereq: 5150-55. A

6310 Advanced Topics (3) Comprehensive individual study and group discussion of topics related to current problems in nutrition and food sciences. Prereq: Consent of instructor. May be repeated.

6900 Seminar (1) May be repeated. S/NC only. E

Textiles, Merchandising and Design

MAJORS

Textiles and Apparel

M.S.

Interior Design

M.S.

Human Ecology

Ph.D.

Professors:

J. G. DeJonge (Head), Ph.D., Iowa State; R. Blakemore, Ph.D., Florida State; A. J. DeLong, Ph.D., Pennsylvania State; M. F. Drake, Ph.D., Pennsylvania State; K. E. Ducett, Ph.D., Tennessee.

Associate Professors:


Assistant Professors:

J. L. Crouse, Ph.D., North Carolina; J. H. Rabun, Ph.D., Tennessee.

Interior Design

The department of Textiles, Merchandising and Design offers a Masters Degree in Interior Design. Students are expected to have a good foundation in this area to enter the program. The program of study will prepare students for careers with interior design or architectural firms, public and private agencies, and educational institutions. Interested students should contact the Department Head for more information.

THE MASTER'S PROGRAM

Thesis Option:

Major (minimum of 9 hours of 5000-level courses) 18 hrs

Thesis: 9 hrs

Minor (minimum of 12 hours of 5000-level courses) 18 hrs

TOTAL: 45 hrs

A minor is chosen in an area other than Human Ecology with the approval of the major professor.

ACQUISITIONS AND EXHIBITIONS

Graduate students pursuing a degree in advanced interior design should submit a portfolio of their undergraduate studio work to the department. This portfolio may include slides or original work.

4320 Family Housing Problems (3) Housing requirements of families. Reading and judging house plans, effective use of space; maintenance problems; housing regulations and restrictions; site selection and neighborhood development; financing procedures. Prereq: 6 hrs from Economics 2110-20-28. Sp

4450-51 Advanced Interior Design (6, 6) Intensive interior design experiences: complex design problems utilizing systematic design methodology. Project types: multi-family housing, commercial and institutional environments, or complex working environments. Assistance and critiques from area professionals. Prereq: 3452 for 4450. Courses taken in sequence or consent of instructor.

4460 The Consumer and the Market (3) Analysis of consumer decision-making and problems in the marketplace. Consumer issues and policies with emphasis on consumer choice, information, consumer protection and current issues. Prereq: Econ 2510 and 2520.

4791 History of Contemporary Interior Architecture (4) Furniture; design and design philosophies of Europe and America in relation to forces that shaped them; movements in visual arts, technological advances, and cultural milieu.


4940 Proxemics (4) Definition of proxemic variables. Recording and analysis of proxemic behavior using unobtrusive methods of observation, still photographs, scale-model environments and interview techniques. Observe bias and methods of bias reduction. Members of seminar required to design, conduct and present original proxemic research. Prereq: 2000 or consent of instructor. (Same as Architecture 4940.)

4950 Environment as Code (4) Theoretical issues involving consideration of environment as a medium of human communication. Codes and nature of coding behavior in animals and humans. Relationships between coding behavior and organization of the central nervous system. Coding and social behavior. Communication process as a generic model of human-environment relationships. Aspects of environmental communications. Prereq: 2000 or consent of instructor. (Same as Architecture 4950.)

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

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

5050 Advanced Interior Design (4) Integrative focus for interior design program covering variety of research and design methods. Prereq: Consent of instructor.

5060 Practicum (1-12) Field experience in selected agencies, organizations or firms that focus on solutions to problems in interior design. Prereq: 12 hrs graduate level interior design or consent of instructor.

5120 Historic Interior Design (3) Research studies of historic interior design developments; interior design, decorative and arts of selected geographic areas of Europe and Orient. Variable topics. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs.
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Prerequisites</th>
</tr>
</thead>
<tbody>
<tr>
<td>6430</td>
<td>Reading and Research in Interior Design</td>
<td>3-15</td>
<td>Consent of instructor.</td>
</tr>
<tr>
<td>6500</td>
<td>Research Seminar (1-3)</td>
<td>Required</td>
<td>9 hrs for M.S. students, 3 hrs for Ph.D. students. S/NC only.</td>
</tr>
<tr>
<td>6510</td>
<td>Environmental Factors I: Theory, Decision Design and Human Requirements (3)</td>
<td>3-15</td>
<td>Systems-oriented theoretical approach to models and conceptual considerations of design and its outcomes.</td>
</tr>
<tr>
<td>5130</td>
<td>History of American Interior Design (3)</td>
<td>3-15</td>
<td>Prereq: Consent of instructor.</td>
</tr>
<tr>
<td>5250</td>
<td>Environmental Design Analysis (3)</td>
<td>3-15</td>
<td>Advanced methodology in environmental design and multidisciplinary research methods.</td>
</tr>
<tr>
<td>5420</td>
<td>Advanced Topics in Interior Design (3)</td>
<td>3-15</td>
<td>Systems approach to interior design problems as applied to design of microenvironments.</td>
</tr>
<tr>
<td>5510</td>
<td>Environmental Factors in Interior Design (3)</td>
<td>3-15</td>
<td>Human factors and systematized design methodology applied to interior design and historic preservation.</td>
</tr>
<tr>
<td>5530</td>
<td>Environmental Factors in Interior Design (3)</td>
<td>3-15</td>
<td>Human factors and systematized design methodology applied to interior design.</td>
</tr>
<tr>
<td>5555</td>
<td>Environmental Design Research (1-3)</td>
<td>3-15</td>
<td>Comprehensive and applied research methodologies to interior design problems.</td>
</tr>
<tr>
<td>5810</td>
<td>Problems in Historic Design Studies (1-3)</td>
<td>3-15</td>
<td>Advanced research in area of historic stylistic movements of interior design within cultural context.</td>
</tr>
<tr>
<td>5820</td>
<td>Problems in Interior Design (1-3)</td>
<td>3-15</td>
<td>Graduate level interior design or consent of instructor.</td>
</tr>
<tr>
<td>5830</td>
<td>Problems in Theory of Historic Preservation (1-3)</td>
<td>3-15</td>
<td>Special topics in historic conservation for interior design.</td>
</tr>
<tr>
<td>5910-20</td>
<td>Seminar in Interior Design (4, 4, 4)</td>
<td>3-15</td>
<td>Variable focus on America of seventeenth, eighteenth, or nineteenth centuries or consent of instructor.</td>
</tr>
<tr>
<td>5940</td>
<td>Furniture Design (3)</td>
<td>3-15</td>
<td>Analysis of human factors in design of body support, task support, and storage furniture pieces and systems.</td>
</tr>
<tr>
<td>5970</td>
<td>Perspectives in Interior Design (3)</td>
<td>3-15</td>
<td>Historical and philosophical concepts in interior design.</td>
</tr>
<tr>
<td>6000</td>
<td>Doctoral Research and Dissertation (3-15)</td>
<td>3-15</td>
<td>Required for the non-thesis student not otherwise registered during any quarter when such a student uses university facilities.</td>
</tr>
<tr>
<td>6420</td>
<td>Textiles and Apparel (3)</td>
<td>3-15</td>
<td>Comprehensive and applied research methodologies to design and marketing problems in textiles.</td>
</tr>
<tr>
<td>6550</td>
<td>Environmental Design Analysis (3)</td>
<td>3-15</td>
<td>Advanced methodology in environmental design and multidisciplinary research methods.</td>
</tr>
<tr>
<td>6540</td>
<td>Advanced Topics in Environmental Design (3)</td>
<td>3-15</td>
<td>Systems approach to interior design problems as applied to design of microenvironments.</td>
</tr>
<tr>
<td>5000</td>
<td>Thesis (1-15)</td>
<td>3-15</td>
<td>Research and dissertation approaches appropriate to interior design.</td>
</tr>
</tbody>
</table>

**Required Courses (at least 12 credits):**

- 5130 History of American Interior Design (3)
- 5210 Furniture Design (3)
- 5250 Environmental Design Analysis (3)
- 5260 Environmental Factors in Interior Design (3)
- 5310 Fashion Analysis (3)
- 5410 Consumer Economics (3)
- 5450 Principles of Retail Management (3)
- 5510 Problems of Design Analysis (3)
- 5520 Environmental Factors in Interior Design (3)
- 5530 Environmental Factors in Interior Design (3)
- 5555 Environmental Design Research (1-3)
- 5580 Problems in Interior Design (1-3)
- 5580 Problems in Interior Design (1-3)
- 5590 Problems in Theory of Historic Preservation (1-3)
- 5910-20 Seminar in Interior Design (4, 4, 4)
- 6000 Doctoral Research and Dissertation (3-15)
- 6420 Perspectives in Interior Design (3)
- 6430 Reading and Research in Interior Design (3)
- 6450 Environmental Design Analysis (3)

**Total Credits:** 36

**Additional Requirements:**

- 12 credits from courses numbered 5100-5499
- 12 credits from courses numbered 5500-5999
- 18 credits from courses numbered 6000-6999

**Final Examination:**

An oral examination is required.

**Thesis Option:**

- Major (minimum of 9 hours of 5000 courses)
- Minor (minimum of 12 hours of 5000 courses)

**TOTAL Credits:** 45 hours

**Additional Requirements:**

- Required courses: 5160, 5170, 5180, and 5250
- Additional credits if necessary

**Contact:** The Department Head for more information.
5520 Retailing Strategy and Decision-making (3) Development of analytical decision-making skills utilizing team case format. Strategy design in selected retail operational areas; issues pertaining to long-range comprehensive planning of company mission and objective. Prereq: 4520 and 5510 or equivalent. Sp

5610 Textile Processing (3) Methods and mechanics of texturing continuous filament yarns, methods and mechanics of processing staple yarns, spinning system, composite yarns weaving, knitting, non-woven fabric formation. Prereq: Engineering Science and Mechanics 3311, Mathematics 2840. (Same as Polymer Engineering 5610.)


5700 Current Topics in Textiles and Apparel (1-3) Lecture, group discussion, individual research and study on specialized topics: apparel production management, functional design, handicapped/elderly, new process finishing, preservation, thermal, toxicity. Prereq: 9 hrs textiles/apparel graduate coursework. May be repeated. Maximum 9 hrs. E

5800 Problems in Textiles and Apparel (1-3) Advanced individual study selected from field of textiles and apparel: apparel, American, European, and international historic textiles, merchandising, textiles. Prereq: 9 hrs textiles/apparel graduate coursework. May be repeated. Maximum 9 hrs. E

5900 Seminar in Textiles and Clothing (1-3) Prereq: Consent of instructor. May be repeated. Maximum 9 hrs. E

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

6010 Advanced Studies in Textiles and Apparel (3) Independent analysis of major philosophies, theories, methods, and research: apparel, historic, merchandising, textiles. Prereq: 9 hrs graduate coursework, 5160, or consent of instructor. May be repeated. Maximum 6 hrs. E

6110 Selected Issues in Textiles and Apparel (3) Lecture, group discussion, individual research on advanced topics and research areas of current significance: future directions, professional issues, theoretical approaches. Prereq: 9 hrs graduate coursework. May be repeated. Maximum 9 hrs. E

6150 Social-Psychological Theories of Clothing Consumption (3) Analysis and evaluation of social science theories of consumer behavior in relation to apparel and textiles. Prereq: 6 hrs graduate level sociology or psychology and 5170 or equivalent, or consent of instructor. Sp

6160 Textile Flammability (3) Factors affecting textile flammability as consumer issue. Standards, regulations, test methods, economic impact. Prereq: 5120, 5180, 5250, or consent of instructor.

6170 Physical Performance Behavior of Textile Structures (3) Fundamentals of yarns and fabric structures; relationship of structure to physical characteristics of textile materials. Prereq: 5120, or consent of instructor.
Intercollegiate Programs

Aviation Systems

MAJOR

Aviation Systems

DEGREE

M.S.

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

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

Assistant Professors:
W. B. Baker, Jr., Ph.D. Tennessee; V. K. Smith, III, Ph.D. Georgia Institute of Technology.

The University of Tennessee Space Institute offers a program leading to the Master of Science with a major in Aviation Systems. The Aviation Systems program is designed for those who possess a Bachelor's degree in engineering or science and who wish to study under a "systems philosophy" toward careers in research and development or administration in various phases pertinent to aviation.

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, a background in statistics, a basic understanding of aerodynamic fundamentals, aircraft propulsion and performance, a background in accounting and a basic knowledge of economics.

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

1. 18 hours in the major field of aviation systems.
2. For the research and development area, Industrial Engineering 5700, 5710, and 5720; for the administration area, in Economics 5030, and Finance 5010-20.
3. 6 hours of electives in one of the areas in item 2.
4. 6 hours of electives in the major field, engineering and/or the areas in item 2.
5. Satisfactory completion of Aviation Systems 5100.
6. Satisfactory completion of a comprehensive final written examination on all course work submitted for the degree and defense of the project course paper.

The thesis program involves 45 quarter-hour credits minimum while the non-thesis program involves 51 quarter-hour credits minimum.

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

Comparative and Experimental Medicine

MAJOR

Comparative and Experimental Medicine

DEGREES

M.S., Ph.D.

Joint Graduate Coordinating Committee:
H. Kitchen (Chairperson); J. E. Fith; W. K. Griesemer; J. E. Lawler; R. L. Michel.

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

For specific course listings please see College of Veterinary Medicine, page 36 and College of Medicine—Knoxville Unit, page 160 in this catalog.

ADMISSION REQUIREMENTS

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

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

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

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

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

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

For additional information, see sections in this catalog on College of Veterinary Medicine and College of Medicine—Knoxville, or write to the Office of Research and Graduate Programs, College of Medicine, University of Tennessee, Knoxville, or to the Graduate School, University of Tennessee, Knoxville, Tennessee 37901.

Ecology

MAJOR

Ecology

DEGREES

M.S., Ph.D.

Shared Faculty:


Zoology:


The Graduate Program in Ecology offers Master of Science and Doctor of Philosophy degrees. This interdepartmental program provides advanced courses in contemporary ecology for undergraduate ecology programs in basic and applied biology, social sciences, mathematics and engineering. Research opportunities in both fundamental and applied ecology are intended to attract students for graduate careers as well as professional positions in industry or government.

The Environmental Sciences Division of the Oak Ridge National Laboratory, the National Park Service, and the Tennessee Valley Authority provide advisors and research facilities. The Great Smoky Mountains, Cumberland Plateau, valley and ridge topography, TVA lakes and wild rivers provide locally a spectrum of natural habitats and consequent biological diversity that is truly unique. In addition, faculty research programs provide opportunities for student research elsewhere on this campus.

ADMISSION REQUIREMENTS

Requirements for admission to this program are:

1. admission to The Graduate School; (2) chemistry through organic, mathematics through calculus, and 4 quarter hours of ecology at the upper division level; (3) departmental application and 3 rating forms; (4) the Graduate Record Examination.

Application forms for admission should be obtained from The Graduate School. Inquiries concerning the admission requirements should be addressed to the Chairperson, Graduate Program in Ecology, University of Tennessee, Knoxville, Tennessee 37967-1610.

ADVISORS

Advisors are selected from ecologists on the shared faculty of the University who have competence in the area in which the student expects to work. Entering students should consult early with the chairperson of the program on the choice of a faculty advisor who will become the chairperson of the student’s faculty committee.

THE MASTER’S PROGRAM

The minimum 45 quarter hours of graduate credit shall include Ecology 5210-20-30 or equivalent and 9 hours of Thesis 5000. In addition, at least 8 hours must be selected from among nine ecology course categories. A maximum of four of these nine must be represented and one of these must be quantitative methods. The remainder of a student’s program is determined in consultation with the faculty. At least 8 hours exclusive of 5210-20-30, must be in courses numbered above 5100.

The general requirements for this Master’s degree are listed in page 22. A minor in ecology is available.

THE DOCTORAL PROGRAM

The requirements for this degree are in general the same as those of the Master’s program. A student cannot enroll for dissertation until the research proposal has been discussed and approved by the doctoral committee. A foreign language is required.

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

5100 Special Problems in Ecology (1-3) Individual investigations in ecology. May be repeated with consent of instructor. Maximum 3 hrs.

5175 Environmental Planning (3) (Same as Planning 5175.)

5190 Development Planning in the Third World (3) (Same as Planning 5190.)


5230 Principles of Ecology: Ecosystems (3) (Patterns, underlying principles behind short and long-term dynamics, energetics and nutrient cycling of terrestrial, freshwater and marine ecosystems. Prereq: 5220.

5310 Ecology for Planners and Engineers (3) Ecological principles and effects that humans 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. Prereq: 5210 or 5310, or Environmental Engineering 4820.

5370 Natural Resource Management and Environmental Assessment in Developing Nations (3) Assessment of environmental and resource development issues. Scientific basis for integrated resource management and environmental assessment in developing nations. Prereq: Basic ecology or equivalent. (Same as Botany 5370.)

5610 Environmental Toxicology (3) Same as Biochemistry 5610.

5640 Techniques in Environmental Toxicology (3) (Same as Biochemistry 5640.)
6100 Special Topics in Ecology (3) Seminars on advanced topics and recent developments in ecology. Prereq: Consent of instructor. May be repeated.

6110 Seminar in Animal Behavior (2)

6120 Seminar in Aquatic Ecology (2)

6130 Seminar in Physiological Ecology (3)

6140 Seminar in Community Ecology (2)

6150 Seminar in Radiation Ecology (2)

6160 Seminar in Systems Ecology (2)

6370 Applied Ecology (4) Review of contemporary and historical issues. Analysis of scientific basis of environmental assessment and natural resource management. Analysis of careers and career planning in applied ecology. Prereq: 5210-20-30 or equivalent or consent of instructor. (Same as Botany 6370.)

6431 Current Topics in Environmental Toxicology (1) (Same as Biochemistry 6431.) S/NC only.

**Industrial and Organizational Psychology**

**MAJOR**

**DEGREES**

Industrial and Organizational Psychology M.S., Ph.D.

Committee: J. M. Larsen, Jr. (Chairperson); W. H. Callahan; H. D. Dewhirst; R. L. Jenkins; R. T. Ladd; J. W. Lounsbery; M. C. Rush; J. E. A. Russell; E. Sundstrom; R. G. O'Brien.

(For complete Faculty Listing, see Department of Management and Psychology)

The master's and doctoral programs are offered jointly by the Department of Psychology and the Department of Management. They are designed to prepare students for personnel, managerial, and organizational research, for university teaching, and for consulting relationships with industry. The program emphasizes a scientist-practitioner model in applying and conducting research based on the principles found in classical and modern organization theory, organizational behavior, psychology, management, and statistics. The programs are administered by a joint committee of the two departments, appointed by the Vice Provost and Dean of The Graduate School 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 School and the Chairperson, Industrial and Organizational Psychology Program, 413 Stokely Center for Management Studies, Knoxville, Tennessee 37996-0549.

**Degree Requirements**

1. Application for admission to The Graduate School (apply for major in "Industrial and Organizational Psychology") and one application for admission to the Industrial and Organizational Psychology program. Deadline: New students are admitted in fall quarter only, and applications must be received by the Graduate Admissions and Records Office by March 1. 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.

2. Test scores on each section of the general portion and the Subject Psychology portion of the GRE are required. Customarily, those students admitted to the program have performed at or above the 89-97th percentile on the general tests. (This corresponds to a raw score or approximately 500 on each of the tests.) The GRE Subject Psychology score will be used in making admission decisions, although special consideration will be given in the case of non-psychology majors.

**THE MASTER'S PROGRAM**

Course Requirements:

1. Management or Psychology 5170-80-90 (Proseminar in Industrial/Organizational Psychology).


3. Eighteen hours of additional course work to be selected primarily from among the 5000-level course offerings in management and psychology e.g., Management 5110 (Organizational Theory), 5520 (Wage & Salary), 5230 (Human Problems in Administration).

4. Nine hours of Psychology or Management 5000 (Master's Thesis).

5. Recommended electives in Psychology, Social Work, Sociology, Planning, etc., as approved for individual programs of study.

Program Requirements:

1. Completion of a comprehensive examination in general psychology within no more than two years of entry by attaining a score of 650 or the 85th percentile on the GRE Subject Test in Psychology.

2. The Ph.D. program requirements described below in sections II A, and II G comprise the major requirements for a Master's degree. An oral examination covering the thesis and related topics must also be completed.

**THE DOCTORAL PROGRAM**

Course Requirements (Currently under review and subject to change for Fall 1985 entrance):

1. Minimum course requirements:
   a. Management or Psychology 5170-80-90. (Proseminar in Industrial/Organizational Psychology) and Psychology 5530 (Applied Psychometrics).
   c. Minimum of five 6000-level seminars to be selected from Psychology or Management 6250-60-70, and Management or Psychology 6830.
   d. 36 hours of Psychology or Management 6000.

**MAJOR DEGREES**

Life Sciences

Coordinating Council:
H. L. Adler (Chair), Physiology; H. G. Welch, Biotechnology; D. K. Dougall, Cellular, Molecular and Developmental Biology; J. M. Becker, Environmental Toxicology; W. R. Farkas, Ethology; G. B. Burghardt, Plant Physiology and Genetics; O. J. Schwarz.

The programs leading to the M.S. and Ph.D. degrees in Life Sciences are interdepartmental and intercollegiate programs which augment the programs of individual departments.

The graduate program in Life Sciences

**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 such 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.**
supports studies and research in the following concentrations: biotechnology, cellular, molecular and developmental biology, environmental toxicology, ethology, plant physiology and genetics.

Students interested in any of these areas should contact the Director of Life Sciences or the director of the area of interest.

Each concentration area is overseen by a committee and may have unique admission and graduation requirements above the minimums for the overall program.

**ADMISSION REQUIREMENTS**

1. A Bachelor's degree with a major in a biological, behavioral or physical science.
2. GRE (general) scores.
3. Three letters of recommendation.
4. Course work including a year of calculus (differential and integral), one year of chemistry, and a year of physics. Specific course deficiencies may be corrected during the first year.

**PROGRAM REQUIREMENTS**

The Master's program requires 45 hours of course work approved by the student's committee, a thesis, and a comprehensive oral examination. The minimum requirements for the doctoral program include at least 9 hours above the 6000 level, 36 hours of course work, a pattern of courses approved by the student's committee, a comprehensive examination, a doctoral dissertation, and a final examination. Individual concentration areas may have additional requirements.

**AREAS OF CONCENTRATION**

**Physiology:** The inter-departmental program in physiology includes research in the areas of regulatory, reproductive, comparative, exercise, cellular, developmental, muscle, or neuro-physiology.

**Biotechnology:** The biotechnology program will prepare students to participate in the wide variety of opportunities presented by the use of living cells and their components for the production of useful materials. This will be achieved at the M.S. level by a prescribed course of study in the biology and biochemistry of cells and molecules in the first year, by further formal study of cells and of engineering aspects of biotechnology in the second year and by the development of special expertise in areas such as animal embryo manipulation, automated chemical synthesis of macromolecules, bioprocess engineering, bioproducts and biotransformations, liposomes, microscopy and image processing, monoclonal antibodies and hybridoma technology, plant tissue culture, recombinant DNA technology and risk assessment and modeling. The production of a research thesis or an industrial co-op experience plus an area of specialization will also be an important part of the training experience.

**Cellular, Molecular and Developmental Biology:** The interdepartmental program in cellular, molecular and developmental biology includes research in structural or functional aspects of cells or subcellular components, or the interactions between cells.

**Environmental Toxicology:** The toxicology program provides intensive training in basic toxicological principles and techniques.

Courses and research expose trainees to mechanisms of intended and unintended interactions between living systems and potentially toxic agents from the point of view of biochemistry, physiology, ecology, public health, environmental law and regulation, pest management, pollution control and repair, and testing and residue analysis of toxicants.

**Ethology:** Ethology is the naturalistic study of normally occurring animal and human behavior. The program provides intensive training in basic ethology with specialized studies available in the development, evolution, and physiology of behavior; human ethology; and behavioral ecology and sociobiology.

**Plant Physiology and Genetics:** This program provides the opportunity for intensive training and research experience in areas transcending the usual boundaries of botany, biochemistry, and agricultural plant sciences. It devotes itself to seeking solutions of problems concerning the interactions of physiology and genetics in applied and fundamental aspects of plant science.

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

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

5010 Biotechnology Seminar (1) Seminar to address topics of interest to biotechnology; repeatable to a maximum of 6 credit hours.

5100 Special Topics in Life Sciences (1-3) Specializations in biotechnology; cellular, molecular, and developmental biology; environmental toxicology; ethology; plant physiology and genetics; and physiology. May be repeated. Maximum 9 hrs.

5109 Research Practicum in Life Sciences (1-3) Individual sections for each of biotechnology; cellular, molecular, and developmental biology; environmental toxicology; ethology; plant physiology and genetics; and physiology. May be repeated. Maximum 9 hrs.

5110-30 Cellular and Molecular Biology (3, 3, 3) Survey of cell structures and functions at molecular and supramolecular level. 5110—Cellular organization; cell metabolism; energy production and use; membrane structure and function; cellular communication; 5120—Cellular biology; mitosis and meiosis; immune functions; DNA replication, repair and recombination; chromosomes and genetic reproduction, 5130—Transcription and RNA processing, translation, control and regulation. Prereq: Consent of instructor.

5119-29 Techniques in Cellular and Molecular Biology (2,2) 5119—Growth of microorganisms, analysis of extracellular and intracellular components. 5129—Subcellular fractionation procedures; purification of macromolecules. Prereq: Consent of instructor.

5129 Recombinant DNA Laboratory (3) (Same as Microbiology 5139.)

5209 Biotechnology Practicum (Co-operative Experience) (3) Work experience in a commercial organization for students undertaking the non-thesis option of the biotechnology concentration. An evaluation by supervisor and a written report by the student are required. May be repeated once, maximum 6 hours.

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

6100 Advanced Topics in Life Sciences (3) Variable topics. May be repeated. Maximum 9 hours.

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**Management Science**

**MAJOR**

**DEGREE**

Management Science M.S.

**Committee:**


**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 complex problems. The program's flexibility also makes it appropriate as preparation for doctoral study in Management Science.

Management Science course work will expose students to both the theoretical development of quantitative techniques and their application to managerial decision making. In addition to the development of sufficient mathematical maturity for creative use of quantitative skills, the program requires concentrated study in a supporting area. Supporting areas are available in other departments of the College of Business Administration (excluding statistics) as well as in computer science, public administration, ecology and other areas, subject to approval by the Management Science Committee.

**Admissions Requirements:** The Master's program requires three graduate school rating forms and the GRE. The GMAT is acceptable in lieu of the GRE. Applications are encouraged from all majors, but mathematics background equivalent of the completion of at least two years of college calculus and proficiency in a computer language (e.g., Computer Science 3150) is required. The program is designed to be completed in one calendar year by full-time students. However, students may start the program in any quarter and may pursue an M.S. degree in Management Science on a part-time basis.

**Course Requirements:**

- **Quarter Hours**
  - Management Science 5310-20-30-35-40 14
  - Applied concentration area (approved by advisor) 3
  - Statistics 5110 12
  - Statistics elective (5000 level or above) 3
  - Mathematics (4000 level or above) 6
  - Electives selected from mathematics, statistics, computer science, and/or management science 6
  - Electives in any area approved by advisor 6
  - Total 50

A thesis option is available which substitutes 9 hours of thesis credit for the following 14 hours of course work: Management Science 5335-40, and one 3-hour course in the applied concentration area and 6 hours of electives in any area. The Management Science Committee will work closely with the student in tailoring a program to his/her needs. The committee must approve a tentative overall program during
the student's first quarter and must approve all courses on a quarter-by-quarter basis. Recognizing the diverse backgrounds and needs of Management Science M.S. students, the Management Science Committee is prepared to waive some of the above requirements on an individual basis. For example, an undergraduate mathematics major with a strong background may be allowed to take 6 additional hours of electives in place of the mathematics requirements. On the other hand, a student lacking experience in rigorous senior-level mathematics courses will be asked to take such courses to fulfill the 6-hour mathematics requirement. The total course load will remain 50 hours for all non-thesis students and 45 hours for all thesis students; however, the number of hours of electives can be reasonably expected to vary between 6 and 18 as a function of prior background.

For course listings and description of the Ph.D. program in Management Science, refer to p. 49.

Statistics

MAJOR DEGREE

Statistics

Program Faculty:
D. L. Sylwest, Statistics, (Chairperson);
Henry Fribourg, Plant and Soil Science;
S. W. Huck, Educational and Counseling Psychology;
Mary Leitnaker, Statistics;
J. E. Juday, Animal Science;
Robert McLean, Statistics;
Ralph O'Brien, Statistics;
John Philpot, Statistics;
Giselle Farnsworth, Statistics;
Richard Sanders, Statistics;
James Schmidhammer, Statistics;
Charles Thigpen, Statistics;
Mary Sue Younger, Statistics.

The Intercollegiate Graduate Statistics Program is a formal University of Tennessee academic program established to recognize graduate students for completing the requirements of a major or minor in statistics as part of their degrees. The Program enables a student to obtain the M.S. in Statistics alone or simultaneously with the Ph.D., M.S. in Statistics, minor or major in another department. The Program also enables a student to obtain a statistics minor along with the M.S., Ph.D., M.S. in Statistics, minor or major in another department. The Program is administered by an Executive Committee with advisory input from the Program faculty. The Program is open to well qualified graduate students in all departments which have an approved statistics minor and/or joint major curriculum offered through the Program. Curriculum requirements for the statistics component of each joint degree are specified in terms of completion of alternative sequences of course options. Course options consist of courses in statistics, offered by the Department of Statistics or by other departments, that have been reviewed and approved by the Executive Committee. Interested students should contact their major department head for information on specific course requirements.

GENERAL ADMISSION REQUIREMENTS

1. The student's sponsoring department must have established with the Executive Committee an approved joint degree program along with specified sequences of statistics courses taught by the Statistics Department and/or other departments.

2. The student's Admission to Candidacy form must contain all courses required for the statistics minor/major set off in a group and labeled as "Statistics courses required for the minor/major.">

3. In many cases, a student may not decide to apply for participation in the Program until he/she has completed two or three statistics courses. In that case the student's major professor should file a program change with the cooperating departments and assist the student in obtaining a Statistics Department faculty member to serve on the student's committee.

DEGREE REQUIREMENTS

The program offers the M.S. in Statistics with a minor in another department; a joint major program in which the student earns a master's or doctoral degree in the student's sponsoring department along with the M.S. degree in Statistics; and a joint major and minor program in which the student earns a master's or doctoral degree in the student's sponsoring department along with a minor in statistics. The table below presents the minimum number of quarter hours in statistics for each of these alternatives. The student selects courses to satisfy the requirements established by the student's sponsoring department and approved by the Program Executive Committee.

The student's committee must include a faculty member of the Statistics Department, at the rank of Assistant Professor or above. The student's formal examination procedure as established by the sponsoring department must include an appropriate section on statistics. Successful completion of the statistics minor/major is recognized by appropriate documentation on the student's transcript. Students who do not complete all requirements for the statistics major/minor will still receive academic credit for statistics courses they have successfully completed.

Degree Program:

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. M.S. in statistics, minor outside of statistics</td>
<td>27</td>
</tr>
<tr>
<td>2. M.S. outside of statistics, minor in statistics</td>
<td>12</td>
</tr>
<tr>
<td>3. M.S. outside of usual separate statistics, requirements for M.S. in both degrees</td>
<td></td>
</tr>
<tr>
<td>4. Doctorate outside of statistics, minor in statistics</td>
<td>24</td>
</tr>
<tr>
<td>5. Doctorate outside of statistics, M.S. in statistics</td>
<td>36</td>
</tr>
</tbody>
</table>

a. Approved statistics courses from the Department of Statistics and/or other departments.
b. Courses taken for the minor or the master's degree in statistics may fulfill requirements for the doctoral degree. Contact the home department for details.
College of Law

Kenneth L. Penegar, Dean
Mary Jo Hoover, Associate Dean
Julia P. Hardin, Associate Dean
John A. Sebert, Jr., Associate Dean
N. Douglas Wells, Assistant Dean

The College of Law is conducted on the semester system. The most current information regarding admission, financial aid, course requirements, academic policies, extracurricular activities, and student services is available in the College of Law Bulletin. Students interested in the college should obtain a copy of the Bulletin from the Admissions Office, The University of Tennessee, College of Law, 1505 West Cumberland Avenue, Knoxville, Tennessee 37996. Completed application should be received before February 1 of the year of requested admission.

The University of Tennessee College of Law commenced operation in 1890 and has continuously sought to provide high quality legal education in a university community. While the principal objective of the college is to prepare students for the private practice of law, its total mission is more broadly conceived. The college exposes students to the legal issues of our society enabling them to develop analytical skills with respect to decisional law and statutes, the ability to communicate effectively their knowledge of the law, an awareness of the historical growth of the law, a knowledgeable appreciation of the interrelationship of law and society, and the ability to use law as an implement of societal control and development. Students are thus equipped to serve their community not only as advocates and counselors, but as policy makers and active, responsible citizens.

The coordinated program of the college has three dimensions: teaching and learning, research into and appraisal of our legal systems and institutions, and service to the community. Each plays a significant role in the college as a modern law center.

The teaching and learning element of legal education at the college involves a cooperative classroom interaction between faculty and students in the analytical study of a host of questions and problems found in today's legal profession. These involve decisional law, statutory interpretation, administrative regulation, techniques of trial and appellate advocacy, and the roles and responsibilities of the lawyer in advising and representing clients. While proper consideration is given to the problems of Tennessee law, the course of study is conducted with a view toward providing an awareness and understanding of the regional and national perspective in order to prepare our students for service in any state.

The college is also directly involved in providing service to the community of which it is a part. A major element of public service is centered in the Legal Clinic where students, under the guidance of skilled and experienced licensed practitioners, provide legal services to indigent persons of Knox County. Additionally, through research, consultation, and other services to legal institutions and groups within the state, the college seeks to participate in the development and improvement of the society in which its students may eventually practice law. The Public Law Institute is a primary example of this function. In combination, the direction and objectives of the college lead to the development of a lawyer, not of a narrow technician, but of a student of the law with the perspective, breadth, and understanding necessary to accomplish the many tasks assigned by society to the legal profession.

THE COLLEGE OF LAW BUILDING

Since 1950 the college has occupied a building especially designed for teaching, study, and research in the law. In the spring of 1971 the college occupied the new wing, doubling the available facilities. The library, the classrooms, and the offices are air-conditioned. Adequate classrooms, courtrooms, seminar rooms, a private office for each full-time faculty member, the well-equipped offices of the Legal Clinic, and a spacious, well-lit Law Library are contained in this modern building. Stacked space for more than 200,000 volumes will permit one of the largest law book collections in the South.

LEGAL CLINIC

The University of Tennessee Legal Clinic was established in 1947. Though the Legal Clinic provides legal assistance to indigent persons, it is designed primarily as a teaching device to correlate theory and practice. It introduces the student, under faculty supervision, to the law in practice through personal contact with clients and their problems. The Legal Clinic functions as a large law office in which the student gains experience in interviewing clients, writing legal letters, investigating and evaluating facts, preparing memoranda of law, preparing cases for trial or adjustment, and briefing cases. Classroom work supplements the handling of actual cases. The student is thus trained in the technique of law practice and the management of a law office. The ethical responsibilities of lawyers and their function as public servants are stressed. Under present rules of the Tennessee Supreme Court, third year students, under the direct supervision of the Legal Clinic staff, are certified to practice before all the courts of Tennessee.

THE LAW LIBRARY

The Law Library contains the official state reports of all states, the complete National Reporter system which covers all states and the federal courts, the Annotated Reports, standard sets of miscellaneous reports, the reports of the Canadian cases and of English cases from the yearbooks to date. In addition to these, there are adequate encyclopedias, digests and dictionaries, standard textbooks, law reviews, and current loose-leaf services, totaling together more than 145,000 cataloged volumes. The library is under the supervision of a law librarian who is trained in law and library science. Law students also have the use of the collections in the University Main Library, which is located across the street from the Law Library, the Undergraduate Library a few blocks away, and other branch libraries.
Program of Instruction/College of Law 109

DEGREE OF DOCTOR OF JURISPRUDENCE

The degree of Doctor of Jurisprudence will be conferred upon candidates who complete, with the required average, six semesters of resident law study and who have 84 semester hours of credit, including all required courses. The required average is 2.0 and that average must be maintained on the work of all six semesters and also for the combined work of the grading periods in which the last 28 hours of credit were earned. A grade of 0.0 or below is a failure.

Eligible law students may receive credit towards the J.D. degree for acceptable performance in up to three (3) upper-level courses taken in other departments at The University of Tennessee. Courses selection and registration are subject to guidelines approved by the law faculty which include the requirement that any such course be acceptable for credit towards a graduate degree in the department offering the course.

DUAL J.D.-MBA DEGREE PROGRAM

The College of Business Administration and the College of Law offer a coordinated dual degree program leading to the conferral of both the Doctor of Jurisprudence and the Master of Business Administration degrees. A student pursuing the dual program is required to take fewer hours of course work than would be required if 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 commence studies in the dual program at the beginning of any term subsequent to matriculation in both colleges provided, however, that dual program students must be admitted prior to entry into the last 28 semester hours required for the J.D. degree and the last 24 hours required for the MBA degree.

Curriculum: A dual degree candidate must satisfy the graduation requirements of each college. Dual degree students withdrawing from the dual degree program before completion of both degrees will not receive credit toward graduation from either college for courses in the other college, except as such courses qualify for credit without regard to the dual degree program. For students continuing in the dual degree program, the J.D. and MBA degrees will be awarded upon completion of all graduation requirements of the dual degree program.

The College of Law will award credit toward the J.D. degree for acceptable performance in a maximum of 8 semester hours of approved courses taken in other departments of the University except for those taken in conjunction with the joint program.

Note: Students are advised to consult the College of Law student handbook for the specific requirements of the College of Law.

SATISFACTORY/NO CREDIT OPTION

A student may take a limited number of elective law courses on a Satisfactory/No Credit basis in the following circumstances:

A) The student has completed 34 semester hours toward the Doctor of Jurisprudence degree;

B) The student is not on academic probation; and

C) The student earns below a 2.0 in a law course and with the consent of the instructor.

TAKING LAW COURSES

The maximum course load for a law student is 18 hours in any one semester. During the summer term the maximum course load is 7 hours.

POLICY FOR GRADUATE STUDENTS TAKING LAW COURSES

The courses are not available for graduate credit; however, a graduate student may be allowed to take up to 6 semester hours of law courses and receive credit toward a degree upon approval of the College of Law and the major chairperson. The graduate student must register for the law course during regular registration at the College of Law requesting an S/NC grade only. If a 2.0 or above is obtained in law course, an S will be recorded on the transcript. If a student earns below a 2.0, an NC will be recorded and the course cannot be used toward meeting degree requirements. Grades for law courses will not be reflected in the cumulative average.

Different rules apply to the student enrolled in the Dual J.D.-MBA Program. Grades must be earned according to the grading system of the respective college, e.g., numerical grades for law courses, letter grades for graduate courses. Refer to page
21 for the grading scale acceptable toward meeting degree requirements. Cumulative GPA for law courses only will be carried until graduation, and the grade point average for the graduate and the law cumulative will be shown on the permanent record.

Faculty

Professors:

- J. L. Sobieski, J.D., Michigan
- C. H. Miller (Emeritus), J. J. Gobert, J.D., Duke
- R. M. Gray (Emeritus), LL.M., Harvard
- J. G. Cook, LL.M., Yale
- K. L. Penegar (Dean), LL.M., Yale
- N. P. Cohen, Faculty

in the permanent record. and the law cumulatives will be shown on

Assistant Professors:

- G. L. Anderson, LL.M., Harvard
- J. D. Miami
- J. D. Vanderbilt
- J. J. Gobert, J.D.
- G. D. H. Hess, J.D.
- L. C. Pierce, J.D.
- R. S. Wirtz, J.D.
- J. L. Sobieski, J.D., Michigan
- N. T. Sewell

(Emuners)

LL.M. George Washington
W. H. Wicker (Emuners)
LL.D.

D. Q. Williams, J.D.

Yale


classroom work a week are required of all full-time students. The required courses will be taken as early in the law curriculum as possible or as scheduled by the law faculty.

required courses

8010 Civil Procedure I (3) Introductory course; binding effect of judgments; selecting proper court—jurisdiction and venue—vindicating applicable law, federal and state practice.

8200 Contracts I (3) Basic agreement process and legal protection afforded contracts. Problems of offer and acceptance, interpretation, illegality, and statute of limitations.

8300 Conflict of Laws (2-3) Jurisdiction, foreign judgment, choice of law, constitutional limitations, recognition of judgments

8460 Federal Courts (3) Jurisdiction of federal courts and conflicts between federal and state jurisdictional, creation of common law and formal marriage, legal effects of marriage, marriage obligations within family, legal separation, annulment, divorce, alimony, property settlements, child custody, child support, adoption, abortion, and illegitimacy.

8540 Civil Procedure IV (3) Mediation; joinder of claims and parties; discovery, trials, verdicts, judgments and appeals; emphasis of Federal Rules of Civil Procedure.

8880 Income Tax II (4) What is income; when is it income; how is it taxed; capital gains and losses, marriage, false return; deductions and credits; rates (corporate, estate, and trust).

8910 Criminal Law (3) General principles applicable to all criminal conduct, specific analysis of particular crimes; substantive defenses to crimes, including insanity, intoxication, mistake, necessity, legal self-defense, and duress.

8070 Legal Process (2) Court structure; case analysis, case synthesis, and use of cases to predict and influence judicial decisions; legislative process, statutory interpretation, influence of judge as policy-maker; adversary system and lawyer's role. Use of legal authority in preparation of written work.

8110 Legal Bibliography and Research (1) Instruction in research design, the meaning of citation form, and research methodologies, including computerized research. Identification and location of authorities required to prepare a law of LL.M. monograph relating to an identifiable legal problem. S/N only.

8111 Legal Writing and Advocacy (2) Legal writing exercises, effective communication of ideas. Preparation of briefs, pleadings, and oral argument.

8130 Property I (3) Feehold estates, future interests, concurrent ownership, leases; real estate contract and deed; principles of personal property.

8140 Property II (3) Recording system, title assurance, easements, nuisance, lateral support, water rights, zoning, and eminent domain.

8180 Torts I (3) Intentional interference with the person, wrongful death, nuisance, trespass, negligence, affirmative duties, immunities, actual causation, and contributory causes.

8190 Torts II (3) Negligence, result within the risk, or proximate causation. Assumption of risk and contributory fault; interference with property, trespass, conversion; privilege; strict liability; liability of suppliers and contractors; misrepresentation; defamation; unjustifiable litigation; privacy; interference with contractual relations.

8300 Constitutional Law (3) Judicial review, limitations on judicial power, national legislation, power of state to regulate and tax, intergovernmental immunities; substantive due process; congressional enforcement of civil rights.

8310 Constitutional Law II (3) Freedom of expression, association and religion; Fourteenth Amendment rights excluding rights of criminally accused, including discharge as to race, sex, etc.; right to franchise and apportionment; consent of state action in matters of civil rights.

8340 Debtor-Creditor Law (3) Enforcement of judgments; bankruptcy and its alternatives for the business and consumer; emphasis on federal bankruptcy statutes.

8360 Family Law (3) Survey of laws affecting formal and informal family relationship: premarital agreements, antenuptial contracts, creation of common law and formal marriage, legal effects of marriage, support obligations within family, legal separation, annulment, divorce, alimony, property settlements, child custody, child support, adoption, abortion, and illegitimacy.

8420 Evidence (4) Rules regulating introduction and exclusion of oral, written, and demonstrative evidence, including relevancy, competency, impeachment, hearsay, privilege, judicial notice, presumptions, burden of proof.

8460 Federal Courts (3) Jurisdiction of federal courts and conflicts between federal and state judicial systems; creation of common law and formal marriage, legal effects of marriage, marriage obligations within family, legal separation, annulment, divorce, alimony, property settlements, child custody, child support, adoption, abortion, and illegitimacy.

8490 Environmental Law and Policy (3) Methods of public policy analysis, framework for understanding responses of system to environmental litigation; Code in Air Act, National Environmental Policy Act, and selected regulatory issues.

8500 Future Interests (3) Law of future interests, including reversions, remainders, possibilities of reverter and rights of entry, executory interests, construction of limitations, and rule of perpetuities.

8510 Government Contracts (3) Principles relating to government procurement, both federal and state; award, performance, and termination of contracts; administrative settlement of disputes arising under government contracts. Prereq: 8200.

8525 International Business Transactions (3) Legal status of persons abroad, acquisition and use of prop-
erty within a foreign country, doing business abroad as a foreign corporation, engaging in business within a foreign country, expropriation or annulment of contracts or concessions.

8530 Public International Law (3) International agreements, organizations, recognition of states, nationality, territory, jurisdiction and immunities, claims, expropriation, force and war.

8535 Jurisprudence (3) Legal theories: natural law, idealism, historical jurisprudence, utilitarianism, analytical jurisprudence, sociological jurisprudence, legal realism and legal process approach.

8540 Labor Law (4) Evolution of labor relations laws, rights of self-organization; employer and union unfair labor practices: strikes, boycotts and picketing, collective bargaining; public employee labor relations; internal union affairs; individual rights in labor relations; employment discrimination; federalism and preemption; unions and antitrust laws.

8590 Law, Language, and Ethics (3) Intermediate level jurisprudence-type course; law as the mind's attempt to defend, direct, and administer human activity; exploration of ethical values underlying formal legal reasoning and statement; analysis of judicial reasoning and legal concepts through methods of epistemology.

8565 Law and Economics (3) Relationship between legal and economic thought, use of economic in legal decision making and legal criticism.

8590 Legal Accounting (2) Accounting problems and techniques, use and understanding of accounting information.

8560 Copyright, Patent and Trademark (3) Protection for intellectual property under federal and state law; patents, trademarks and trade names, trade secrets, copyright considerations, international aspects.

8555 Legal Imagination (3) Systematic study of literature and its application to accurate, fluent, and creative legal composition.

8670 Legal Writing (1) By arrangement. Completion of a potentially publishable Casenote or Comment or Perspectives for the Tennessee Law Review or participation as a member of a faculty supervised moot court competition. S/NC only.

8680 Legislation (3) Interpretation and drafting of statutes, legislative process, and legislative power; judicial views on legislative process subject to critical comparison with realities of legislative processes and applicable constitutional principles.

8690 Modern Land Use Law (2) Land use planning, nuisance, zoning, eminent domain.

8700 Local Government (3) Distribution of power between state and local governmental units; sources of authority for limitations on local government operations; creation of local governmental units and departments; local governmental home rule; problems represented by fragmentation of local government units; problems in financing of local services; influence of federal programs on local government finance and decision making.

8710 Natural Resources Law (3) Selected materials on nature of interest, conveying, royalties, grants and reservations, leases, and taxation.

8740 Business Associations (4) Legal forms of cooperative business enterprise: agency, partnership, limited liability companies, cooperatives, housing subdivisions, and shopping centers.

8755 Remedies (4) Judicial remedies: damages, restoration, equitable relief; consideration of availability, limitations and measurement of various remedies; comparative evaluation of remedies available in various situations.

8755 Selected Problems in Remedies (3) Course content varies. Topics: civil rights injunctions, remedies in complex litigation (class actions and/or derivative suits), problems in restitution. Prereq: 8750 or consent of instructor.

8760 Advanced Business Associations (2) Selected topics. Prereq: 8740.

8770 Products Liability (3) Negligence of manufacturers, retailers, and others; defects in products; recall and other suppliers; detectiveness and causation; defensive and contributory fault.

8800 Sales and Secured Transactions (4) Art. 2 (Sales) and Art. 9 (Documents of Title) of the Uniform Code, problems of fraud, vendor's remedies, and guaranty; Art. 9 (Security Interests in Personal Property) of the Uniform Commercial Code.

8815 Discrimination and the Law (3) Comparison of race, sex and other invidious discriminatory practices as they affect political participation, education, employment, housing and other social and economic activities; emphasis on legislative enforcement of post-Civil War Equal Rights Amendments. Prereq: 8746.

8820 Securities Regulation (3) Advanced problems of governmental regulation of issuance of securities.

8825 Social Legislation (3) Schemes other than traditional tort law for compensating victims of accidents, disability and other maloccurrences; Workers Compensation and no-fault systems of compensation; Social Security disability benefits and administrative procedure for resolving such claims; Brief survey of medical assistance, welfare, related matters.

8840 Wealth Transfer Taxation (3) Transfers of wealth at death (specifically, in the context of federal income tax); generation skipping transfers; deductions and credits; interrelationship of transfer taxation. Prereq: 8860.

8855 Tax Theory (3) Comparative study of methods and purposes of governmental revenue collection through income, property, inheritance and estate taxes, and various actual proposed schemes of taxation. Prereq: 8860.

8860 Income Tax (3) Partnership taxation; corporate reorganizations and distributions; transactions among corporations and shareholders. Prereq: 8860.


9050 Decedents' Estates (3) Nature, creation, transfer, termination, and modification of trusts; fiduciary administration; intestate succession; validity, execution, mistake, revocation, probate and contest of wills; ademption, advancements and contribution of wills.

920 Antitrust (3) Federal antitrust laws; monopolization, price fixing, group boycotts, and anti-competitive practices generally; government enforcement techniques and private treble damage suits.

995 Directed Research (1-2) Hours to be arranged. Independent research under direct supervision of instructor; maximum of 3 credits per year in each two years of study. Proposal must be approved in advance by Academic Standards Committee.

9990 Land Finance Law (2) Financing devices: mortgaging, deeds of trust and land contracts; problems involved in transfer of interests subject to these devices; problems incurred in event of default; contemporary problems arising in such areas as condominiums, cooperatives, housing subdivisions, and shopping centers.

LEGAL CLINIC COURSES

Students are eligible to enroll in clinical courses only after the successful completion of their fourth semester (56 semester hours) in addition to meeting other specified prerequisites. Students must enroll in only one clinical course per semester and are limited to a total of two courses. Clinical courses are 8746, 8756, 8775, 8785.

8746-56 Introduction to Advocacy (4-9) Litigation, trial problems and preparation; basic trial strategy, discovery, presentation of evidence, voir dire, jury instructions, related tax and estate law; gift and inheritance tax generation skipping transfers; documentation of actual clients; ethical issues during supervision in clinical problem solving.

8785 will receive 7 hours credit for the Introduction to Advocacy course.

NOTE: Students receiving credit for 8170 prior to taking an Introduction to Advocacy course (8746 or 8756) will receive 5 hours credit for taking the Introduction to Advocacy course. Students receiving credit for 8170 will receive 4 hours credit for the Introduction to Advocacy course. Students receiving credit for 8746 or 8756 will receive 4 hours credit for the Introduction to Advocacy course. Students receiving credit for 8746 or 8756 will receive 4 hours credit for the Introduction to Advocacy course. Students receiving credit for 8746 or 8756 will receive 4 hours credit for the Introduction to Advocacy course.}

SEMINARS

8240 Arbitration Seminar (2) Arbitration of labor agreements; judicial and legislative developments, nature of process, relationships to collective bargaining, selected arbitration problems on various topics under collective agreements, and role of lawyers and arbitrators in the process.

8320 Constitutional Law Seminar (2) Current constitutional law problems; original paper required. Prereq: 8300.

8345 Criminal Law Seminar (2) Advanced problems in criminal law and administration of justice.

8400 Estate Planning Seminar (2) Problems of estate planning both interstate and intrastate, distribution of property, taxes and other legal problems in estate planning. Prereq: 8310, 8420.

8455 Juvenile Law Seminar (2) Unique history and philosophy of juvenile justice system, state and federal law, and extraordinary judicial functions of juvenile court, and various dispositional alternatives; judicial options and materials from fields of history, sociology, and psychology. Knox County Juvenile Court serves as laboratory for students; professional staff from the Court participate in seminar on regular basis.

8550 Labor Relations Law Seminar (2) Selected labor relations law problems.

8570 International Law Seminar (2) Current international law problems; paper required. Prereq: 8530.

8580 Law and Current Problems Seminar (2-3)

8845 Seminar in the Professional Competence of the Lawyer (2) Typical situations in which malpractice claims arise; third party claims, conflicts of interest, breach of fiduciary duty, examination of difficult problems of proof including use of expert testimony.

8850 Law and Mental Health Seminar (2) Psychiatric principles, role of psychiatrist, and relationship to role of legal counsel; assigned readings; field work in mental health clinics; co taught by law professor and psychiatrist.
8870 Business Planning Seminar (2) Selected problems on corporate and tax aspects of business planning and transactions. Prereq: 8860, 8862, and 8749.

8875 Commercial Law Seminar (2) Content varies. Planning seminar to execute a complex commercial transaction or selected problems in commercial transactions; major research paper. Prereq: 8450.

8890 Environmental Protection Seminar (2) Problems of litigating in defense of environment and mobilizing public and private efforts in defense of environment. Problems of proving environmental impact of selected projects, interpretation and evaluation of scientific data, use of expert witnesses. Special environmental concerns of region, e.g., TVA operations, strip mining, forest management, wildlife preserves. Team-teaching and selected experts. Prereq: 8490.

8910 Administrative Law Seminar (2) Principles of administrative law. Discretion, choice of adjudication or rulemaking to develop administrative policy; consistency in administrative action.

8930 Consumer Protection Seminar (2) Selected problems in consumer protection.

8950 Law and Medicine Seminar (2) Medical profession's involvement in judicial process: medical malpractice and alternatives to fault-based liability; responsibilities for disposition and care of dead bodies and legal principles governing organ transplantation; expert medical proof and testimony; medico-legal aspects of euthanasia; legal import of medical profession's various canons of ethics.

8955 Trade Regulation Seminar (2) Antitrust laws and laws applicable to regulated industries.

8960 Office Practice Seminar (2) Techniques of law office management, methods and practice: techniques in preparation of various legal instruments, office accounting, interviewing and counseling, management of personnel.

8995 Land Acquisition & Development Seminar (2) Alternative business forms and major documents (notes, deeds, prospectus, etc.) necessary to accomplish acquisition or development of large pieces of raw land prepared and presented for seminar discussion. Prereq: 8990.

COURSE OFFERINGS SUBJECT TO CHANGE

The necessity of adjustments to accommodate changing conditions may dictate modifications in the course offerings and other features of the program described above. Accordingly, the college reserves the right to make such variation in its program as circumstances may require. Prospective students who are interested in the precise course offerings at a given time or who desire other special information should make inquiry in advance.

It is necessary to offer some courses and seminars only on an every-other-year basis. Choice is based on subject matter and past patterns of student enrollment.
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**

*MA., Ph.D.*

Professors:

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

Associate Professors:

- I. E. Harrison, Ph.D. Syracuse;
- W. E. Klippel, Ph.D. Missouri;
- M. H. Logan, Ph.D. Pennsylvania State;
- G. F. Schroeder, Ph.D. Washington State;
- F. H. Smith, Ph.D. Michigan.

Assistant Professors:

- B. J. Howell, Ph.D. Kentucky;
- J. F. Simek, Ph.D. SUNY-Binghamton;
- P. S. Willey, Ph.D. Tennessee.

Instructor:

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

Research Associate Professor:


Research Assistant Professors:

- M. O. Smith, Ph.D. Tennessee;
- S. D. Tardiff, Ph.D. Michigan State.

The Department of Anthropology offers the Master of Arts and the Doctor of Philosophy degrees with concentrations in physical anthropology, cultural anthropology, archaeology, zooarchaeology, and folk culture. Additional information may be obtained from the Anthropology Department.

**THE MASTER'S PROGRAM**

Requirements for the M.A. degree include:

1. For admission, a letter of intent by applicant and submission of three letters of recommendation.
2. A minimum of 45 quarter hours for graduate credit. Thirty-six of these 45 hours must be in anthropology; 9 hours may be taken in closely related disciplines; at least two-thirds of all credit must be at the 5000 level or above.
3. A minimum of three quarters of residence at UT.
4. Introductory statistics course to be taken before taking the Graduate Evaluation Examination.
5. Graduate Evaluation Examination taken during the quarter the student is enrolled in her/his 33rd quarter hour or the first time the examination is given after completing the 33rd hour. The examination is given each year in January.

**THE DOCTORAL PROGRAM**

Requirements for the Ph.D. degree include:

1. Admission to the program through departmental acceptance of a previously earned M.A. degree in anthropology. Students with an M.A. in a field other than anthropology may be admitted by completing other requirements which are described in the departmental brochure.
2. Formation of an advisory committee, and in consultation with that committee, establishment of a program of study, including delineation of field(s) of competence.
3. No minimum credit hour requirement. Students should plan to devote no fewer than four years beyond the B.A. to attain the Ph.D.
4. Foreign language(s), statistics, or some other skill to be determined by the student's committee.
5. Written and oral comprehensive examinations.
6. 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 concepts and objectives in study of culture. Range of
cultural phenomena and approaches to its study. Recommended prereq: 2530. Sp

3440 Religion of Primitive Peoples (3)* Religions of nonliterate peoples. Place of religion in their social and cultural systems and its development. Prereq: 2510 and consent of instructor. 4 hrs. F

3450 Community Studies in Complex Cultures (3) Review of cross-cultural comparative urban and village communities and methodologies used in community studies. Recommended prereq: 2530. A

3530 Peoples and Cultures of Africa (3)* Ethnographic survey of the aboriginal cultures of sub-Saharan Africa. Cultural diversity and human ecology in area perspective. Recommended Prereq: 2530. (Same as Afro-American Studies 3530.) F

3540 North American Indians (3)* An ethnographic survey of cultures of Arctic, Southwest, Plains and Eastern Areas. Emphasis on cultural differences of peoples occupying these areas during precolonial period. Recommended prereq: 2530. Sp

3555 Cherokee Ethnology (3)* Survey of sociopolitical aspects of internal affairs and external relationships from first European contact to present. Emphasis on eighteenth and nineteenth century. Prereq: Consent of instructor. 3 hrs. E


3450 Community Studies in Complex Cultures (3) Review of cross-cultural comparative urban and village communities and methodologies used in community studies. Recommended prereq: 2530. A

4250 Medical Anthropology: Lecture (3) A survey of medical anthropology. Emphasis on Western and non-Western cultural aspects of health, disease, treatment, death, and related concepts. Focus on analyses and descriptions of anthropological fieldwork. A

4300 Readings in Anthropology (1-9)* Intensive reading; problem oriented. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs. A

4240 Field Work in Anthropology (3-9)* Practicum work surveying, excavating, processing, and analyzing of data; intensive reading. Prereq: 2510-20-30 and consent of instructor. May be repeated. Maximum 9 hrs. A

4400 Cultural Ecology (3) Survey of concepts and methods in studying dynamic interaction between cultures and their environments. Topics include ecological theory, methods of analysis, and application from selected case studies. Prereq: 2520, 2530, 3410 or consent of instructor. A

4420 Dynamics of Culture (3) Culture change, innovation, diffusion and acculturation: cultural continuity and stability. Prereq: 2530 or consent of instructor. A

4440 Urban Anthropology (3) Survey of theoretical and methodological issues anthropologists encounter researching cross-cultural urban settlements. Focus on anthropological perspectives on urban problems and planning. Prereq: 3450 or consent of instructor. A

4480 Current Trends in Anthropology (3)* Analytical integrative review in symposium of the current debates, research directions, theories, fieldwork methods, and general assumptions of the four subfields of anthropology: archaeology, physical anthropology, linguistics, and cultural anthropology. Sp

4550 Indians of the Southeastern United States (3) Survey of southeastern Indian cultures; emphasis on original adjustment to environment; lifeways of Southeastern Amerindian groups prior to Euro-American contact. Prereq: 2520, 3540 or consent of instructor W

4560 Cherokee Ethnology (3)* Intensive survey of ideology and material aspects of Cherokee culture existing at time of first European contact. Prereq: 2520, 3540 or consent of instructor W

4590 Method and Theory in American Anthropology (3) Historical development of New World archaeology with emphasis on theory and field techniques. Prereq: 2520 or consent of instructor. Sp

4610 African Prehistory (3) Survey of cultural history in Africa, south of the Sahara, from earliest evidence of human activity to time of European contact. Prereq: 2520 or consent of instructor. (Same as Afro-American Studies 4610.) W

4640 Zooarchaeology (3) Basic osteological studies of vertebrate classes; emphasis on analysis of human utilization of native animals in subsistence and culture. Identification, analysis, and interpretation of archaeologically derived molluscan and vertebrate remains. F

4720 American Folklore (3) Anthropological perspectives of folklore of geographical regions and ethnic groups of the United States. Prereq: 3700 or consent of instructor. Sp

4740 Southern Appalachian Folk Culture (3) Survey of settlement history and economic development of southern Appalachia in relation to traditional culture: technology, subsistence, social organization, beliefs and values, oral traditions, and customs. Prereq: Consent of instructor. F

4741 Research in Southern Appalachian Folk Culture (3) Research-oriented, wide range of traditional culture in Southern Appalachia: settlement patterns, folk housing, economy, clothing, beliefs, speech, art, song, dance, and oral traditions and customs. Prereq: 4740. May be repeated. Maximum 6 hrs.

4760 Italian Folklore (3) (Same as Italian 4760.)

4920 Physical Growth and Constitution (3)* Comparative study of human life cycle, human skeletal and dental maturation; sex differences in growth; human constitutional types. Prereq: 2510 or consent of instructor. F

4940 Biology of Native Americans (3) American Indian origins and evolution from standpoint of skeletal remains and methods and genetics of humans. Emphasis on North American Indians. Prereq: 2510 or consent of instructor. Sp

4950 Primates Studies (3) Survey of field and laboratory investigations of comparative anatomy and non-human primate behavior. Prereq: 2510 or consent of instructor. A


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

5010 Graduate Research (1-9)* Independent investigation of special problems in anthropology. May be repeated. Maximum 18 hrs. E

5100 Seminar in Cultural Anthropology (3-9) F

5101 Foreign Study (1-12) See page 104. F

5102 Off-campus Study (1-12) See page 104. F

5103 Independent Study (1-12) See page 104. F

5140 Seminar in Zoarchaeology (3) Approaches to analysis and interpretation of archaeological faunas. Intensive reading; evaluation and discussion of major faunal studies, guiding principles, and application of presenting faunal data. May be repeated. Maximum 8 hrs. A

5149 Laboratory Studies of the Vertebrate Skeleton (4) Examination and comparison of skeletons of major groups of mammals, amphibians, reptiles, birds, mammals. Oriented toward identification of archaeologically derived faunas. May be repeated. Maximum 8 hrs. Sp, A

5159 Laboratory Study of the Mollusca (4) Examination and identification of terrestrial and freshwater mollusks of eastern U.S. Emphasis on living and archaeologically derived pelecypods. Prereq: 4640. 1 hr and 3 labs. Sp, A

5160 Seminar in Archaeology (3-9) Theoretical and practical issues central to contemporary archaeology. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs. F

5180 History of Thought in American Archaeology (3) Extensive review of continuity and change in concepts and methodologies; contributions of influential anthropologists. Prereq: 2520, 3610 and consent of instructor. F

5200 Special Topics in Anthropology (3)* Lecture and/or seminar course for advanced students on selected topics of current interest to field of anthropology as a whole. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs. S

5210 Community Anthropology: The Local Community (3)* Ethical issues, researcher models and research methods on local community. Prereq: 4440 or consent of instructor. Su

5220 Nutritional Anthropology (3) Anthropological contributions to study of food-related cultural and biological variability in present and past populations. Prereq: 2510, 2520, 2530 or consent of instructor. Recommended: Basic nutrition course. F

5340 Fieldwork in Archaeology (3-9)* Practicum work surveying, excavating, processing, and analyzing of data; intensive reading. Prereq: 9 hours of introductory anthropological anthropology and consent of instructor. May be repeated. Maximum 9 hrs. F

5410 Ethnographic Research Techniques (3) Methods of collecting, ordering, and utilizing data. Prereq: Consent of instructor. A

5420 Anthropological Theory (3) Theoretical developments in cultural anthropology: contributions of leading anthropologists. Recommended prereq: 4410. A

5430 Psychological Anthropology (3) Analysis of relations between individual, society, and culture. Application of psychological techniques in cross-cultural studies of personality, language, and cognition. Prereq: Consent of instructor. A
5460 Quantitative Methods in Anthropology (3) Application of quantitative methods to anthropological data. Correlation and derivative procedures, distance analysis, discriminant analysis, and implementation of computer routines. Prereq: Statistics 2100 or equivalent. F

5470 The Healer in Cross-Cultural Perspective (3) Graduate seminar dealing with socialization, methods of diagnosis, and therapeutic modes of healers in predominantly non-Euro-American milieu. Prereq: 4250. W

5510 Education in Cultural Perspective (3) [Same as Curriculum and instruction 5510.] F

5511 Non-Western Ethnography: Anthropological Approaches (3) Analysis of traditional educational practices among non-Western peoples, problems from application of Western models of education among American Indian, African tribal groups and Asian cultures. [Same as Curriculum and instruction 5511.] W

5600 Theory in Archaeology (3) Review of development of archaeological theory. Coverage up to and including recent systems approaches. F

5610 Problems in North American Archaeology (3) Seminar to explore specific research problems in North American archaeology. Research topics on prehistoric and historic settlement patterns in North America. Prereq: Consent of instructor. May be repeated. Max. 6 hrs. A

5620 Problems in Old World Archaeology (3) Selected topics of 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.)

5640 Archaeological Resource Management (3) Theory and practice—public, conservation, contract, and salvage/research archaeology. Legislation; contracts, responsibilities, and certification; agencies and policies; project design, administration, and logistics; standards of field work, analysis and publication; archaeology and public; conservation archaeology as career. May be repeated. Maximum 6 hrs. W

5650 Archaeology of Southeastern United States (3) Intensive study of prehistoric American Indian. Special emphasis on Tennessee prehistory. Prereq: 3610 or consent of instructor. W, A

5660 Seminar in Prehistoric Lithic Technology (3) Analysis of techniques employed in production of prehistoric lithic industries; raw materials employed; resultant implements, morphology and function; and typological constructs utilized in archaeological analysis. Prereq: Consent of instructor. F

5670 Seminar on Aboriginal Lithic Resources (3) Training and research in stone materials utilized by prehistoric populations—properties, natural occurrence and geological context, relative abundance and quality extraction and distribution, processing and ultimate forms and functions. Theory and implementation of regional resource surveys, discrete regions in terms of lithology and cultural homogeneity, particularly East and Middle Tennessee, input from professional geologists, and field research. Recommended prereq: 5660.

5700 Theory in Folk Culture Studies (2) Seminar analyzing development of theory and method in Euro-American and American folk culture studies. Prereq: Consent of instructor.

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.


5900 Dental Anthropology (3) Dental anatomy, theories of dental evolution, genetic and environmental influences controlling dental morphology, comparative primate dental morphology, dental trait analyses, significance of dentition for skeletal aging, and dental casting. Prereq: 3900. A

5910 Measurement of Man (3) Techniques of measuring and describing skeletal material and human subject with emphasis upon practical application to growth, nutrition, and human engineering. Prereq: Consent of instructor. A

5930 The Human Skeleton in Forensic Medicine (3) Application of physical anthropology to problems in human identification. Determination of age, race, and sex of skeleton and preparation of reports for legal medicine. Prereq: 3900. Sp

5940 Skeletal Biology of Early Human Population (3) Practical and theoretical approaches to analysis of prehistoric human skeletal populations. Demography, vital statistics, pathology, nutrition, and measures of biological relationships as they relate to population as adaptive unit. Prereq: 3900. F

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 Neanderthal Man and Human Evolution (3) Morphological, genetic and evolutionary relationships of Neanderthals. Prereq: 4970 or consent of instructor. W, A

5990 Human Variation (3) Nature of human biological variation with emphasis on microevolutionary processes responsible for establishing and maintaining variation and relationship to variation to population structure. Prereq: 3930 or consent of instructor. A

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

6010 Advanced Graduate Research (1-9) Independent investigation of special problems in anthropology by advanced graduate students. May be repeated. Maximum 18 hrs. Only 3 hrs may count toward 6000-level requirement. F

6220 Seminar in Nutritional Anthropology (3) Analytical review of major theoretical viewpoints in nutritional anthropology. Prereq: 5220 and consent of instructor.

6410-30 Seminar in Cultural Anthropology (3, 3) Seminar. To be offered during the first three quarters of residence completed by the candidate's major area who shall be the candidate's committee chairperson. The candidate's committee will consist of any committee-approved combination of graduate credit courses outside the student's departmental concentration.

6910 Measurement of Man (3) Techniques of measuring and describing skeletal material and human subject with emphasis upon practical application to growth, nutrition, and human engineering. Prereq: Consent of instructor. A

6930 The Human Skeleton in Forensic Medicine (3) Application of physical anthropology to problems in human identification. Determination of age, race, and sex of skeleton and preparation of reports for legal medicine. Prereq: 3900. Sp

6940 Skeletal Biology of Early Human Population (3) Practical and theoretical approaches to analysis of prehistoric human skeletal populations. Demography, vital statistics, pathology, nutrition, and measures of biological relationships as they relate to population as adaptive unit. Prereq: 3900. F

6960 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.

6970 Seminar in Human Paleontology (3) Prereq: 4970 or consent of instructor.

Archaeology—Greek and Roman

See Classics

Art

MAJOR DEGREES

Art M.F.A.


Associate Professors: P. M. Brakke, M.F.A.; R. H. Daehnert, M.F.A.; R. LeFevre, M.F.A. Rochester Institute of Technology; W. E. Leland, M.F.A. Texas; T. C. M. Smith, Ph.D. Chicago; J. Riesing, M.F.A. Nebraska; S. Yates, M.F.A. North Carolina (Greensboro); R. P. Young, M.A. Columbia.


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

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

THE MASTER'S PROGRAM

A minimum total of 90 hours is required:
1. Successful completion of 30 hours of studio in concentration area. Inter-area studios 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. Sixteen hours of Art History for graduate credit, including a minimum of two courses at the 5000 level.
3. 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. Art 5999, Projects in Lieu of Thesis (30 hours) is a third year of semi-independent study. 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.

The candidate's committee will consist of a minimum of 3 members and a maximum of 6 members, and will be appointed prior to registration for Art 5999. Three members of the committee shall be as follows: one from the candidate's major area who shall be the major professor, one from art history, and one from a studio discipline outside the concentration area.

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 work, must satisfactorily complete an oral examination.

Retention and Termination:
1. First year evaluation: At the end of the first three quarters in residence the student must present work for evaluation by the fac-
ulty and receive permission to continue in the program.
2. 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).
3. If, in a review by the student’s major area faculty, the student's progress is deemed insufficient, the faculty may recommend the following: a pause in which work is continued without advancement towards the degree; probation with specific goals set for a specific time; or termination.

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.

3516 Typography (4) Theories and techniques of type-setting and printing as fine art medium. Creative problems using type and printing presses. May be repeated. Maximum 12 hrs.

3704 Medieval Art (4) Byzantine and western art of the Middle Ages: manuscript illumination, mosaics, Romanesque, pilgrimage church, Gothic cathedral
3705 Northern European Painting: 1350-1600 (4) From courtly art of late Middle Ages to Northern Renaissance. Jan van Eyck, Roger van der Weyden, Bosch, and Durer; early printmakers. A
3715 Early Italian Renaissance Art: 1300-1450 (4) Development and exploration of naturalism. Revival of antiquity and development of theories of perspective in Early Renaissance. Duccio, Giotto, Masaccio, Donatello, Botticelli. A
3716 The Art of Italy, 1475-1575 (4) Leonardo da Vinci, Michelangelo, Titian, Raphael, Pontormo and Giorgione. F
3725 Art of Southern Europe and New World, 1500-1830 (4) Tintoretto, El Greco, Caravaggio, Zurbaran, Velasquez, Rembrandt. Relations between Iberia and Latin America. Sp
3726 The Art of Northern Europe 1550-1767 (4) Concentrated study of Bruegel, Rubens, Rembrandt; Georges de la Tour, Vermeer, Poussin and Hals. W
3735 History of Nineteenth-century Painting in Europe and America (4) Emphasis on French, Neoclassicism, Romanticism, Friedrich, Constable, Turner, Corot and Barbizon landscape, Hudson River Group, pre-Raphaelite Brotherhood, Manet, Courbet, Impressionism, Eakins, Homer, Seurat through Cezanne. W
3736 History of Twentieth-century Painting in Europe and America (4) Fauvism, Die Brucke, Cubism, Der Blaue Reiter, Futurism, Dada and Surrealism, geometric abstraction, social-commentary painting, Abstract Expressionism in the U.S.A. and parallels in Europe; Pop, Op, Minimal, and Concept Art. F
3745 History of Modern Architecture in Europe and America (4) Survey of nineteenth-century styles; Sullivan and skyscraper. Twentieth century: Viennese leaders, the Bauhaus, Gropius, Van der Rohe, 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 1800 to 1900; Neoclassicism to Rodin. From 1900 to present: emphasis on Cubism, Constructivism, Expressionism, Abstraction, Primary Forms, Environments, and Earthworks. Sp
3765 History of North American Art (4) Survey of landmarks in painting, architecture, sculpture, and design from prehistory to 1900. F
3766 History of Twentieth-century American Art (4) Analysis of developments in architecture, painting, sculpture, and design from 1900. W
3767 Nineteenth-century American Painting (4) From West and Copley to “The Eight.”
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 Museology (4) Concepts, practices and historical development of museums of art, archaeology, anthropology and science. (Same as Anthropology 3811.)
4008 Special Topics (2-4) Student- or instructor-initiated course offered at convenience of department. Prereq: Determined by department. May be repeated. Maximum 16 hrs.
4015 Individual Problems (4) Prereq: Consent of instructor. May be repeated. Maximum 12 hrs.
4016 Special Topics in Drawing (3) Student- or instructor-initiated course offered at convenience of department. Prereq: Determined by department. May be repeated. Maximum 16 hrs.
4115 Drawing IV (6) Individualized pursuit of personal drawing techniques and concepts; individual and group critiques; weekly life drawing sessions. Prereq 12 hrs 3115. May be repeated. Maximum 18 hrs. E
4206 Special Topics in Painting (3) Student- or instructor-initiated course offered at convenience of department. Does not substitute for basic program. Prereq: Determined by department. May be repeated. Maximum 12 hrs.
4215 Painting IV (6) Advanced painting stressing individual concepts and personal expression with varied media. Prereq: 12 hrs in 3215. May be repeated. Maximum 16 hrs.
4256 Special Topics in Fiber and Fabrics (3) Student- or instructor-initiated course to be offered at convenience of department. Prereq: Determined by department. May be repeated. Maximum 23 hrs.
4270 Fabric: Advanced Projects (4-6) Prereq: 8 hrs of 2370 or consent of instructor. Maximum 12 hrs.
4275 Fiber: Advanced Projects (4-6) Prereq: 8 hrs of 3275 or consent of instructor. May be repeated. Maximum 12 hrs.
4406 Special Topics in Sculpture (3) Student- or instructor-initiated course offered at convenience of department. Prereq: Determined by department. May be repeated. Maximum 16 hrs.
4415 Advanced Sculpture IV (4-6) Individual development of sculptural problems and techniques. Prereq: Consent of instructor. May be repeated. Maximum 16 hrs. E
4470 Advanced Wood Sculpture (4-6) Application of lamination, carving, and jointing techniques in design and construction of contemporary forms. Prereq: 2450 or consent of instructor. May be repeated. Maximum 18 hrs.
4502 Graphic Design/Illustration Practicum (1-15) Practical work experience in design or illustration field only by prearrangement with department. Prereq: Senior or graduate standing and consent of instructor. May be repeated. Maximum 16 hrs.
4505 Advanced Graphic Design (4) Advanced projects in conceptual and applied design for printed materials; publications, posters, advertisements. Prereq: 3545.
4506 Special Topics in Graphic Design/Illustration (3) Student- or instructor-initiated course offered at convenience of department. Prereq: Determined by department. May be repeated. Maximum 12 hrs.
4509 Product Illustration (4) Advanced media, techniques, styles and concepts as applied to illustration of products for printed reproduction. Prereq: 3528 or consent of instructor.
4516 Portfolio and Exhibition Techniques (4) Application of design principles to promotion, construction, display and evaluation for two- and three-dimensional artists. Prereq: Senior or graduate standing or consent of instructor. Sp
4519 Editorial Illustration (4) Advanced study of conceptual approaches in editorial illustration for printed reproduction. Prereq: 4505 or consent of instructor.
4506 Special Topics in Printmaking (3) Student- or instructor-initiated course offered at convenience of department. Prereq: Determined by department. May be repeated. Maximum 16 hrs.
4519 Intaglio IV (4-6) Photographic, collage techniques, combine printing with other print media. Prereq: May be repeated. Maximum 18 hrs. F, W, Sp
4529 Intaglio IV (4-6) Extensive use of aluminum plates, color combine printing, photographic techniques. May be repeated. Maximum 18 hrs. F, W, Sp
4576 Metal Design IV: Advanced Projects (4-6) Prereq: 3965. May be repeated. Maximum 18 hrs.
4706 Special Topics in Art History (4) Student- or instructor-initiated course offered at convenience of department. Prereq: Consent of department. May be repeated. Maximum 16 hrs.
4720 History of Printmaking (4) Survey of prints from fifteenth century to present. Twentieth century in Europe and the U.S. Prereq: 1815, 1825.
4811 Museum Internship (1-15) Prereq: 8 hrs from 3811-21-31 and consent of instructor. May be repeated. Maximum 16 hrs.
4855 Studies in Art History (2) Concentration in selected area. Prereq: 18 hrs of art history and consent of instructor. May be repeated. Maximum 6 hrs.
4905 Advanced Photography (4-6) Individual development of photographic problems and techniques. Prereq: 3905, 3915, 3925. May be repeated. Maximum 18 hrs.
4906 Special Topics in Photography (3) Student- or instructor-initiated course offered at convenience of department. Prereq: Consent of department. May be repeated. Maximum 12 hrs.
4956 Special Topics in Ceramics (2) Student- or instructor-initiated course offered at convenience of department. Prereq: Determined by department. May be repeated. Maximum 12 hrs.
4968 Honors Ceramics IV: Advanced Projects (4-6) Prereq: 3900, 3960, and consent of instructor. May be repeated. Maximum 18 hrs.
4975 History of Ceramics Seminar (4) Historical and contemporary ceramics: clay sculpture, architecture, and pottery. Oriental, Ancient Greek, Pre-Columbian, and American ceramics. May not be used toward art history requirements. Prereq: 2950, 2960, and 2970.
5000 Thesis (1-15) P/NP only. E
Audiology and Speech Pathology/College of Liberal Arts

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

5011-21-31 Exhibition in lieu of Thesis (3, 3, 3) S/NC only. E

5101 Foreign Study (1-12) See page 104.

5102 Off-campus Study (1-12) See page 104.

5103 Independent Study (1-12) See page 104.

5115 Graduate Drawing I (2-6) May be repeated. Maximum 18 hrs. F, W, Sp


5215 Graduate Painting I (2-6) May be repeated. Maximum 18 hrs. F, W, Sp


*5325 Graduate Watercolor II (2-6) May be repeated. Maximum 18 hrs. F, W, Sp.


5706 Special Topics in Art History (4) Student- or instructor-initiated course offered at the convenience of department. May be repeated with consent of department. Maximum 12 hrs.

5710 Studies in Medieval Art (4) Art and architecture of the Middle Ages: major monuments from Byzantium or western Europe. Prereq: M.F.A. candidate or consent of instructor. May be repeated with consent of department. Maximum 8 hrs.

5720 Studies in Baroque Art (4) 17th century art and architecture: major artists and works from either southern or northern Europe. Prereq: M.F.A. candidate or consent of instructor. May be repeated with consent of department. Maximum 8 hrs.

5730 Studies in Italian Renaissance Art (4) Art and architecture of the 14th, 15th and 16th centuries in Italy. Early or High Renaissance or Mannerist periods. Prereq: M.F.A. candidate or consent of instructor. May be repeated with consent of department. Maximum 8 hrs.

5740 Studies in Modern Western Art (4) Selected topics in 19th and 20th century western art. Prereq: M.F.A. candidate or consent of instructor. May be repeated with consent of department. Maximum 8 hrs.

5750 Studies in Modern American Art (4) Selected topics in 19th and 20th century American art. Prereq: M.F.A. candidate or consent of instructor. May be repeated with consent of department. Maximum 8 hrs.

5760 Studies in Asian Art (4) Selected topics in Japanese or Chinese art. Prereq: M.F.A. candidate or consent of instructor. May be repeated with consent of department. Maximum 8 hrs.

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. S/NC only. E

*Graduate II courses must be preceded by successful first year evaluation by the faculty.

Courses listed below offered periodically only at the Pi Beta Phi Arrowmont School of Crafts, Gatlinburg, Tennessee. Courses may be repeated.

4004 Special Topics I (1-4) Student- or instructor-initiated course offered at convenience of department.

4104 Drawing I (1-4) Intermediate to advanced.

4204 Painting I (1-4) Intermediate to advanced.

4254 Fibre Processes I (1-4) Intermediate to advanced.

4264 Fibre Construction I (1-4) Intermediate to advanced.

4274 Fabric Surface Design I (1-4) Intermediate to advanced.

4284 Fibre Constructions I (1-4) Intermediate to advanced.

4304 Watercolor I (1-4) Intermediate to advanced.

4404 Sculpture I (1-4) Intermediate to advanced.

4504 Communication Design I (1-4) Intermediate to advanced.

4604 Printmaking I (1-4) Intermediate to advanced.

4654 Metal Design I (1-4) Intermediate to advanced.

4664 Enameling I (1-4) Intermediate to advanced.

4904 Photography I (1-4) Intermediate to advanced.

4954 Ceramics I (1-4) Intermediate to advanced.

Audiology and Speech Pathology

MAJORS

Speech and Hearing Science

Speech Pathology

DEGREES

M.A.

Ph.D.

M.A.

Professors:

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

Associate Professors:

S. B. Burchfield, Ph.D., Michigan State; C. J. Ferrell, Ph.D., Tennessee.

Assistant Professors:

A. O. Dielofner, Ph.D., Washington; E. Hambly, Ph.D., Iowa; J. Robinson, Ph.D., Wayne State.

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 practitioner in any clinical environment. Within this broad coverage of speech pathology or audiology, it is possible for a student to specialize to some extent. For example, in the M.A. in Audiology program, a student may concentrate in audiological assessment, aural rehabilitation-rehabilitation, medical or pediatric or industrial audiology. Within the M.A. in the Speech Pathology program, a student may concentrate in language disorders, cultural language differences, or speech disorders such as aphasia or stuttering. Students interested in specializing beyond the typical M.A. program should consult the department office or their advisor for lists of suggested courses, practica and independent studies.

Students majoring in the two areas are expected to complete the academic requirements for clinical certification from the American Speech and Hearing Association, including the required number of clock hours of clinical practicum. An exception to this rule must be approved by the Department Curriculum Committee. Enrollment in clinical practicum courses 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 two-thirds 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. Students in the non-thesis program must present a total of 48 quarter hours of approved graduate credit and pass a final written examination. No more than 9 quarter hours of credit for practicum will be counted toward the degree requirements for thesis or non-thesis students. A minimum of 32 quarter hours must be at the 5000 or 6000 level. The decision as to choice of the thesis or non-thesis option 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 students into future 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 programs of study will be determined by the student in consultation with his/her faculty committee. In addition to the general Graduate School requirements, specific requirements for the degree of Doctor of Philosophy in Speech and Hearing Science will include:

1. Successful completion of course work in the study of one or more research tools, or other specific scientific methodological vehicles pertinent to the research interests of the candidate. The choice of research tools is subject to departmental approval.
2. A minimum of 9 quarter hours of graduate credit obtained in course work in a cognate field outside the Department of Audiology and Speech Pathology. These hours are in addition to those required in item 1 above.
3. Sufficient course work within the department but outside the area of specialization to give a broad foundation and understanding.
4. A comprehensive examination to demonstrate a general knowledge of the basis of audiology, speech and language pathology, and specific knowledge in each of the advanced knowledge of the specific areas of specialization.
5. Research and dissertation to give at least 36 hours of graduate credit (6000 level).
6. A final oral examination.

4040 Appraisal of Speech and Language Disorders (4) Diagnostic procedures for children and adults with speech and language problems including observation and practice with diagnostic tests. Prereq: 3200, 4330, or consent of instructor. (Same as Special Education 4040.) F, Sp
4070 Free Association (4) Oral and written free association as process for diagnosing and treating speech and language disorders. Prereq: 3200, 4330, or consent of instructor. (Same as Special Education 4040.) F, Sp
4250 Introduction to the Psychology and Education of the Hearing Impaired (3) (Same as Special Education 4250.)
4310 Stuttering (3) Nature and treatment. Review and integration of various theories. Prereq: 3200 or consent of instructor. (Same as Special Education 4310.) F, Su
4320 Introduction to Clinical Practice in Speech Pathology (3) Prereq: 3040, 3050, 3310, and consent of instructor. (Same as Special Education 4320.) F, Sp
4330 Clinical Practice in Speech Pathology (1-6) Prereq: 4320 and consent of instructor. (Same as Special Education 4330.) Audiology and Speech Pathology is the primary department. E
4340 Clinical Practice in Speech Pathology (1-6) Prereq: 4040, 4330 and consent of instructor. (Same as Special Education 4340.) May be repeated. Maximum 45 hrs. E
4400 Voice Disorders (4) Etiology, diagnosis, and treatment of organic and functional voice disorders. Prereq: 3040, 3065, or consent of instructor. (Same as Special Education 4400.)
4450 Clinical Practice in Audiology (1-6) Prereq: 4720 and 4930. E
4460 Clinical Practice in Audiology (1-6) Prereq: 4450, 4720, and 4930. E
4470 Clinical Practice in Audiology (1-6) Prereq: 4460, 4720, and 4930. May be repeated. Maximum 9 hrs. E
4520 Speech Pathology (3) Independent study of special problems in speech pathology. Prereq: Consent of instructor. E
4550 Problems in Speech Pathology (1-6) Prereq: Consent of instructor. E
4560 Problems in Audiology (1-6) Prereq: Consent of instructor. May be repeated. Maximum 6 hrs. E
4610 Introduction to Language Pathology in Children (4) Nature and treatment of language retardation. Observation in language clinic is available. Prereq: 3040, 3200, or consent of instructor. F, Sp
4620 Birth Defect Syndromes and Language Retardation (3) Examination of research literature relevant to birth defects and language retardation including clinical, educational and socioemotional implications of such disorders. Prereq: 4610 or consent of instructor. W
4630 Practical Applications of Language Habilitation Techniques (3) Discussion and demonstration of various methods and procedures used in treating language retarded children. Prereq: 4610 or consent of instructor. W
4640 Parent Participation in Language Habilitation Programs (3) Nature of counseling and educational relationships with parents of exceptional children including emotional support for families, behavior management strategies, home training methods. Prereq: 4610 or consent of instructor. Sp
4650 Speech and Language of the Culturally Different Child (3) Discussion of speech and language differences of children of various minority groups, of different ethnic and class membership and from different geographic regions; their causes, and their effects upon educational programs. F, W, Su
4660 Topics in Language Retardation and its Habilitation (3) Lectures on selected topics by representatives of such fields as special education, early childhood education, educational psychology, genetics, and psychology. Prereq: 4610 or consent of instructor. Su
4720 Audiology II (4) Basic principles of clinical audiometry; pure-tone, speech, masking and overview of special auditory tests. Prereq: 3710. (Same as Special Education 4720.) W, Su
4930 Aural Rehabilitation: Speechreading and Auditory Training (3) Rehabilitation of acoustically impaired by maximizing use of residual hearing and utilizing speechreading as receptive communicative process. Prereq: 4720. (Same as Special Education 4930.) F, W, Su
4940 Introduction to the Verbo-Tonal System (4) Prereq: 3710. Recommended prerequisite for 3350. (Same as Special Education 4940.) F, W, Su
5000 Thesis (1-15) P/NP only. E
5002 Non-Thesis Graduation Completion (3-15) Required for the non-thesis student not otherwise registered during any quarter when such a student uses university facilities and/or faculty time before degree is completed. May be used toward degree requirements. May be repeated. S/NC only. E
5005 Thesis Equivalent Research (1-9) Prereq: 5110 and M.A. in Speech Pathology or Audiology or equivalent. May be repeated. Maximum 9 hrs.
5040 Advanced Clinical Practice in Audiology Study and Practice (1-4) Prereq: 4720 and 4930. May be repeated. Maximum 12 hrs. (Same as Special Education 5040.) E
5041 Advanced Clinical Practice in Audiology: Off-Campus Sites (1-6) Prereq: Consent of instructor. E
5045 Practicum in Hearing Aid Orientation and Communication Counseling (1-6) Practical exposure to counseling hard of hearing and family members concerning use and expectations of hearing aids, suggestions for better use of communication skills. Prereq: 4720, 4930, and consent of instructor. May be repeated. Maximum 9 hrs. E
5050 Practicum in Verbo-Tonal Habilitation (1-6) Prereq: 4940, 5950, or consent of instructor. May be repeated. Maximum 9 hrs. E
5051 Practicum in Aural Rehabilitation (1-6) Prereq: 4720 and 4930. May be repeated. Maximum 9 hrs. E
5060 Neural Bases of Speech and Language (3) Structure and function of central and peripheral nervous systems, with emphasis on their role in speech and language. Prereq: 3065. F, W
5070 Anatomy and Physiology of Hearing (3) Structure of human ear; pathologies of hearing impairment, and psychoacoustics of audition. Prereq: 3710. F
5071 Electrophysiological Assessment of Auditory Function (2) Techniques for electrophysiological measurement of auditory sensitivity, sound transmission by ear, distortion in ear, and ear as analytic mechanism. Prereq: 4720, 5070 or consent of instructor. Sp
5100 Comparative Anatomy of the Peripheral Auditory Structures (3) Tutorial laboratory course in comparative anatomy of temporal bone employing microscopic dissection techniques. Prereq: 5070 or consent of instructor. E
5110 Introduction to Research in Speech and Hearing (3) Analysis of research techniques, application of statistics, and completion of pilot research project. Prereq: Elementary statistics. F, W, Su
5117 Instrumentation in Audiology and Speech Pathology (3) Principles of instrumentation used in audiology and speech pathology. Prereq: 3010. W, Sp
5119 Laboratory in Instrumentation in Audiology and Speech Pathology (1) Laboratory assignments designed to familiarize student with instruments for measuring speech and hearing processes. Prereq: 5117. E
5200 Seminar in Stuttering (3) Current significant research in problem of stuttering. Prereq: 4310 or consent of instructor. W, Su
5201 Aphasia (3) Historical review of aphasia literature, theories of brain functioning, aphasia classification and terminology, tests and rationale for testing, etiology, therapy considerations and prognosis for recovery. Prereq: 5060 or equivalent or consent of instructor. W, Su
5220 Seminar: Articulation Disorders (3) Current significant research in therapy and management of articulation disorders. Prereq: Undergraduate course in articulation disorders or consent of instructor. F, Sp
5230 Seminar: Voice Disorders (3) Current significant research in theory and management of voice disorders. Prereq: 4400 or consent of instructor. W, Su
5230-39-40 Advanced Clinical Practice in Speech and Language Disorders (1-4) Prereq: 4340 or consent of instructor and consent of instructor. May be repeated. Maximum 9 hrs. E
5350-60-70 Advanced Clinical Practice in Speech-
5351. Advanced Clinical Practice in Speech-Language Pathology: Public Schools (1-6) Prereq: 100 hrs clinical experience, consent of instructor. May be repeated. Maximum 9 hrs each.

5380. Cerebral Palasy (3) Neurological foundations and speech and language training. Prereq: 5050. (Same as Special Education 5380.) F

5381. Adult Dysarthia (3) Neuromotor organization for articulation, speech production, types of adult dysarthria and associated neuromuscular symptomatology; diagnosis and management of adult dysphasic speakers. Prereq: 5060. Su

5390. Cleft Palate (3) Etiology, diagnosis and clinical management of cleft palate speakers, emphasis on speech. Prereq: 3310. (Same as Special Education 5390.) W, Su


5450. Sound Measurement and Audiometer Caliberation (3) Noise measuring systems and techniques; factors in military and industrial audiology, role of audiologist in industry. Prereq: Basic Acoustics or consent of instructor. W

5461. Noise and Audiology (3) Audiologist's role in noise-related activity, clinical, legal and consulting applications. Prereq: 5450 or consent of instructor.

5460. Advanced Audiology (3) Theory and practice of advanced pure tone and speech audiometry; instrumentation and interpretation of audiometric findings with differential diagnosis. Prereq: 4720. F

5470. Impedance Measurement in Audiology (2) Theoretical considerations behind emergence of impedance measurement in clinical measurement of hearing. Practical experience in using several impedance measuring devices. Prereq: 4720 and 5070. W


5500. Seminar in Audiology (1-6) Significant research in various areas of audiology. Prereq: Consent of instructor. May be repeated. Maximum 16 hrs. F, Sp

5503. Special Auditory Tests (3) Theoretical and practical considerations of auditory procedures used for differential diagnosis of cochlear vs. retrocochlear auditory lesions, identifying central auditory lesions and nonorganic hearing loss. Prereq: 5460 G

5565. Special Problems in Audiology (1-9) Prereq: 4720 or equivalent and consent of instructor. May be repeated. Maximum 8 hrs. E

5570. Seminar in Speech Pathology (3) Current significant research in speech pathology. Topics vary from quarter to quarter. Prereq: 12 hrs in speech pathology. May be repeated with consent of department. Maximum 12 hrs. E


5550. Special Problems in Speech Pathology (1-3) Prereq: Consent of instructor. May be repeated. Maximum 6 hrs. E

5560. Independent Study in Speech Pathology (1-3) Prereq: Consent of instructor. May be repeated. Maximum 6 hrs. E

5570. Management and Supervision for Speech-Language-Hearing Professionals (3) Management systems, accountability, performance appraisal and clinical supervision. Interaction with families and speech language pathologists interested in private practice, supervisory or administrative positions. Su

5600. Independent Study in Audiology (1-6) Special reading, consultation, and research activities in field of audiology. May be repeated. Maximum 6 hrs. E

5610. Practicum: Language Pathology in Children (3) Seminar on clinical practice involving discussion and utilization of testing tools and analyses of habitable philosophies, specialties and techniques. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs.

5651. Seminar in Language Differences (3) Significant research in relevance of culture to different children. Prereq: 4850. Su

5730. Hearing Disorders (3) Advanced study of auditory disorders commonly encountered in medical environment. Includes exploratory and investigatory procedures to differentiate lesions of auditory mechanism. Field trips may be required. Prereq: 4720 or equivalent and 5070. F

5740. Pediatric Audiology (3) Advanced study of theoretical and practical considerations of procedures to evaluate hearing of infants and small children. Prereq: 4720 or equivalent. W

5750. Educational Audiology (3) Advanced case management of hearing impaired child; audiology follow-up; educational alternatives, teacher and parental counseling, social adjustment, classroom acoustics and psychological analyses of speech production and perception. Prereq: 5040 and 5440. F, W, Su

5790. Seminar in Psycholinguistic Concepts in Speech Pathology (3) Psycholinguistic concepts and information theory in studying the normal acquisition of language and certain disorders of language. Prereq: Consent of instructor. (Same as Psychology 5790.) Sp


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

6010. Experimental Phonetics (3) Acoustical and physiological analyses of speech production and perception. Prereq: 5119 or consent of instructor.

6010. Experimental Phonetics (3) Acoustical and physiological analyses of speech production and perception. Prereq: 5119 or consent of instructor.

6019. Experimental Phonetics Laboratory (2) Must be taken concurrently with 6010.

6020. Psychoacoustics (3) Auditory reception and perception of non-speech stimuli. Prereq: 8010. W

6029 Psychoacoustics Laboratory (2) Must be taken concurrently with 6020. W

6060. Advanced Speech Physiology (3) Physiology of speech production and theories of speech motor control. Prereq: 5060 or equivalent. Sp

6069 Speech Physiology Laboratory (2) Techniques involved in physiological analysis of speech production. Coreq: 6060. Prereq: 5060 or equivalent. Sp

6070 Advanced Anatomy and Physiology of Hearing Mechanism (2) Prereq: 5070 or equivalent. W, A

6071. Advanced Clinical Concepts and Models in Hearing Science (2) Prereq: 6070 or consent of instructor.

6072. Advanced Study of Auditory Neurophysiology (2) Prereq: 6071 or consent of instructor.

6080 Seminar in Speech Science (3) Advanced study of experimental areas such as speech physiology, acoustical analysis, recognition, perception and intelligibility of speech, communication and auditory, and psycholinguistic measurement of speech and language. Topics vary from quarter to quarter. Prereq: 5010 or consent of instructor. May be repeated. Maximum 9 hrs. Sp, W, A

Biochemistry

Major:

Biochemistry

M.S., Ph.D.

Directors:

Professors: W. D. Wicks (Head), Ph.D. Harvard; J. E. Churinich, Ph.D. Sheffield (England); L. Huang, Ph.D. Michigan State; J. G. Joshi, Ph.D. Poona (India); K. J. Monn Ph.D. Rochester; T. P. Sato (Emelius), Ph.D. Michigan.

Assistant Professors: A. H. Farnham, Ph.D. California (Berkeley); E. Frewer, Ph.D. Virginia; J. W. Knott, Ph.D. Kentucky.

Adjunct Faculty: W. Farkas, Ph.D. Duke; S. Kennel, Ph.D. California (San Diego); B. Lewis, Ph.D. Yale.

The graduate program involves successful completion of a comprehensive examination and extensive research leading to the Ph.D. dissertation and its oral defense. The MASTER'S PROGRAM

This program requires about two years of full-time study and provides both breadth and depth of training in courses of graduate instruction with research laboratory experience. Students completing this program will have a sound foundation in modern biology and chemistry and will be equipped to follow and absorb future advances in these fields. Recent graduates of this program are now involved in such occupations as: industrial pharmaceutical research, junior college and high school teaching, hospital and university laboratory work, cancer research, scientific journalism, and pursuit of Ph.D. degrees.
Candidates usually should offer course work covered by an undergraduate major in the biological sciences, chemistry or biochemistry. 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:

a. Introductory Organic Chemistry with laboratory (at least one year), and a minimum of three quarters of approved physical chemistry.

b. At least two courses selected from the following: Biochemistry 6410, 6510.

c. At least 9 hours of advanced lecture-seminar courses from the following: Biochemistry 5410, 6010.

d. At least 9 hours of Master's research and at least one semester in the biological sciences, chemistry or biochemistry.

The DOCTORAL PROGRAM

An incoming student must present course work covering at least an undergraduate major in the biological sciences, chemistry or biochemistry. Departmental requirements for the awarding of the Ph.D. include mastery of the subject matter indicated in the following list of courses.

1. Introductory Organic Chemistry with laboratory (at least one year), Introductory Physics, Differential and Integral Calculus, and the major of three quarters of approved physical chemistry (Biochemistry 4210-20-30 or Chemistry 3410-20-30) and at least 18 hours of biology beyond the introductory level including at least 3 hours of genetics and 3 hours of physiology.


3. At least two quarters of approved graduate courses in chemistry, physics, or other physical sciences, for example: Chemistry 5110-20-30-35, Chemistry 5340, Physics 5210-20-30, Physics 5440, Physics 5510-20-30. No survey or review courses will be allowed.

4. At least two courses selected from 6110-20-30-40-60-60.

5. Participation in Biochemistry 6410 and in the Advanced Biochemistry Seminar (6010) during the entire period of residence.

6. Comprehensive examination: usually taken after the second year of study.

7. A dissertation reporting the results of original and significant research carried out during the term of candidacy.

8. A final oral examination which will be concerned primarily with the student's dissertation.

Petitioning for Master's degree: Students who have passed the comprehensive examination in the Ph.D. program and have completed at least 45 hours of approved course work for graduate credit, at least two-thirds of which must be at or above the 5000 level, may petition the department for award of a Master's degree. The additional requirements for such a degree shall be:

a. The preparation of a research manuscript suitable for submission for publication in a major scientific journal; and oral defense of that manuscript to an examining committee of three faculty members appointed by the head of the department, at least two of whom shall be members of the department.

b. Publication at least once full-length paper in a major biochemical journal as senior author.

4110-20 Cellular and Comparative Biochemistry (4, 4) Electrolyte behavior; chemistry and structure of proteins; enzyme behavior and biological function; catabolism; energy; nuclear biochemistry; nucleic acid function, protein synthesis and biochemical genetics; regulation of biological processes. Must be taken in sequence. Prereq: Chemistry 3211-21-31, 3219-29-39, and 1 course from Biology 1210-20-30 or Botany 1110-20-30. 3 lectures and discussion. F, Sp.

4119 Cellular and Comparative Biochemistry Lab (2) Basic analytical and biochemical procedures in biochemistry and molecular biology. pH titrations, spectrophotometry, chromatography, electrophoresis, sedimentation and assays. Prereq or coreq: 4110 or equivalent. F, W.

4129 Cellular and Comparative Biochemistry Lab (2) In depth experiments with enzymes, nucleic acids and membranes; synthesis and metabolism; hybridization, sequencing, sedimentation, radiotopic labeling, and immunological analysis. Prereq or coreq: 4110-20 and 4119. Sp.


4210-20 Introduction to Physical Biochemistry (3, 3) Introduction to thermodynamics; phase stability and phase change; chemical potential; osmotic pressure; activity and the Debye-Huckel model; electrochemistry; permeability; Elements of statistical mechanics, diffusion; collision theory, chemical kinetics and transition state theory, higher order kinetics and transition state theory, higher order kinetics; specialized kinetics of enzymatic processes; some biocomputer considerations. Prereq. Mathematics 1840-50-60, Chemistry 3211-21-31 and 3219-29-39, and an introductory course in biology. F, W.

4230 Introduction to Physical Biochemistry (3) Physical characteristics of macromolecules; excitation energies; absorption and fluorescence, sedimentation and transport hydrodynamics; electrophoretic mobility, light scattering, and structural x-ray crystallography of proteins and nucleic acids. Prereq: 4220 or Chemistry 3430, or equivalent. Sp.

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

5300 Graduate Research Participation (3-9) May be repeated. Maximum 12 hrs.

5310 Experimental Techniques (3) Laboratory course in modern experimental methodology and instrumentation. Intended primarily for graduate students. Prereq: Consent of instructor.

5320-30 Experimental Techniques (3) Laboratory rotations. Student works in laboratory of faculty member on clearly defined project. Written proposal and oral report required. Intended primarily for departmental graduate students. Prereq: 5310. W, Sp.

5450 Special Topics (1-3) Registration only prior to arrangement with department. May be repeated.

5510-20-30 Advanced Biochemistry (3, 3, 3) Topics in biochemistry and molecular biology. Prior knowledge expected. Experimental approaches to current problems in biochemistry and molecular biology. Designed for graduate students in biological sciences. May be taken for graduate credit, or equivalent, or consent of department. F, W, Sp.

5610 Environmental Toxicology (3) Basic concepts in toxicology, interactions at subcellular, cellular, organ, organ, population, and environmental levels, legal aspects, major emphasis on biochemical toxicology. Prereq: 4116-20. Chemistry 3211-21-31, Chemistry 4910-20-30, or consent of instructor. (Same as Ecology 5614) W.


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


6110 Advanced Topics in Biochemistry and Biophysical Methods (1-3) Application of modern biological and biophysical techniques to the study of the structure and function of biological macromolecules and membranes. Static and time-resolved fluorescence spectroscopy, calorimetry, magnetic resonance, x-ray crystallography, gene cloning, hybridization technology, electron microscopy, and others. Prereq: 5510-20-30 and 4230.

6129 Advanced Topics in Mechanisms of Enzyme Catalysis (3) Enzyme functions and mechanisms of catalysis; rate accelerations; enzyme-substrate complementarity; theories of catalysis; measurements and magnitude of catalytic rate constants; rapid mixing techniques; relaxation methods; rate-determining processes; group transfer reactions; oxidations and reductions; eliminations, isomerizations and rearrangements and reactions that make and break carbon-carbon bonds. Prereq: 5510-20-30 and 4220.


6140 Advanced Topics in Membrane Structure and Function (1-3) Structural organization of biological membrane components, dynamic properties as studied biophysically and structurally, selected topics of membrane functions related to structural organization. Prereq: 5510-20-30.

6150 Advanced Topics in Metabolic Regulation (1-3) Energy metabolism, current advances in regulation by metabolites or hormones; regulation due to ligand interactions or covalent modification; hormone-receptor interactions, internalization, degradation and recycling. Prereq: 5510-20-30.


6170 Current Topics in Biochemistry (1) Seminars and lectures dealing with current advances in field of chemical biology. May be repeated with consent of department. S/NC only. F, W, Sp.


6431 Current Topics in Environmental Toxicology (1) Critical reviews of research problems and methods in environmental toxicology; behavioral toxicology; biochemical and ecological effects, bioassays and...
epidemiology. Presentations by students, faculty and guest lecturers from academia and industry. May be repeated with consent of department. Maximum 6 hrs. (Same as Ecology 6431.) S/NC only. F, W, Sp

6440 Current Topics in Regulation of Protein Function (1) Covalent modifications of proteins by phosphorylation-dephosphorylation, allosteric interactions, etc. Prereq: 4110-20 or equivalent. May be repeated. Maximum 9 hrs. S/NC only. F, W, Sp

6450 Advanced Special Topics (1-3) Registration only by prior arrangement with department. For students who have passed Ph.D. preliminary examination or the advanced state of graduate studies. Topic title posted in advance. May be repeated. Maximum 9 hrs.

Biography

1550 Scientific Illustration (3) Introduction to design and production of graphs, charts for scientific illustration; planning of poster presentations and displays. No graphics background required. Prereq: Advanced standing in a science curriculum; consent of instructor.

Botany

MAJOR DEGREES

Botany M.S., Ph.D.

Professors: R. W. Holton (Head), Ph.D.; D. Michie; J. D. Caponnet; Ph.D.; D. Harvard; E. C. Clebsch; Ph.D. Duke; H. R. DeSelph, Ph.D.; Ohio State; A. M. Evans, Ph.D.; Michigan; W. T. Herrnhut; Ph.D.; Vanderbilt; K. W. Hughes, Ph.D.; Utah; L. W. Jones, Ph.D.; Texas; J. F. McCormick, Ph.D. Emory; F. H. Ph. Ohio State; R. H. Petersen, Ph.D.; Columbia; A. J. Sharp (Emeritus), Ph.D.; Ohio State; H. H. Shugart, Ph.D.; Ohio State; R. R. Henke, Ph.D. Miami (Ohio); C. C. Amundsen, Ph.D. Colorado; A. S. Heilman, Ph.D.

Associate Professors: C. C. Amundsen, Ph.D.; Colorado; A. S. Heilman, Ph.D.; Ohio State; R. R. Henke, Ph.D.; Miami (Ohio); L. G. Kickok, Ph.D.; Massachusetts; B. Mullen, Ph.D.; North Carolina State; O. J. Schwarz, Ph.D.; North Carolina State; W. G. Smith, Ph.D.; Duke.

Assistant Professors: E. E. Schilling, Ph.D.; Indiana; D. K. Smith, Ph.D.; Tennessee; B. E. Wolford (Curator), Ph.D.; Tennessee.

*Alumni Distinguished Service Professor

The Department of Botany offers the Master of Science and Doctor of Philosophy degrees with concentrations in anatomy, botany, cytology, cytogenetics, ecology, genetics, lichenology, morphological, mycology, photobiology, physiology, phycology, pteridology, and taxonomy.

Educational service is required of each graduate degree candidate and such service will include teaching and/or ancillary services performed in the department related to the instruction of courses.

For further information, contact the Department Head or the Graduate Coordinator.

Requirements for Admission: The Botany Department requires scores from the general and subject matter portions of the Graduate Record Examination, at least three letters of recommendation or standard recommendation forms from academic or professional persons, a short statement describing reasons for interest in graduate education in botany, and the following specific courses: (1) general botany or biology, 12 quarter hours; (2) advanced botany or closely allied biological sciences, 16 quarter hours; (3) physical sciences; general inorganic chemistry, 12 quarter hours organic chemistry and physics highly recommended; (4) college mathematics, 9 quarter hours.

THE MASTER'S PROGRAM

Thesis Option: 1. Satisfactory preparation of a written formulation and as oral defense to the student's committee of a research proposal suitable for a thesis problem. Must be completed before enrollment in Botany 5000. 2. Demonstrated reading proficiency in one modern foreign language or in the use of computers for data analysis. Proficiency in a foreign language may be demonstrated by satisfactory performance on an examination or an oral examination with a grade of A or B of the following computer science courses or the equivalent: Computer Science 1510 or 1610, Computer Science 2710, and Computer Science 4310 or 4850. 3. Satisfactory completion of 9 credit hours at the 6000 level. 4. Presentation of a written thesis and its oral defense. 5. Participation in an annual departmental seminar.

Non-Thesis Option: 1. Satisfactory completion of 51 quarter hours of approved graduate courses of which 30 quarter hours must be in botany including Botany 5003 and 5004. 2. Satisfactory completion of 2 credit hours at the 6000 level. 3. Satisfactory performance on a final written examination on all work offered for the degree. A Thesis in Botany 5003 or German 3030 (can also be applied to the doctoral program) Proficiency in computer use may be demonstrated by satisfactory completion with a grade of A or B of the following computer science courses or the equivalent: Computer Science 1510 or 1610, Computer Science 2710, and Computer Science 4310 or 4850.

The DOCTORAL PROGRAM

1. Satisfactory presentation of a written formulation and oral defense to the student's committee of a research proposal suitable for a dissertation problem. Must be completed before enrollment in Botany 6000. 2. Satisfactory performance on a written and oral comprehensive examination. 3. Presentation of one or more cognate areas outside of the department totaling 9 graduate credit hours with at least a B average. 4. Satisfactory performance on an examination in one modern foreign language or an A or B in French 3030 or German 3030. 5. Satisfactory completion of 9 credit hours at the 6000 level (excluding dissertation). 6. Preparation of a written dissertation and its oral defense. 7. Presentation of an oral defense seminar near the end of the doctoral program.

Note: Graduate School requirements are denoted by an asterisk. These requirements should be interpreted as minimal requirements and specific stipulations or additional requirements may be required by the individual student's faculty committee.

**3010-20 Plants in Evolution (4, 4) Monera to angiospermae; emphasis on evolutionary relationships, morphology and development. Prereq: 6 hrs. in biological sciences. F, W**

**3030 Field Botany (4) Study of plants in natural environments including plant identification, 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, Sp**

**3050 Socioeconomic Impact of Plants (3) Significance of plants in origin and development of human cultures, evolution of cultivated plants, and role of plants in present civilizations. Occasional field trips. Sp, Su**

**3070 Genetics and Society (3) An introduction to genetics, anthropology and evolution with emphasis on their implications for human society. (Same as Anthropology 3070.) W**

**3090 Biology and Human Affairs (3) Basic biologi- cal principles involved in preservation and deterioration of an environment in which human cultures may survive. F**

**3210 Introductory Plant Physiology (4) Organismal physiology of plants; water relations, mineral nutrition, photosynthesis, growth 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, Su**

**4017 Field Mycology (3) Field experience on identification of higher fungi. Frequent field trips, field recognition of species and habitats, laboratory ses- sions. Prereq: 3010-20 or equivalent. Recommended prereq: 3010-20 or equivalent. Sp, A**

**4021 Field Bryology (3) Field experience on identification of mosses and liverworts. Frequent field trips, field recognition of species and habitats, laboratory ses- sions. Prereq: 6 hrs of botany. Recommended prereq: 3010-20 or equivalent. Sp, A**

**4022 Field Lichenology (3) Field experience on identification of lichens. Frequent field trips, field rec- ognition of species and habitats; laboratory sessions. Prereq: 6 hrs botany. Recommended prereq: 3010-20 or equivalent.**

**4023 Field Agrostology (3) Field experience on identification of grasses. Frequent field trips, field recognition of species and habitats; laboratory ses- sions. Prereq: 6 hrs botany. Recommended prereq: 3010-20 or equivalent. Sp, A**

**4030 Mechanisms of Plant Speciation (3) Processes of plant speciation emphasizing population genetics, isolation, drift, hybridization, variation in popu- lations, establishment of population barriers and other aspects of plant speciation. Prereq: 3010-20 and Biol- ogy 3110. W**

**4045 Aquatic Vascular Plants (3) Field experience on identification of aquatic vascular plants. Frequent field trips, field recognition of species and habitats. Prereq: 6 hrs botany. Recommended prereq: 3010-20 or equivalent. Sp, A**

**4050 Synanthropology (3) Field experience on identification of composites. Frequent field trips, field recognition of species and habitats; laboratory ses- sions. Prereq: 6 hrs botany. Recommended prereq: 3010- 20 or equivalent. Sp, A**


**4061 Field Phycology (3) Field experience on identification of freshwater algae. Frequent field trips, field recognition of species and habitats; laboratory ses- sions.**

"Not for graduate credit for botany majors."
6 hrs of botany. Recommended prereq: 3010-20 or equivalent.

5070 Principles of Biological Illustration (3) Princi- ples and application of photograph techniques, inclu- ding photomicrography and photomacrogaphy, drawing
graphs, and other methods for recording and pre- sentation for research and publication of data in pictorial
or graphic form. 1 hr and 2 labs. W.

5080 Pteridology (4) Evolutionary study of lower vas- cular plants: morphology, cytology, ecology, life cycles and
classification. Biometric studies and recogni- tion of local species. Prereq: 3020-30 or consent of instructor. 2 hrs and 2 labs or field trips. F, A

5090 Morphology and Evolution of Basidiomycetes (4) Structure and function of somatic and sexual life
cycles as applied to evolution in group. Cultures and
specimens in laboratory. Prereq: 3010 or equivalent. F, A

5120 Agrostology (4) Collection, identification, clas- sification, and phytology of tribes of grasses. Prereq: 3030 or consent of instructor. 2 hrs and 2 labs. F, A

5150 Advanced Morphology of Flowering Plants (4) Vegetative and reproductive organography: regu- latory physiology, floral development, pollination
mechanisms, embryology and deviations, seed and
fruit development. Prereq: 3020-30 or 4120; 3210 or consent of instructor. F, A

5160 Biosystematics (4) Major experimental meth- ods used in systematics and application to specific types of systematic problems. Cytotaxon- omy, numerical taxonomy and chemotaxonomy. Prereq: Consent of instructor. F, A

5210 Advanced Plant Physiology I (3) Plant cell metabo- lism: carbon, nitrogen and sulfur assimilation, respiration and biosynthesis of specialized plant products such as terpenoids, alkaloids and pig- ments. Prereq: 3010; 3030 or equivalent. F

5220 Advanced Plant Physiology II (3) Photophysiology, response of plants to light: photochemistry, photo- synthesis, and phytochrome mediated responses. Water and solute uptake, ions, and movement; transloca- tion; and fundamentals of mineral nutrition. Prereq: 5210 or Biochemistry 4120 and plant or cell physiolo- gy course. Recommended prereq: 1 yr of physics. W

5235 Advanced Plant Physiology III (3) Growth and differentiation of plants at molecular, cellular and organ- ismic levels. Hormonal regulation of development; macromolecular interpretation of differen- tiation (cytokinin, germination, flowering); and senescence. Prereq: 5210 or Biochemistry 4120 and a plant cell physiol- ogy course. Recommended prereq: 5220; Sp

5290 Quaternary Problems (4) (Same as Geology 5290 and Zoology 5220.)

5310-20 Advanced Topics in Morphology of Vascular Plants (2-4) Needs of students determine content. May be repeated with consent of instructor. F, A

5350 Analysis of Plant Communities (4) Plants as components in ecosystems. Analog computation, application to structural changes, genetic controls, hybridization, specialization, and polyploidy. Laboratory emphasis on normal and aberrant meiotic systems and somatic chromosomes from plants and animals. Prereq: Biology 3110 and at least 6 additional hrs in biological sciences. Sp, A

5360 Marine Ecology (3) Relationships of marine orga- nisms to environment and their interactions with each other. Trophic relationships in nectar, coastal and estuarine ecosystems; succession; deep-sea ecol- ogy; stability. Prereq: One previous ecology course. F

5370 Natural Resource Management and Environ- mental Assessment in Developing Nations (3) (Same as Ecology 5370 and Planning 5370.)

5390 Seminar in Botany (1) Readings and discus- sions of current literature and/or selected topics in botanic research. May be repeated. Maximum 12 hrs. S/N only. F, W, Sp


5730 Population Biology (4) (Same as Zoology 5730.)

5780 Plant Cytology (4) Intensive consideration of cellular organization, structure and function, with empha- sis on the relation where possible of ultrastructure, biochemistry and function of subcellular organelles. Principles and application of various analytical and electronic microscopic techniques, cell fractionation and isolation of subcellular components; differentiation and analy- tical centrifugation; photomicrography and microcinematography. Intended for graduate stu- dents in the biological sciences. 2 hrs and 2 labs. Sp, A

5810 Cytogenetics (4) Chromosome structure and behavior during mitotic and meiotic divisions in rela- tion to structural changes, genetic controls, hybridization, specialization, and polyploidy. Laboratory emphasis on normal and aberrant meiotic systems and somatic chromosomes from plants and animals. Prereq: Biology 3110 and at least 6 additional hrs in biological sciences. Sp, A

5820 Methods and Instrumentation in Laboratory Investi- gation (1) Laboratory course providing project experience and theoretical background in various research methods, ion exchange resins, adsorption spectrometry, disc electrophoresis, polargraphy, zonal and ultracentrifugation, gas chromatography, auto- matic analyzers, microscopy, culture methods, use and detection of radioisotopes, and others. Prereq: Course in plant physiology, Chemistry 3211-3212 or equivalent, Physics 2210-2210-30 or equivalent. S/N only.


5850 Methods and Instrumentation in Field Investi- gations (4) Intensive field work using appropriate methods and instrumentation. Topics vary according to needs of students. May be repeated with consent of instructor. S/N only.

5870 Experimental Plant Genetics (4) Genetics of plant stress and disease resistance. Mechanisms of gene action, controlling elements, transfor- mation, cytoplasmic inheritance, and adap- tation. Prereq: Biology 3110 and Chemistry 3251. 3 hrs and 1 lab. W, A

5910-20 Developmental Plant Morphology (3, 1) Devel- opmental morphology of plants from aspect of phenomena of morphogenesis: symmetry, differentiation, regeneration, tissue mix- tures, abnormal growth, environment and genetics factors. Prereq: 3010-30 or 4120, and 3210 or 5210 for 5910; 5910 for 5920, 2 hrs and 1 lab for 5910; 5910 for 5920, 2 hrs and 1 lab for 5910; 5920, F, A

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

6010 Advanced Topics in Morphology of Vascular Plants (4) Needs of students determine content. Topics selected from broad categories of experimen- tal anatomy, morphology, and morphogenesis. Prereq: 3020-30, 4120, 5910-20 or consent of instructor. May be repeated with consent of department.

6060 Advanced Topics in Cryptogamic Botany (2-4) Advanced studies and current research in experi- mental phycology, mycology, bryology, pteridology, or developmental morphology of cryptograms. Prereq: May be repeated with consent of department.

6310 Advanced Topics in Cytology and Cell Biology (2-3) Requirements and interests of students deter- mine topics, such as actions of chemicals on actively dividing cells, current ultrastructural research in selected

6070 Botanical Photography (3) Photography of nat- ural history subjects and achievement of technical and aesthetic skills and knowledge to photo- graphies for class, seminar or public lecture. Landscape, habitat, close-up and still object photograph, in color and black & white. 6 hrs of botanical. Recommended prereq: 3010-20 or equivalent.

6010 Physiophytonetanatomy (4) Interaction between environment and phytoanatomy. Nutrient uptake, pri- mary production, community ecology as theory applied to phytoplankton communities, and physiological adaptations by populations to environment. Prereq: 3010 or consent of instructor. F, A
cytoplasmic organelles and cellular systems, experimental cytology, cellular control of nucleic and biosynthesis. Prereq: 5780; Biology 3110; Biochemistry 4110-20. May be repeated with consent of department.

6320 Ecosystems of the World (3) Classification and characteristics of natural and artificial ecosystems. Interrelations of climate, topography, soils, vegetation, and fauna. Prereq: 5340. F, A

6370 Applied Ecology (4) (Same as Ecology 6370.)

6420 Advanced Topics in Genetics (2-4) Literature survey of selected topics from all areas of genetics. Prereq: Biology 3110; Biochemistry 4110-20. May be repeated with consent of department.

6620 Seminar in the History of Botany (2) F, A

6820 Advanced Topics in Plant Physiology (2-4) Requirements of student determine content, including plant growth and hormones; minor element nutrition; photoperiodism; radiation effects. Prereq: 5110, 1yr college physics. May be repeated with consent of department.

6830 Advanced Topics in Ecology (2-4) Needs of student determine content, such as morphological and ecological evolutionary systematics; systems of classification. Seminars on lectures and labs depending on subject. Prereq: 3020-30, 5100. May be repeated with consent of department. Sp., A

**Chemistry**

**MAJOR DEGREES**

Chemistry

M.S., Ph.D.

*Professors:*

- C. S. Feigerle, Ph.D. Northwestern; C. E. Barnes, Assistant Professor, Carolina State.
- E. L. Wehry, Ph.D. State; R. M. Pagni, Ph.D. Wisconsin; D. C. Kleinfelter, Ph.D. California (Berkeley); (Emeritus), Ph.D. Michigan; J. E. Bloor, Ph.D. Colorado; K. D. Cook, Ph.D. Yale; J. F. Eastham, Ph.D. Wayne State; J. A. Dean, Ph.D. Colorado; S. G. Mamantov, Ph.D. Louisiana State; H. H. Ross, Ph.D. Iowa State; W. A. Van Hook, Ph.D. Manhattan; G. K. Schweitzer, Ph.D. Illinois; L. J. Magid, Ph.D. Purdue; H. H. Fletcher, Ph.D. Wisconsin; J. R. Peterson, Ph.D. Princeton; W. H. Betlach, Ph.D. Yale; W. E. Bailey, Ph.D. Wayne State; H. D. Johnson, W. H. Betlach, Ph.D. Purdue; D. C. Kleifer, Ph.D. Princeton; M. H. Lietzke, Ph.D. Wisconsin; R. M. Magid, Ph.D. Yale; R. P. Pagett, Ph.D. Wisconsin; J. R. Peterson, Ph.D. California (Berkeley); H. H. Ross, Ph.D. Wayne State; G. K. Chambers, Ph.D. Illinois; D. A. Shirley, Ph.D. Iowa State; W. T. Smith, Ph.D. Ohio State; W. A. van Hook, Ph.D. Johns Hopkins; E. L. Werby, Ph.D. Purdue; T. F. Williams, Ph.D. London; J. H. Wool, Ph.D. (Emeritus), Ph.D. North Carolina.

*Associate Professors:*

- J. L. Adcock, Ph.D. Texas; F. A. Grimm, Ph.D. Cornell; J. D. Kovac, Ph.D. Yale; A. A. Lane, Ph.D. California (Berkeley); L. J. Magid, Ph.D. Tennessee; F. M. Schell, Ph.D. Indiana; C. Woods, Ph.D. North Carolina State.

*Assistant Professors:*

- S. G. Mamantov, Ph.D. California (Berkeley); C. E. Barnes, Ph.D. Stanford; J. E. Bartness, Ph.D. Northwestern; K. D. Cook, Ph.D. Wisconsin; C. S. Feigerle, Ph.D. Colorado; M. J. Stapanian, Ph.D. Iowa State.

*Alumni Distinguished Service Professor.

Students majoring in Chemistry for the Master's or doctoral degree are required to present as a prerequisite one year each of general, analytical, organic and 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. Applicants are required to take the general and subject chemistry Graduate Record Examination.

For students minorning 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 program leading to the M.S. degree with specialization in polymer science is conducted jointly with the Department of Chemical, Metallurgical, and Polymer Engineering, which offers a degree with similar specialization.

The requirements for the M.S. degree in Chemistry consist of the satisfactory completion of:

1. Research and a thesis to give 9 to 18 hours of graduate credit (5000).
2. Participation in seminar (5911-21-31) during the entire period of graduate study. (No more than 3 credit hours of seminar may be applied to the above requirements.)
3. Sufficient undergraduate course work in chemistry and/or a related field to make an overall total of 45 hours, including:
   a. 4100-70.
   b. Two of the following (except for: polymer science) 5511, 5521, 5531.
   c. For emphasis in polymer science, 5531, 5140-51, Polymer Engineering 4910 and participation in the Polymer Seminar Program during the entire period of graduate study.
   d. For emphasis in environment, 5220, 5250-60-70, Ecology 5310, and Environmental Engineering 4030.
   e. For emphasis in energy, 5410, 5610-20-30, a chemistry sequence (5110-20-30-35 or 5250-60-70 or 5420-30 or 5710-20-30, 5810), and Mechanical Engineering 4180.
   f. For other specializations, one of the following sequences: 5110-20-30-35 or 5250-60-70 or 5420-30 or 5710-20-30, 5810).
4. A final oral examination.

**THE DOCTORAL PROGRAM**

The department offers specialization in nine areas for the Ph.D. degree: analytical chemistry, chemical physics, environmental chemistry, energy, inorganic chemistry, organic chemistry, physical chemistry, polymer science, and theoretical chemistry. The program in chemical physics is conducted jointly with the Physics Department which offers a similar degree.

A program leading to the Ph.D. degree with specialization in polymer science is conducted jointly with the Department of Chemical, Metallurgical, and Polymer Engineering, which offers a degree with similar specialization.

For the Ph.D. degree in Chemistry, the satisfactory completion of the following is required:

1. Research and a dissertation to give at least 36 hours of graduate credit (6000).
2. Participation in seminar (5911-21-31) during the entire period of graduate study.
3. Course and specialization requirements:
   - 4100-70.
   - Two of the following (except for: polymer science): 5511, 5521, 5531.
   - For specialization in analytical, inorganic, organic, physical, or theoretical chemistry, 39 hours of additional graduate course work including at least 6 hours at the 6000 level and one of the following groups: (1) for analytical, 5250-60-70; (2) for inorganic, 5420, 5710-20-30; (3) for organic, 5110-20-29-30-35; (4) for physical, 5340-50, 5410-20-30-50, (5) for theoretical, 5340-50, 5410-20-30-50, Physics 5210.
   - For specialization in environment or energy, a six-month internship in a government or industrial laboratory; 39 hours of additional graduate course work including 6 hours at the 6000 level and the following: (1) for environment, 5220, 5250-60-70, Ecology 5310, Environmental Engineering 4030, plus selected courses from other areas of chemistry, environmental engineering, meteorology, microbiology, health physics, ecology, computer science, statistics, and industrial health; (2) for energy, 5410, 5610-20-30, a chemistry sequence (5110-20-30-35 or 5250-60-70 or 5420-30 or 5710-20-30, 5810), Mechanical Engineering 4180, plus other courses from other areas such as catalysis, heterogeneous equilibria, kinetics, thermal science, combustion and propulsion engines, resource economics, polymer engineering, and electrical engineering.
   - For specialization in chemical physics, an examination on the basic principles of mechanics, electricity, and magnetism; 5410-20-30-50, 5110-20 or 5710-20, 6730 or 6810, Mathematics 4540, 4610, 4710, Physics 4610-20-30, 5110-20-30, 5210, 5610-20-30.
   - For specialization in polymer science, 4160-70, 5511, 5521-40-50, 5160 or 5710. Polymer Engineering 4910; 30 hours of additional graduate course work, including at least 6 hours at the 6000 level and at least 12 hours of chemistry courses; participation in the Polymer Seminar Program during the entire period of graduate study.
4. Graduate course work in related fields may be used for undesigned course work in this requirement during the period of graduate study.

All course selections must be approved by the appropriate departmental committee.

4. A comprehensive advanced examination in the field of specialization.

5. Demonstration of a reading knowledge of one of the following languages: French, German, Russian, or an approved alternate.

5. A final oral examination.

- 3211-21-31 Organic Chemistry (3, 3, 3) Compounds and their reactions; stereochemistry; spectrophotometric and other physical properties. Must be taken in sequence. Prereq: 1110-20-30. Corresponding laboratory (3219-30-35) is coreq for students not having credit for the laboratory.

- 3219-29-39 Organic Chemistry Laboratory (1, 1, 1) Experiments on topics discussed in 3211-21-31. Corresponding lecture (3211-21-31) is coreq for students not having credit for the lecture.


*3511-21-31 Principles of Organic Chemistry (3, 3, 3) Structure and reactivity of aliphatic and aromatic compounds. Tetrahedral and hybridized systems. Use of spectroscopic and physical techniques to elucidate reaction mechanisms. Recommended for chemistry majors and students planning careers in chemical manufacturing, quality control, and introduction to industrial physical or biological sciences. Must be taken in sequence. Prereq: 3110-20-30. Corresponding laboratory: 3219-29-39 or 3219, 3529-39 as a coreq; latter is recommended.

*3529-39 Organic Chemistry Laboratory (1, 1) Experiments on topics discussed in 3221-31. Similar to 3229-39 except designed for students who have need for updated knowledge on various spectrometric and chromatographic techniques. Corresponding lecture (3231-31 or 3231-31) is coreq for students not having credit for the lecture.

*3810 Radioactivity and Its Application (3) Radioactive materials in tracer and therapeutic applications. Radioactive decay, detection apparatus and techniques, tracer procedures and safety precautions in laboratory work. Not for credit by chemistry or physics majors or minors. Prereq: 1 yr of general mathematics or equivalent. 1 yr of general chemistry. 2 hrs and 1 lab. Sp.

4110 Physical Chemistry (3) Theoretical aspects of chemical kinetics. Quantum mechanics of atomic and molecular systems. Molecular symmetry, crystal structure and interatomic forces. Statistical thermodynamics. Prereq: 3430. F, W

4119 Physical Chemistry Laboratory (2) Solutions, phase equilibria, reaction kinetics and spectroscopy. The corresponding course 4110 is coreq. F, W

4160-70 Intermediate Physical Chemistry (3, 3) (Designed for entering graduate students who have had one year of physical chemistry.) 4160—The thermodynamics of quantum mechanics, phase equilibria and solutions, and chemical equilibria. 4170—Gases and kinetic theory, solid state, molecular structure and interatomic forces, introduction to chemical statistics. F, W

4210 Advanced Analytical Chemistry (3) Chemical separations including chromatography, ion exchange and solvent extraction, spectrophotometric techniques. Prereq: Analytical chemistry. W

4219 Advanced Analytical Chemistry Laboratory (2) Experiments on topics in 4210. Coreq: 4210. W

4220 Advanced Analytical Chemistry (3) Electroanalytical methods of analysis (including potentiometry, coulometry, polarography, and voltammetry); magnetic and optical spectroscopy. Krypton absorption and fluorescence techniques. Prereq: Analytical chemistry. Recommended: 3420 or 4920. Sp


4420 Physical Inorganic Chemistry (3) Theoretical concepts leading to an understanding of inorganic chemistry; quantum theory of the atom, principles of molecular structure, and elementary nuclear chemistry. Prereq: 3410-20-30. W


4510 Organic Qualitative Analysis (3) Identification of compounds and mixtures using advanced instrumental techniques as well as classical chemical approaches. Prereq: 3231-39. 3 labs. Not open to students who have completed 5250-60-70 or 5260-60-70. F


4610 Advanced Chemical Experimentation (2) Laboratory course in application of modern experimental techniques to solution of chemical problems. Synthesis and characterization of organic and inorganic compounds. Introduction to the use of advanced techniques. Prereq: 3231-39 or 3531-39, 3430-39. 4220. 4610 not open to students who have completed 4510. W, Sp.


4929 Biophysical Chemistry Laboratory (2) Experiments in physical chemistry of biologically important systems. Coreq: 4920. Not open to students in 3410-20-30-39.

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

5110-20-30 Advanced Organic Chemistry (3, 3, 3) Structure, reactions and reaction mechanisms of aliphatic, aromatic and cyclic compounds. Prereq: 3211-21-31. E


5139 Spectroscopic Characterization of Organics (3) Electromagnetic techniques and spectroscopic methods; nuclear magnetic resonance, infrared, and mass spectrometry. Prereq: 3211-21-29-31 or equivalent. F

5140 Introductory Polymer Chemistry (3) Fundamental principles, role of chemistry in interdisciplinary field of polymer science; relation of molecular structure to bulk properties of polymers. Each yr. Prereq: 1 each year undergraduate organic and physical chemistry. Sp.

5150 Kinetics of Polymerization (3) Kinetics of formation and molecular weight distributions of polymers, homogeneous and heterogeneous step growth and chain growth polymerizations. Prereq: 5140 and 4160-70 equivalent.

5160 Organic Chemistry of Polymers (3) Synthesis of monomers; mechanism, stereochemistry, and sequence distribution of polymerizations. Formation of block, graft, and network polymers. Reactions on polymers, including degradation. Prereq: 5140 and 5531. A

5170 Physical Chemistry of Polymers (3) Rubber elasticity, solution chemistry of macromolecules: structural, configurational, and conformational statistics of polymers. Prereq: 5150. A

5220 Analytical Chemistry of Environmental Pollutants (3) Application of modern analytical chemistry to problems in aquatic and atmospheric pollution. Prereq: Consent of instructor. A

5240 Chemical Instrumentation (4) Principles of chemical instrumentation. Practice in design and construction of chemical instruments; special project. Prereq: Consent of instructor.

5250-60-70 Advanced Analytical Chemistry (3, 3, 3) Absorption and emission spectrophotometry, structure elucidation by IR, NMR, UV, and mass spectrometry; 5260—Chemical separation methods: solvent extraction, chromatography, electrophoresis; radiochemical methods; fluorescence; x-ray methods; 5270—Electroanalytical, magnetic and thermal analytical methods; on stream and automatic analysis. Prereq: 1 yr of physical chemistry. F, W, Sp

5340 Quantum Chemistry (3) Postulate approach to fundamental principles of quantum mechanics. Accurate solutions to Schrodinger equation; approximate (ab initio and semiempirical) molecular orbital methods; calculation of molecular properties. F

5350 Quantum Chemistry (3) Electronic excited states; introduction to group theory and some of the reactivity of organic molecules. Prereq: 5340. W


5511 Survey of Inorganic Chemistry (3) Atomic structure, wave mechanical atoms, ionic and covalent bond, electronic configuration of the elements, inorganic stereochemistry, coordination chemistry, and descriptive chemistry of the elements. F

5521 Survey of Analytical Chemistry (3) Volumetric and gravimetric analysis; acid-base, oxidation-reduction, complexation and precipitation equilibria; spectrophotometric, electroanalytical, and separation methods. F

5531 Survey of Organic Chemistry (3) Bonding in organic molecules, chemistry of hydrocarbons, alkylic compounds and conformational analysis, monofunctional oxygenated derivatives, carbonyl compounds, stereochemistry, aromatics, and spectral analysis of organic molecules by infrared, ultraviolet, nuclear magnetic resonance and mass spectral techniques. F

5550 Industrial Chemical Research Practice (3) modern industrial research taught by case studies and visiting lecturers from industry. Course content varies, selected to illustrate good past and current industrial research problems. Prereq: Completion of a 5000 chemistry course sequence.

5510-20-30 Chemical Basis of Energy Conversion (1, 1, 1) Chemistry of various energy and fuel interconversion systems. Introduction to homogeneous and heterogeneous catalysis, conversion systems, fossil fuels chemistry, and electrochemical and photochemical conversion systems. Prereq: 5410 and one 5000 sequence. F, W, Sp.


5810 Nuclear Chemistry (3) Nuclear properties, radioactivity, radioactive decay processes, nuclear structure and models, nuclear reactions, and methods of radiation detection. Prereq: 1 yr of physical chemistry. A

5911-21-31 Chemistry Seminar (1, 1, 1) Departmental research, current research literature, general topics. May be repeated. Registration: Consent of instructor except summer for resident graduate students. SI NC only. F, W, Sp.

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

6111 Selected Topics in Organic Chemistry (3) Subject matter varies among important topics of current significance. Prereq: Consent of instructor. May be repeated. Minimum 9 hrs. A

6150 Natural Product Chemistry (3) Structure, chemistry, and synthesis of naturally occurring substances of biological or environmental significance. Course content varies, selected to offer current chemical interest. Prereq: Two of 5110-20-30-35.


6165 Orbital Symmetry Control (3) Application of Woodward-Fourier rules to mechanisms and stereochemistry of concerted organic reactions. Prereq: Two of 5110-20-30-35.

6175 Organic Photochemistry (3) Physical and chemical effects of electron excitation of organic molecules. Experimental techniques and applications of photophysical and photomechanical phenomena. Prereq: Consent of instructor.

6210 Advanced Analytical Spectroscopy (3) Newer methods of spectroscopic analysis, including: transform methods, lasers in spectroscopy, fiber optics, spectroscopic techniques for remote sensing. Prereq: 5250.

6211 Selected Topics in Analytical Chemistry (3) Subject matter varies among important topics of current significance: environmental chemistry, spectroelectrochemistry, modern liquid chromatography, thin-layer chromatography, bioanalytical methods, and microcomputers and microprocessors. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs. A

6211 Selected Topics in Polymer Chemistry (3) Subject matter varies among important topics of current significance. Prereq: Two of 5140-50-60-70 or consent of instructor. May be repeated.

6220 Nuclear Magnetic Resonance (3) Theory of nuclear magnetic resonance spectroscopy with emphasis on high-resolution methods. Applications to problems in nuclear structure and behavior. Prereq: Two of 5110-20-30-35.

6430 Photochemistry and Radiation Chemistry (3) Fundamental physical and chemical processes pursued to excitation of molecules by photons and electrons; multiphoton processes and uses of laser sources; fluorescence and phosphorescence; radiations and reactions as studied by optical spectroscopy; chemical reactivity of excited states; ion-molecule and free radical reactions; electron capture and electron transfer processes. Prereq: 5430.

6450 Electrochemistry (3) Electrochemical double layer; electrode kinetics; transport properties of electrolytes; electroanalytical methods. Prereq: 5430 or 5270.

6475 Electronic Structure of Radicals (3) Applications of electron spin resonance to study of molecular conformation, structure, and bonding in organic and inorganic radicals; comparison of experimental results with theoretical predictions based on Walsh rules and on INDO molecular orbital calculations. Prereq: 5340-50 and 6520.

6480 Statistical Thermodynamics (3) Application of statistical mechanical methods to systems of chemical interest such as isotope effects on equilibrium and solution properties, phase equilibria, condensation phenomena. Prereq: 5410, 5450.

6495 Advanced Chemical Kinetics (3) Mechanism of elementary chemical reactions at molecular level including topics such as dynamics of molecular collisions, potential-energy surfaces, reaction cross-sections, direct versus complex modes of reaction, photofragmentation, energy partitioning, and transfer, chemical lasers, and other photoactive species. Two of 5110-20-30-35.

6510 Thermodynamics of Solutions (3) Theory of regular solutions and of electrolyte solutions; measurement of activity coefficients and other thermodynamic properties; selected topics from literature. Prereq: 5410.

6520 Magnetic Resonance (3) Principles of magnetic resonance spectroscopy underlining nuclear magnetism and electron spin resonance. Chemical applications to solid and liquid systems. Prereq: 5340.

6711 Selected Topics in Inorganic Chemistry (3) Subject matter varies among important topics of current significance: photophysical spectroscopy, transition metal chemistry, organometallic compounds, inorganic solution kinetics and mechanisms, crystal chemistry, nonaqueous solvents, and other photoactive species. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs. A

6730 Topics in Quantum Chemistry (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 reaction. Prereq: 5340-50.

6750 Molten Salt Chemistry (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) (Same as Physics 6810.)

6811 Selected Topics in Nuclear Chemistry (3) Subject matter varies among important topics of current significance: nuclear decay schemes, nuclear models, nuclear reaction theory, nuclear detection techniques, activation analysis. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs. A

6820 Molecular Vibration-Rotation Theory (3) (Same as Physics 6820.)

**Classics**

Professors: S. C. Rutledge (Head), Ph.D. Ohio State; G. C. Gesell, Ph.D. North Carolina.

Associate Professor: J. E. Shelton, Ph.D. Vanderbilt.

Assistant Professors: C. P. Craig, Ph.D. North Carolina; S. D. Martin, Ph.D. Michigan; D. W. Tandy, Ph.D. Yale.

The graduate courses in the Classics include the wider reading of Greek or Latin authors in a selected field, a more detailed study of one of the great departaments of classical literature, and the development of background for the appreciation of Greek or Roman life and literature.

**Greek**

3010 Plato (3) A

3020 Herodotus (3) A

3030 Euripides (2) A

4020 Aeschylus, Sophocles (3) A

4040 Aristophanes (3) A

4050-60-70 Directed Readings in Greek (3, 3, 3) F, W, Sp

5010 Special Topics in Greek Literature (3) May be repeated. Maximum 9 hrs.

**Latin**

3440 Livy (3) A

3460 Elegiac Poets (3) A

4310 Selected Readings from Latin Literature (3) A

4320-30 Selected Readings from Latin Literature (3, 3) May be repeated: A, A

4340 Horace, Odes (3) A

4350 Tacitus (3) A

4360 Lucretius (3) A

4370 Readings in Medieval Latin (3) A

5310 Special Topics in Latin Literature (3) May be repeated. Maximum 9 hrs.

5410-20 The Latin Epic: Lucretius, Vergil (3, 3) A

5510-20 Roman Comedy; Plautus (3, 3) A

**GENERAL COURSES**

3310 Art and Archaeology of the Aegean Bronze Age and Early Greece (3) Troy, the Cyclades Islands, Greek mainland, and Crete. Emphasis on palaces of Mycenae, Tiryns, and Pylos, their fall, the following Dark Age, and the rebirth of Greek civilization. Illustrated lectures.

3340 Cities of the Greek and Roman World (3) Archaeological survey of Greek and Roman cities from 3000 B.C. to 500 A.D. with emphasis on development of city planning and quality of life. Such cities as Mycenae, Athens, Priene, Alexandria, Rome, and Lepcis Magna will be studied.

3350 Shrines and Sanctuaries of the Greek and Roman World (3) Survey of major shrines and sanctuaries of Greek and Roman world with emphasis on archaeologically remains. Such sites as Olympia, Epidaurus, Paestum, Cumae, Pelliere, and Baalbek will be considered. Classical authors will add to understanding of place of great shrines and sanctuaries in Greek and Roman life.

4220 Seminar in Classical Studies (3) Field of classical studies today. Ancient achievement in areas of both philology and archaeology; impact of decipherment of Linear B, new understandings of culture and politics of "golden ages" of Pericles and Augustus, classical studies and academic profession on high-school and college levels. May be repeated. Maximum 6 hrs.

4410 Special Topics in Classical Civilization (1-3) Topics in art, literature, religion, and society of Greece and Rome. May be repeated with consent of department. Maximum 9 hrs.

4510 Selected Readings in Latin Literature in Translation (3) Content varies; may be repeated with consent of department. Maximum 9 hrs.

4610 Studies in Classical Archaeology (3) Variable content course offering subject matter not taught in existing course, or concentrating on one aspect of existing survey. Prereq: According to topic. May be repeated. Maximum 9 hrs. A

4620 Roman Law (3) Development of Roman law by jurists; relationship of Roman law to Roman economic and society, relationship of Roman law to American jurisprudence. Case-book format.

5810 Special Topics in Classical Civilization (3) May be repeated. Maximum 9 hrs.

5620 Problems in Old World Archaeology (3) (Same as Anthropology 5620.) A

**Computer Science**

MAJOR

DEGREE

Computer Science

M.S., Ph.D.

Professors: J. S. Bradley, Acting Head, Ph.D. Iowa (Mathematics, Head); J. W. Atchley, Ph.D. Iowa (Operations Research); C. P. Craig, Ph.D. Florida, (Electrical Engineering); J. W. Atchley, Ph.D. Pennsylvania State; J. R. B. Blake, Ph.D. Oxford (U.K.); J. E. Bell, Ph.D. Manchester (U.K.) (Chemistry); R. C. Gonzalez, Ph.D. Florida, (Electrical Engineering); K. C. O'Kane, Ph.D. Pennsylvania State; G. L. Sherman, Ph.D. Purdue (Director of Computing Center).

Consent of department. Maximum 9 hrs. A

Assistant Professors: R. B. Blake, Ph.D. Oxford (U.K.); C. P. Caffee, Ph.D. Pennsylvania State; J. A. Brebner, Ph.D. Warsaw (Poland).

Associate Professors: J. R. B. Cockrell, Ph.D. (Physics); Z. Ziegler, Dr. (Physics).
BACKGROUND REQUIREMENTS TO M.S. PROGRAM

Upon admission to the graduate program in Computer Science, students will need to develop any missing parts of the following background:

1. 2610 and 3520 or equivalent course in advanced programming and assembler language programming.

NOTE: The department currently offers a 7-hour Immigration Course (5100/5109) that covers the material in these courses. The Immigration Course is taught once a year, in the fall quarter; it assumes the student has had at least one quarter of substantial programming and is intended to help students entering the program from other disciplines meet some of the background requirements rapidly.

2. 2215 and 3215 or equivalent courses in discrete structures.
3. 3155 or an equivalent course in introductory numerical algorithms.
4. Mathematical maturity equivalent to that of a student who has completed the calculus sequence through one year of multivariable calculus and matrix algebra.

THE MASTER’S PROGRAM

All students must receive departmental credit for or exhibit proficiency in the following courses:

1. Computer Science 4510, 4550, 5100 and 5109.
2. Electrical Engineering/Computer Science 5175 and 5940.
3. One of the three courses Computer Science 4710, 4730, or 4225.

The department offers two options:

Thesis Option:
1. Complete 45 hours of course work at the 4000 level or above, including at least 33 hours at the 5000 level (no more than 9 hours of which may be thesis hours), but excluding 5100 and 5109.
2. Complete at least 9 hours of thesis credit, Computer Science 5000.
3. Pass an oral examination by a committee of at least three faculty members.

Non-Thesis Option:
1. Complete 45 hours of course work at the 4000 level or above, including at least 33 hours at the 5000 level, but excluding 5100 and 5109.
2. Pass written and oral comprehensive examinations.

Under either option, a student wishing to count a course from another department towards the graduate degree must have prior written approval from the computer science graduate committee.

A student will not be allowed to continue in the Computer Science program if any of the following occurs:

1. The student cheats or engages in any other act of dishonesty with respect to the University community. In particular, for computer programs assigned as individual projects, this includes getting or giving help as well as copying or modifying all or part of another person’s program.
2. The student’s cumulative graduate GPA falls below 3.0 for two consecutive quarters, excluding the summer quarter.
3. The student earns two or more grades below C in courses taken for graduate credit.

THE DOCTORAL PROGRAM

Entrance Requirements:
In addition to the admissions procedures required by the Graduate School, a student seeking admission to the Ph.D. program must:

1. Have three letters of recommendation sent directly to the Department Head from individuals capable of assessing the student’s potential for advanced work in computer science (for example, college teachers, or employers for whom the student has worked after earning a bachelor’s degree). The department reserves the right to contact these individuals or other knowledgeable people of additional information deemed necessary or desirable.
2. Have his/her GRE verbal and quantitative scores sent to the University. The student must take these exams early enough to get the scores at least three months before the beginning of the quarter in which he/she seeks admission. A minimum score of 40th percentile will be required. Test results should not be more than three years old.
3. Have GRE Achievement Exam score in Computer Science, Engineering or Mathematics sent to the University, subject to the same deadline as (2) above. In lieu of an Achievement Exam score in Computer Science, Engineering or Mathematics, the department will consider:
   a. An Achievement Exam score in another area, or
   b. alternate evidence of achievement in computer science or computer engineering, such as significant work experience in either field, or
   c. an earned graduate degree requiring substantial computer science coursework.
   An applicant who wishes to submit an alternate exam score or alternate evidence of achievement must make this request to the department as soon as possible.
4. Satisfy the background requirements for Master’s program.
   The department will admit only those students who, in the judgement of the faculty, have demonstrated ability and a desire to complete a program of study based on creative research and high achievement in course work. The number of students admitted will depend upon departmental resources available.

Precandidacy Course Work:
The departmental precandidacy course requirements include a set of 4000-level core courses and a distribution among 5000-level and 6000-level courses as determined by the Departmental Graduate Committee.

Admission to Candidacy:
Admission to the Ph.D. program does not guarantee admission toward the degree. Official admission to candidacy is based on the following procedures:

1. The student completes the coursework requirements as defined above.
2. The student passes the written comprehensive examinations covering three areas selected by the student in advance. Each exam is graded as high pass, pass, low pass, or fail. The student must make a high pass in at least one of the areas and no less than low pass in all other exams. These exams may be taken a maximum of two times, separated by no more than one calendar year; in a second attempt, a student does not have to repeat any area(s) in which a high pass was earned on the first attempt. The CS Graduate Committee administers these exams, which must be passed prior to admission to candidacy and at least three quarters before the date of conferment of the degree. Comprehensive examinations must be taken within five years, and all requirements must be completed within eight years, from the time of a student’s first enrollment in the doctoral degree program.

3. The student reaches an agreement with a member of the Computer Science Department’s faculty to become the major professor, dissertation director, and chair of the student’s committee. The committee must have at least four members, with at least three from the Computer Science Department and at least one holding an appointment in another department. At least three members, including the chair, must be approved by the Graduate Council to direct doctoral research.
4. The student’s committee evaluates the student’s background and outlines a coherent program of study, which may include additional courses and outside readings in the technical literature. This program is subject to periodic revision within reasonable limits and will be reviewed by the committee no less frequently than once a year (Completion of the entire program is not required before admission to candidacy).
5. In an open, public meeting, the student presents to the committee a survey of current literature in the area of proposed Ph.D. research. A specific dissertation topic is not required at this time; rather, the student is expected to know state-of-the-art work in the general area of interest.
6. The student completes Graduate School requirements for formal admission to candidacy.

Dissertation Proposal:
After consultation with the committee and initial investigation of a topic, the student submits a written proposal to the committee and makes an oral presentation of this proposal in a meeting which other faculty may attend. The written version must be typed, conform to high standards of scholarly writing, and contain an overview of previous research in the area of interest. Based on the written and oral presentations, the committee must accept the topic, reject the topic, or modify the topic to make it suitable for doctoral research.

Dissertation and Residency Requirements:
The student continuously registers in CS 6000 (minimum of three hours each quarter) from the time the topic proposal is approved, admission to candidacy occurs, or registration for course 6000 is begun, whichever comes first. The quarter in which the dissertation is accepted by the Graduate School and including the summer quarters.

The minimum residency for a doctoral degree is one academic year or three quarters. The minimum residency for a master’s degree is one academic year or three quarters. The minimum residency for a doctoral degree is one academic year or three quarters.

All requirements must be completed within eight years, from the time of a student’s first enrollment in the doctoral degree program.

Dissertation Defense:
The student presents and defends the dis-
4225 Numerical Solutions to Equations and Numerical
4210 Introduction to Artificial Intelligence (3) Intelligent
analyses; frequency distributions, percentiles, data
SPSS and SAS programs for standard statisti-
cal methods. 3510 and 3515 may not both be taken
for credit. Students with knowledge of FORTRAN should
SAS programs for standard statistical methods. 3510 and 3515 may not both be taken
for credit. Students with knowledge of FORTRAN should
3515 Introduction to Numerical Algorithms (3) Roots of equations, systems of linear
approximations (3) F, Sp
W
4245 Numerical Linear Algebra (3) (Same as Mathematics 4245.) F, W
4235 Numerical Methods for Ordinary Differential
4230 Independent Study in Computer Science (1-3)
4300 Scientific Programming (3) Introduction to scientific programming and numerical
4220 Introduction to Artificial Intelligence (3) Intelligent
search, and expert systems. 3510 and 3515 may not both be taken for credit. Students with
4215 Discrete Structures II (3) Continuation of Computer
4210 Introduction to Numerical Algorithms (3) Roots of equations, systems of linear
approximations (3) F, Sp
W
4200 Number Systems for Digital Computers (3) Floating-point arithmetic, machine
representation, finite-segment p-adic number
presentation, finite-segment p-adic number
3520 Assembly Language Programming (3) Machine
3510 Introduction to Numerical Algorithms (3) Roots of equations, systems of linear
approximations (3) F, Sp
W
4050 Number Systems for Digital Computers (3) Floating-point arithmetic, machine
representation, finite-segment p-adic number
presentation, finite-segment p-adic number
3520 Assembly Language Programming (3) Machine
3510 Introduction to Numerical Algorithms (3) Roots of equations, systems of linear
approximations (3) F, Sp
W
4050 Number Systems for Digital Computers (3) Floating-point arithmetic, machine
representation, finite-segment p-adic number
presentation, finite-segment p-adic number
3520 Assembly Language Programming (3) Machine
3510 Introduction to Numerical Algorithms (3) Roots of equations, systems of linear
approximations (3) F, Sp
W
4710 Formal Languages and Automata (3) Grammars
of Context-Free Languages (3) F, W
4470 Programming Languages (4) Comparison and
4460 Principles of Compiler Design (3) Techniques
4450 Advanced Topics in Numerical Partial Differential
4440 Computer Programming Languages (4) Comparison and
4430 Statistical Data Processing (3) FORTRAN
language for organization and analysis of scientific
data. SPSS and SAS programs for standard statisti-
cal methods. 3510 and 3515 may not both be taken
for credit. Students with knowledge of FORTRAN should
3515 Introduction to Numerical Algorithms (3) Roots of equations, systems of linear
approximations (3) F, Sp
W
4215 Discrete Structures II (3) Continuation of Computer Science/College of Liberal Arts
3215 Discrete Structures II (3) Continuation of Computer
Science/College of Liberal Arts
major operating system. Memory management, dispatchers, interrupts, device characteristics, theory and implementation, analysis and design, implementation of portions of multiuser operating system. Prereq: 4510 and 4550 or equivalent, or consent of instructor. 4610 and 5670 may not both be taken for credit. F

5680 Case Studies in Operating Systems (3) Examination of different operating systems. Operating system design, alternative strategies for memory, device and CPU allocation and management; protection, time sharing, real-time systems. Prereq: 4510 or 5670 or consent of instructor. 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. A

5750 Theory of Formal Languages (3) Phrasestructure 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

5790 Computer Architecture (3) Elements, major components, Storage components and their use; size, speed, and cost, Processor organization, instruction set organization, stack machines, pipelining, overlap and vector processors. Operating system considerations. Prereq: 5670 or 5840.

5760 Information Organization and Retrieval (3) Organization, storage, searching and retrieval of information. Development of IR systems from off-line to modern on-line operations. Information analysis and indexing; any computer languages. Search and matching procedures; retrieval process. Information dissemination systems. Data base retrieval systems. Prereq: 4590. F

5840-50 Pattern Recognition (3, 3) Prereq: 3150, Statistics 3450 and Mathematics 4050 or equivalent. (Same as Electrical Engineering 5670-80.) F, W

5880 Data Security (3) Need for security and methods for achieving it: encryption, machine architecture, hardware and software implementations, historical and current approaches. Case studies in fraud and misuse. Prereq: 3520 or consent of instructor.

5910-20-30 Special Topics in Computer Science (1-6, 1-6) May be repeated. Maximum 9 hrs.

5940-50 Advanced Small Computer Systems (3, 3) (Same as Electrical Engineering 5940-50.) Prereq: EE 5175 or 4850.

5970 Independent Study in Computer Science (1-3) Special project under faculty guidance. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs.

6000 Doctoral Research and Dissertation (3-15) F/ NP only. May be repeated with consent of instructor.

6210 Advanced Topics in Artificial Intelligence (3) Issues of knowledge organization, knowledge representation and problem solving that underlie the design of expert systems. Analytical and design techniques used in implementing non-trivial expert systems. Prerequisite: consent of instructor.

6570 Advanced Topics in Database Management Systems (3) Advanced topics concerning normalization, query optimization, data base security and integrity in data base systems. Prerequisite: consent of instructor.

6570 Advanced Topics in Operating Systems (3) Advanced topics in operating systems including disk and file systems and computer networks. Prerequisite: consent of instructor.

6730 Advanced Topics in Computability and Computational Complexity (3) Advanced topics in computability and decidability. Prerequisite: consent of instructor.

6750 Advanced Topics in Formal Languages and Automata (3) Advanced topics concerning formal languages and automata machines. Prerequisite: consent of instructor.

6810 Advanced Topics in Information Storage and Retrieval (3) SMART and SIRE system, system evaluation methodology, file clustering, dynamic query processing, information retrieval, natural language processing. Prerequisite: consent of instructor.

6910 Advanced Topics in Computer Science (3) Advanced topics is forum for graduate students individually or in groups. Prereq: Consent of instructor. May be repeated. Maximum 18 hrs.

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**Cultural Studies**

**Afro-American Studies**

3140-50-60 Directed Readings in Afro-American Studies (1, 1, 1) Designed for students who are interested in doing intensive reading in some area of Afro-American Studies which is defined by the student and the instructor. Prereq: 2010 or 2020 and consent of instructor. W

3530 Peoples and Cultures of Africa (3) (Same as Anthropology 3530) Prereq: Consent of instructor.


4292 History and Philosophy of Afro-American Education (4) Attempt by Afro-Americans to secure an education for themselves and their children from era of slavery to Supreme Court decision of 1954. Black perceptions of importance of education and special obstacles confronting blacks who tried to get an education. (Same as Curriculum & Instruction and History 4292.)

4310 Research in Afro-American Studies (4) Deals with Black experience and research process.

4500 Issues and Topics in Afro-American Studies (3-4) Problems, topics and issues in area of Afro-American Studies. Content and credit determined by instructor. May be repeated. Maximum 12 hrs.

4610 African Prehistory (3) (Same as Anthropology 4610.)

4830 Afro-American Women in American Society (3) Historical and contemporary social, economic and political factors in American society as they relate to the Black Woman. (Same as Women's Studies 4830.)

4880 Afro-American Psychology (3) (Same as Psychology 4880.)

4950 The Afro-American Experience to 1865 (3) (Same as History 4950.)

4960 The Afro-American Experience Since 1865 (3) (Same as History 4960.)

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**Asian Studies**

3670 Islamic Literature in English Translation (4) Survey of origins to modern period of major Islamic literatures, especially Arabic, Persian and Turkish. Readings include The Arabian Knights, The Rubaiyat of Omar Khayyam and Gibran's The Prophet.

4010-20-30 Readings in Asian Literature (4, 4, 4) Prereq: Mastery of intermediate level of Japanese, Chinese, Sanskrit, or Arabic and consent of instructor.

4012 Selected Topics in Asian Studies (4) Content varies. May be repeated. Maximum 12 hrs.

4431-32-33 Advanced Modern Standard Arabic I, II, and III (4, 4, 4) Prereq: Arabic 3510. Readings in essays by modern Arab writers dealing with 20th century issues. Written and oral exercises over points of grammar and syntax that occur in essays. Prereq: 4311-32-33 or consent of instructor.

4434-35 Spoken Lebanese/Palestinian Arabic I, II (4, 4) Aural-oral introduction to central dialect of Arabic-speaking world. Prereq: 2431-32-33 or consent of instructor.

4531-32-33 Advanced Chinese (4, 4, 4) Prereq: 3531-32-33 or equivalent of consent of instructor. Must be taken in sequence.

4631-32-33 Advanced Japanese (4, 4, 4) Reading in graded primer with attention paid to finer points of grammar. Conversation, drill and composition practice with native speaker. Must be taken in sequence.

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**Comparative Literature**

4012-22-32 Special Topics in Comparative Literature (3, 3, 3) Content varies. May be repeated. F, W, Sp

4050-60-70 Dante and Medieval Culture (3, 3, 3) (Same as Italian 4050-60-70.) A, A, A

5012 Comparative Theories of Literature (3) Groce, Richards, Frye, Welkie, and others. Prereq: Completion of three literature courses in foreign language above 3000, or equivalent. W

5022 Approaches in Comparative Literature (3) French and American schools; "comparative literature" vs "general literature"; Van Tiegum, Carle, Baldensperger, Welkie. Prereq: 5012; completion of three literature courses in foreign language above 3000, or equivalent. W

5032 Studies in Comparative Literature (3) Independent research projects. Prereq: 5012 and 5022. Sp

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**Cultural Studies**

5101 Foreign Study (1-12) See page 104.

5102 Off-campus Study (1-12) See page 104.

5103 Independent Study (1-12) See page 104.

**Latin American Studies**

4001 Cultural Plurality in Latin America (3) Value systems and behavioral patterns based on Spanish-Mediterranean, Luso-Mediterranean, indigenous Indian and African heritage existing today in Latin America. Prereq: Consent of instructor.

4002 Institutional Changes in Latin America (3) Government, political parties, role of military, Church, educational institutions, democracy and dictatorship, nationalism, and family. Evolution of institutions in Latin and Hispanic America. Prereq: Consent of instructor.

4970 Latin American Studies Seminar (3-4) May be repeated with consent of instructor. Maximum 8 hrs.

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**Linguistics**

4000 Topics in Linguistics (3) Content varies. May be repeated. Maximum 9 hrs.

4120-30 Foundations of Linguistics Science, Development of Methodology, Contemporary Theory (3, 3) Intellectual and methodological foundations of linguistics science. Changes in linguistic interest brought about by Saussure's Cours and the growing importance of other disciplines on linguistics science. (Same as English 4120-30.)

4250 Introduction to Descriptive Linguistics (3) (Same as French, German, Russian, Spanish 4250.)

4260 Introduction to Historical and Comparative Linguistics (3) (Same as French, German, Russian, Spanish 4260.)

4270 Introduction to Romance Linguistics (3) (Same as French, Russian 4270.)

4271 Introduction to Slavic Linguistics (3) (Same as Russian 4271.)

4440 Sociolinguistics (3) (Same as English 4440.)

4460 Special Topics in English Linguistics (3) (Same as English 4460.)
Women's Studies

3430 The Concept of Woman (4) (Same as Philosophy 3430.)

4000 Topics in Women's Studies (4) Content varies. May be repeated.

4103 Independent Study (1-16) See page 104. Prereq: Consent of Chair of Women's Studies Committee.

4280 Women in European History (4) (Same as History 4280.)

4290 Women in American History (4) (Same as History 4290.)

4430 Women's Health (3) (Same as Health 4430.)

4830 Afro-American Women in American Society (4) (Same as Afro-American Studies 4830.)

4870 Contemporary Research on the Behavior of Women (3) (Same as Psychology 4870.)

5110 Psychology of Women (3) (Same as Educational and Counseling Psychology 5110.)

THE MASTER'S PROGRAM

The departmental requirements for the M.A. degree in English include (1) thesis and 36 quarter hours of courses in the Department of English or 45 quarter hours without a thesis, (2) evidence of proficiency in one foreign language, and (3) a final oral examination for thesis students, written and oral for non-thesis students. The courses should include 12 hours at the 6000 level, 12-21 additional hours of courses at the 5000-6000 level, and 12 hours at the 6000 level for graduate credit, including the 3000-4000 level. A reading list is in the office of the Director of Graduate Studies in English.

The M.A. with writing option is intended for those who wish to pursue an academic writing career, particularly in the fields of English composition or technical and professional writing. It is open to all students who have completed the B.A. degree, and may also be taken by M.A. students who have completed the M.A. degree in English or in a related field.

1. A minimum of 36 quarter hours beyond the B.A. degree.
   a. 12 hours at the 6000 level.
   b. 12 additional hours at the 5000-6000 level. (A student may take only three hours of 5103 Independent Study toward the degree.)
   c. 12 hours for graduate credit at any level, including the 3000-4000 level.

A student must take at least 15 hours in writing and 15 hours in literature, the remaining 6 to be selected from any English course at the proper level. Of the courses in writing, at least 9 hours must be taken at the 5000 level.

2. Students in the M.A. with writing option may choose one of the following writing projects in consultation with a project director and faculty committee:
   a. A thesis, using research to analyze some aspect of writing or rhetorical theory, for which 9 quarter hours credit is given.
   b. A creative project, for which 9 quarter hours credit is given. A collection of poems or short stories, a novel, a play, or a creative work of non-fiction prose would be acceptable as creative projects.

3. A final oral examination consisting chiefly of questions covering the general history and interpretation of English and American literature. A reading list may be modified by the M.A. examining committee, meeting in a body with the student, to reflect the candidate's particular writing emphasis, but most of the oral examination should focus upon the literature outlined in the original reading list.

4. Evidence of proficiency in one foreign language.

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 a balanced program of at least 72 quarter hours (or the equivalent) in English: 36 hours at the 6000 level; 24 additional hours at the 5000-6000 level; and 12 hours for graduate credit at any level, including the 5000-6000 level. At least 5 of 12 hours selected for graduate credit, including at least 9 hours selected for graduate credit, and by the department 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 comprehensive examinations from several areas divided as the department directs. Successful completion of these examinations will be followed by the writing of the dissertation and by an oral examination in the field of the dissertation.

Any course in the 5000 or 6000 series may be repeated for credit with the permission of the department.

*1211 Written and Oral English for Foreign Students (6) Rapid review of English grammar structures and pronunciation with intensive oral, aural, and written drill. Required during the first quarter of residence of all foreign students (graduates, undergraduates and transfer students) who are not native speakers of English.

*1221 Written and Oral English for Foreign Students (6) Emphasis on the more advanced structures of English grammar and on paragraph writing. Required during the first quarter of residence of foreign students who are not native speakers of English.


3135 Tennant and His Successors (3) Includes such poetry as that by the Pre-Raphaelites, humorists, and Decadents.

3156 Browning, Arnold, and Hopkins (3)

3150 Melville (3)

3210-20 English Literature and Culture of the Nineteenth Century (3, 3) Survey of literature dealing with leading movements in politics, science, religion, and the arts. 3210—1800 to 1835. 3220—1835 to 1900. 3411-12-20 Modern Drama (3, 3, 3) 3411—Continental to 1930. 3412—Continental since 1930. 3420—British. 3430—American.

3510 Sixteenth-century Prose and Poetry (3) More and Wyatt to Spenser. A

3520 Elizabethan Drama (3) Marlowe, Jonson, and others. A

3610 Restoration and Eighteenth-century Prose (3) Emphasis upon Dryden and Pope. A

3620 Restoration and Eighteenth-century Drama (3) Dryden through Sheridan. A

3630 Restoration and Eighteenth-century Prose (3) Defoe, Addison, Steele, Swift, and others. A

3670 The Age of Johnson (3)

3710 Literature of English Bible (3) Studies of Old Testament literature, excluding Wisdom literature. A

*Not available for graduate credit.
4270 Advanced Poetry Writing (3) Further development of skills in basic Writing Poetry course. Prereq: 3470 or consent of instructor.


4400 Sociolinguistics (3) Study of language in relation to society. Includes empirical and theoretical study. Emphasis both on individuals and on large-scale social units: tribes, nations, and social classes. Prereq: 3330 or Linguistics 2000 or consent of instructor.

4450 Dialectology (3) Theories and methodologies of dialect research, fieldwork, and analysis. Prereq: 3340 or consent of instructor.

4455 American Dialects (3) Characteristics of major and regional dialects of American English. Their origins and functions. Implications for cultural pluralism. Prereq: 3330 or Linguistics 2000 or consent of instructor.

4460 Special Topics in English Linguistics (3) May be repeated with consent of department. (Same as Linguistics 4460.)

4461 Quantitative Analysis of Language (3) Techniques of studying language both in spoken and in written texts, including literature, identifying questions, collecting, analyzing, and interpreting data, implications for linguistic and/or literary theory. Prereq: 3330 or Linguistics 2000 or consent of instructor.

4471-81 English as a Second or Foreign Language (3, 3, 3) 4471—Applied linguistics in teaching and learning of English as a second or foreign language. Phonological and grammatical structure of present-day English. Analysis of differences (phonological, grammatical, lexical) between English and another language. Prereq: Second year of a foreign language. 4481—Materials and methods of language teaching; with emphasis on preparation of materials and structured teaching situations. Theory of testing language competence and performance, with emphasis on construction of tests. Team teaching with an experienced member of the staff. Prereq: 4471. (Same as Linguistics 4471-81) W; Sp

4510-20 Black Literature (3, 3) Trends and developments.

4640 Black American Literature and Aesthetics (3) Evaluation of literary texts in Black American Literature and Aesthetics since 1899, emphasis on more recent works.

4651 Southern Literature through the Nineteenth Century (3) Southern writing from colonial period to end of nineteenth century, including frontier homers and local color writers.

4652 Southern Literature in the Twentieth Century (3) Modern Southern literary renaissance, the Fugitives and Agrarians, Faulkner and more recent writers such as Welty, O'Connor, and Porter.

4660 Emerson and Thoreau (3)

4680 American Humor through Mark Twain (3)

4721-31-41 Ballad and Folktales (3, 3, 3) 4721—Study of traditional English and Scottish popular ballads and their North American variants; 4731—Study of native American ballad and folktales; 4741—The folk narrative; functions, categories, and patterns of storytelling.

4850 Milton (3) Emphasis on major poems. A

4880 Seventeenth-century Prose and Poetry (3) Bacon and Donne to Marvell. A

4930-40 Chaucer (3, 3) 4930—The Canterbury Tales. 4940—Troilus and Criseyde and early poetry.

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

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

5101 Foreign Study (1-12) See page 104.

5102 Off-Campus Study (1-12) See page 104.

5103 Independent Study (1-12) See page 104.

5140 Teaching Freshman Composition (3) Introduction to teaching of Freshman English through study of various techniques and philosophies of composition. Required of all first-year teaching assistants. F

5150 Old English Prose (3) A

5170-80 History of the English Language (3, 3) 5170—Phonetic transcription, Old English, development of inflection and syntax. 5180—Middle and Early Modern English, developments in pronunciation and vocabulary. F; W

5210-20-30 Reading in American Literature from the Colonial Period to the Present (3, 3, 3) F; A; W; Sp; A

5240 Readings in British Literature (3) Critical and historical analysis of poetry, prose, drama, criticism; historical and cultural background; discussion of relevance or irrelevance of race as influence on text and reader.

5250 Fiction Writing (3) Advanced fiction projects, under supervision of instructor and time for independent study. Prereq: Extensive background in reading and writing fiction.

5255 Writing of Advanced Non-Fiction prose: The Genres (3) Practice in writing of biography, travel book, historical study, and associated genres. Viewpoint is creative. Prereq: 4000-level writing course or consent of instructor.

5270 Poetry Writing (3) Major poetic project or continuation of project begun in 4270. Individual consultation with instructor supplements class analysis; readings in contemporary poetry and theory. Prereq: 4270 or consent of instructor.

5280 Special Topics in Writing (1-3) Topic varies. May be repeated. Maximum 9 hrs. Enrollment by consent of Director of Graduate Studies only.

5290 Analysis of Technical Writing (3) Theory and practice of technical writing. Exploration of current theories of scientific, business, technical, academic, and government rhetoric. Analysis of shared ele- ments in practice and in particular writing. Prereq: 4140 or consent of instructor.

5310 Rhetoric and Composition: History and Theory (3) Modern developments in rhetorical theory, their origins in Plato, Aristotle, and others.

5410-20 Readings in Medieval English Literature (3, 3) A

5510-20 Readings in Literary Criticism from Plato and Aristotle to the Present Day (3, 3)

5620-30-40-50 Readings in English Literature of the Nineteenth Century (3, 3, 3) A

5630 Film History, Rhetoric, and Criticism (3) Film as narrative art form: historical development of film; the "rhetoric" of film; critical approaches to film study, including genre, auteurs, formalist, and historical; critical analysis of individual films.

570-29-30 Readings in English Literature of the Eighteenth Century (3, 3, 3) A

5820-30-40-50 Readings in English Literature of the Renaissance (3, 3, 3) A

5850 Introduction to Literary Research (3) Critical examination of aims of English studies, profession of English teacher, theory of literature, and methods of research, including collection of materials, evaluation of material, and transmitting of results of scholarship. F, W

5910-20-30 Readings in English and American Literature of the Twentieth Century (3, 3, 3) A
6000 Doctoral Research and Dissertation (3-15) P/ NP only. E
6110-20-30 Studies in Elizabethan Literature (3, 3, 3) A
6410-20-30 Studies in Chaucer (3, 3, 3)
6310-20-30 Studies in Victorian Literature (3, 3, 3)
adoption of Constitution.
6270-80 Studies in American Fiction (3, 3)
adoption of Constitution.
6241-42 Studies in Colonial American Literature (3, 3, 3)
6110-20-30 Studies in Elizabethan Literature (3, 3, 3)
6000 Doctoral Research and Dissertation (3-15) P/ NP only. E
J. B. Rehder, Ph.D. Louisiana State.
Ph.D. Georgia; B. Ralston, Ph.D. Northwestern; L. W. Brinkman, Jr.; Ph.D. Wisconsin; J. R. Carter,
C. W. Minkel, Ph.D. Syracuse; C. T. Paludan, Ph.D.
E. H. Hammond, Ph.D. California (Berkeley);
C. W. Minkel, Ph.D. Syracuse; C. T. Paludan, Ph.D.
T. J. Blassing (Adjunct), Ph.D. Northwestern;
J. B. Rehder, Ph.D. Louisiana State.
Assistant Professors:
S. R. Jumper (Head), Ph.D. Tennessee;
C. S. Aiken, Ph.D. Georgia; T. L. Beit, Ph.D. Iowa;
E. H. Hammond, Ph.D. California (Berkeley);
T. J. Blassing (Adjunct), Ph.D. Northwestern;
J. B. Rehder, Ph.D. Louisiana State.
The Department of Geography offers the degrees of Master of Science and Doctor of Philosophy in Geography with concentrations in geography of development, physical geography and human geography, urban geography, geography of Anglo-America, and rural and nonmetropolitan geography.
THE MASTER’S PROGRAM
The department offers both the thesis and non-thesis options for the Master of Science degree. Both options require a minimum of 45 quarter hours beyond completion of a sound undergraduate major program. At least two-thirds of the total hours in the graduate program must be at or above the 5000 level, and must include 5100 (at each offering during residency), 5150, 5160 and 56 quarter hours at the 6000 level. In the thesis option, no more than 9 hours may be thesis courses. A final examination is required in both programs.
THE DOCTORAL PROGRAM
The doctorate is a research degree and is granted only to those persons who demonstrate proficiency in conducting independent research. Students must have achieved the equivalent of a comprehensive Master’s program before they will be admitted to the doctoral program. Course requirements for the degree shall be determined by the student’s faculty committee in accordance with specific interests and needs. The program of study must include sufficient course work within the department, but outside the areas of specialization, to give a broad foundation and understanding of the discipline. The program must include 5150, 5170, 5720, and at each offering during residency) 5100. A minimum of 15 hours of credit must be earned in related fields outside the department. Examinations in foreign language, cartography, and quantitative techniques is required. Other techniques pertinent to the student’s areas of specialization may be required. The language will be French or German unless otherwise approved by the student’s faculty committee. Examinations required for admission to candidacy include a written comprehensive, written examinations on two special fields, and an oral examination on the student’s program, the special fields, and the dissertation proposal. Also required is a final oral examination on the dissertation and on other aspects of the program as determined by the student’s doctoral committee.
3420 Urban Geography (4) Concepts and theories concerning development and significance of systems of cities and internal morphology of cities. F or W
3450 Rural Geography (4) Geographical appraisal of rural areas of the United States, including small towns and urban fringes. Problems and potentials of rural America. F or W
3450 Geography of Resources (4) Study of factors related to variations in resource availability from time to time and from place to place, with particular emphasis upon energy and metallic resources. F or W
3250 Climatology (4) General circulation system leading to world pattern of climates. Climatic change and modification in relation to climate and human activity. W or Sp
5350 The Land-Surface System and Man (4) Nature and regional variations in relationships among surface form, weather, vegetation, and surface materials. Humans as evaluators and agents of change. F, Su
3610 Political Geography (4) Importance of geographic factors for understanding political relationships within and among nations: spatial implications of political decision making processes; geography of administrative units. F
3560 Cultural Geography (4) Basic concepts of culture; methods and body of cultural geography; world patterns of cultural phenomena. Sp
3790 Geography of Middle America (4) Covers Mexico, Central America, and the West Indies. F
3800 Geography of South America (4) W
3870 Geography of Asia (4) A survey of the physical, cultural and economic characteristics of the countries of Asia, excluding the Soviet Union.
3910 Regional Geography of United States and Canada (4) Major physical, economic, and social distributions as they intersect and form distinctive character of regions of United States and Canada. F
3920 Geography of the American South (4) Geographical appraisal of southeastern United States, including physical, economic, and social conditions, origins and development of the South, its sub-regions, and its relation to the United States as a whole. F
3940 Geography of Appalachia (4) Interrelationships of physical, economic, and social patterns that give distinctive character to the region and its parts, especially Southern Appalachia. Appalachia in perspective in the current American scene. F
4075 Geography of Transportation (4) Geographic examination of transportation systems, emphasizing transport of people and goods by land, sea, and air. F or W
4000 Quantitative Methods in Geography (4) Geographic applications of statistical techniques, point pattern analysis and analysis of areal units. Prerequisites: Mathematics 3000 or consent of instructor. W
4210 Problems in Geographic Method (4) Examples of problems and approach in geographic analysis and synthesis. Emphasis on character of geographic data, areal sampling, generalization, classification, regionalization, and questions of scale. F
4240 Historical Geography of the United States (4) Survey of changing human geography of the United States during four centuries of settlement and development. Emphasis upon changing population patterns, development of agricultural regions and patterns of urban development. Sp
4510 Principles of Geomorphology (4) (Same as Geol. 4510) Basic principles and uses of aerial photography and reproduction of maps. Recommended prerequisite: 3700. 2 hrs and 2 labs.
4730 Advanced Cartography (4) Map production from design through color proofs. Prerequisite: 3700, 4710, and 4726 or consent of instructor. Sp
4740 Remote Sensing: Types and Applications (4) Basic principles and uses of aerial photography and other remote sensing techniques. Emphasis upon value of various types of imagery for geographic interpretation and cartography. Recommended prerequisite: 3700 and knowledge of a computer language. F
4750 Interactive Computer Graphics (3) (Same as Computer Science 4750.)
5799 Practicum in Cartography/Remote Sensing (2-6) Prerequisite: Written consent of instructor required prior to registration. May be repeated. Maximum 6 hrs. E
5000 Thesis (1-15) P/ NP only. E
5002 Non-Thesis Graduation Completion (3-15) Required for non-thesis option of Master of Science degree. May be registered any quarter when such a student uses university facilities and/or faculty time before degree
5100 Colloquium in Geography (1) Discussion of departmental research, current research literature, and general topics. Registration at each offering required of resident graduate students. May be repeated. Maximum 8 hrs. S/NC only. E

5101 Foreign Study (1-12) See page 104. Prereq: Written consent of instructor prior to registration. E

5102 Off-campus Study (1-12) See page 104. Prereq: Written consent of instructor prior to registration. E

5150 Introduction to Geographical Research (3) Aims of geographical research; survey of printed source materials; practice in effective presentation of research findings. F

5160 Research Design and Field Problems (4-6) Development of research problems, preparation of appropriate study designs, and practical field application. Su

5170 Geographical Concept and Method (3) Traditional and modern thought regarding the nature, scope, problems, and methods of geography. A

5200 Special Problems in Geography (2-6) Reading and research on problems or topics of interest to individual students. Students must define topic and receive instructor's approval of study plan before registration for course. Written consent of instructor prior to registration. May be repeated with consent of instructor. Maximum 9 hrs. A

5250 Topics in Historical Geography (3) Examination of trends, concepts and methods in historical geography. Prereq: 4240 or consent of instructor. May be repeated with consent of instructor. Maximum 9 hrs. A

5260 Advanced Cultural Geography (3) Geographic analysis of rural settlement in Eastern United States, with emphasis upon New England, Tidewater East, and Upland South, and specific application to Southern Appalachians. Includes field work and final paper. Prereq: 3660 or consent of instructor. A

5310 Topics in Regional Geography of the United States (3) Intensive analysis of problems and trends in one or more regions of the United States, excepting American South. May be repeated with consent of instructor. Maximum 9 hrs. A

5320 Topics in the Geography of the American South (3) Geographic perspective on economic and cultural aspects of southeastern United States. Topics vary. May be repeated with consent of instructor. Maximum 9 hrs. A

5410 Advanced Topics in Economic Geography (3) Examination of trends, problems, and methods in modern economic geography. Prereq: 3410 or consent of instructor. May be repeated. Maximum 9 hrs. A

5520 Advanced Urban Geography (3) Analysis of research on urban systems, internal morphology, urban problems, and urban spatial behavior. Prereq: 3430 or consent of instructor. A

5550 Topics in Geography of Land-Surface System (3) Examination of trends, problems, and methods in geography of land-surface system. Prereq: 3520 or consent of instructor. May be repeated with consent of instructor. A

5610 Topics in Climatology (3) Examination of trends, problems, and methods in modern climatology. Prereq: 3520 or consent of instructor. May be repeated with consent of instructor. A

5660 Advanced Political Geography (3) Geographic consequences of public decisions, emphasis on understanding how administrative and political processes affect public land management, spatial distribution of public goods, and urban morphology. Prereq: 3610 or consent of instructor. A

5710 Seminar in Geography (3)

5720 Topics in Quantitative Geography (3) Multivariate analysis and problems in geography; research problems utilizing appropriate packaged computer programs; usefulness to geographic research of techniques developed by other disciplines. Prereq: 4100 or consent of instructor. Sp

5740 Advanced Topics in Remote Sensing (3) Applied research using remote sensing and aerial photographic imagery for interpretation and mapping of geographic data. Prereq: 4740 or consent of instructor. A

5750 Topics in Cartography (3) Trends, concepts, problems, and methods in cartography. Prereq: 4730, or consent of instructor. May be repeated with consent of instructor. Maximum 8 hrs. A

5799 Advanced Practicum in Cartography/Remote Sensing (2-6) Prereq: Consent of instructor. May be repeated. Maximum 6 hrs. E

5815 Regional Geomorphology (4) (Same as Geology 5815.)

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

6110-20 Seminar in Economic Geography (3, 3) A

6220-30 Seminar in Urban Geography (3, 3) A

6240-50 Seminar in Historical Geography (3, 3) A

6260-70 Seminar in Cultural Geography (3, 3) A

6310-20 Seminar in Rural Geography (3, 3) A

6410-20 Seminar in Regional Geography of the United States (3, 3) A

6610-20 Seminar in Regional Geography of Latin America (3, 3) A

6710-20 Seminar in Physical Geography (3, 3) A

NOTE: Registration in 6000-level courses may be repeated with consent of department.

Geological Sciences

MAJOR

DEGREES

Geology

M.S., Ph.D.

Professors:

K. R. Walker (Carden Professor and Head), Ph.D. Yale; H. J. Klepper (Emeritus), Ph.D. Ohio State; O. C. Kopp, Ph.D. Columbia; R. E. McLaughlin (Emeritus), Ph.D. Tennessee; K. X. Miura, Ph.D. Western Oregon; L. A. Taylor, Ph.D. Lehig; J. G. Watts (Emeritus), Ph.D. North Carolina.

Associate Professors:

T. W. Brodhead, Ph.D. Iowa; D. W. Byerly, Ph.D. Tennessee; G. M. Clark, Ph.D. Pennsylvania State; H. V. McSweeney, Ph.D. Harvard.

Assistant Professor:

R. W. Armstrong, Ph.D. northeastern; P. A. Delcourt, Ph.D. Minnesota; S. G. Dries, Ph.D. Wisconsin; S. F. Labotka, Ph.D. California Institute of Technology; M. L. Mcjkiny, Ph.D. Yale; N. B. Woodward, Ph.D. Johns Hopkins.

The Department of Geological Sciences offers both the M.S. and Ph.D. degrees in geology. Persons interested in these programs should consult the department. For admission, an applicant must provide two rating forms or letters of recommendation, and GRE scores, including the subject exam in geology (or in another area if geology was not the area of previous undergraduate level concentration). Students are not admitted under provisional or non-degree status.

General course requirements for both degrees include:

1. At least 12 quarter hours in mineralogy, petrology, stratigraphy/sedimentation, paleontology, structural geology, optical mineralogy, and field geology (normally taken in an undergraduate program).

2. A two-semester introductory sequence in chemistry, calculus, and one of the following areas (normally taken in an undergraduate program): statistics, botany, zoology, biology, physics.

THE MASTER'S PROGRAM

Completion of the M.S. degree includes satisfactory performance on an oral qualifying examination during the second term, maintenance of a minimum B average in all graduate coursework, and successful defense of the dissertation. Course requirements include a minimum of 45 quarter hours of graduate credit that include no fewer than 24 hours in geology courses (21 or more hours at 5000 level) and 9 hours of Thesis 5000.

A public oral presentation of the thesis is required. Failure to achieve a 3.0 GPA for two successive quarters will terminate a student's candidacy.

THE DOCTORAL PROGRAM

Completion of the Ph.D. degree includes satisfactory performance on the comprehensive examination taken no later than the end of the second year, maintenance of a minimum B average in all graduate coursework, and successful defense of the dissertation. Course requirements include a minimum of 39 quarter hours of graded courses for graduate credit and at least 36 hours of Dissertation 5000. At least 26 of these 39 hours must be at or above the 5000 level with a minimum of 9 hours in courses at the 6000 level. Up to one-third of required hours may be taken in related areas. Attendance in a weekly seminar is required each quarter for not more than 6 hours S/NC credit toward the degree total.

Each Ph.D. student must satisfy research tool requirement which will be determined by his/her faculty committee and will consist of one of the following:

a. Demonstration by examination of a read knowledge in one modern foreign language in which there is a significant body of geological literature.

b. Completion of course 3303 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 are completed with a B average in appropriate mathematics, statistics, or computer science courses. The course must be taken during a student's graduate program and must be approved by the student's entire committee.

Option c. is available only to students who have had previous formal college-level reading experience in an appropriate foreign language.

A written and oral comprehensive exam and an oral defense of the dissertation are required. Failure to pass the comprehensive exam (a second opportunity may be granted by the department) or to achieve a 3.0 GPA for two successive quarters will terminate a student's candidacy.

*3180 Mineralogy (4) Introduction to crystallography and study of minerals. Laboratory includes hand specimens, chemical and x-ray methods of identification. Prereq: 1010, Chemistry 1110-20 or equivalent. 3 hrs and 1 lab. A

*3310-20 Intervertebrate Paleontology (4, 4) Systematic review of important Metazoan intervertebrate fossil groups. 3210—Porifera to Annelids, including cnidarians, echinoderms, brachiopods, and condylobranchs; 3220—Mollusca through lesser Chordata, including cephalopods and echinoderms. May be taken separately or in sequence. Prereq: 3200; Biology 1210-20 or consent of instructor. 3 hrs and 1 lab or field period.
4440 Field Geology (3) Five-week field course, first term sophomore or junior. Advanced undergraduates or first-year graduates in geology. Employs entire time of students. Field techniques demonstrated, practiced and applied to solving geologic problems. Prereq: 12 hrs geology and consent of instructor.

4460 Geologic Photography, Photogrammetry and Remote Sensing (4) Terrestrial, airborne, and satellite geologic remote sensing, photographic principles and practice, geometry of terrestrial and aerial photography, principles of nonphotographic remote sensing systems.

4510 Principles of Geomorphology (4) Gradational processes and interpretation of earth's surface and landforms produced. Prereq: 1010-20-30 or equivalent. Same as Geography 4510. 3 hrs and 1 lab.

4550 Optical Mineralogy (4) Identification of minerals and determination of crystal-chemical parameters using petrographic microscope.

4610 Principles of Geochemistry (4) Application of chemical principles to geologic problems. Emphasis on crystal chemistry and relation between basic atomic structure and distribution and behavior of elements in the earth's crust. Prereq: Chemistry 1110-20 or equivalent. Recommended: 3310.

4650 Mineral Phase Equilibria (3) Principles of phase chemistry and application of phase equilibria studies in rock-forming mineral systems as aid to understanding conditions of precipitation of rocks. Prereq: 4610 or consent of instructor.


4810 Special Problems in Geology (1-4) Prereq: Consent of instructor. May be repeated. Maximum 4 hrs.

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

5050 Geochemistry of Ore Mineral Deposits (3) Study of ore deposits based on experimental, empirical and theoretical geochemical considerations. Prereq: 4550 and 4110 or consent of instructor.

5069 Experimental Geochemistry Laboratory (1-3) Independent lab study of problem in geochemistry using lab techniques. Prereq: Consent of instructor.

5210 Special Problems in Geology (1-4) Prereq: Consent of instructor. May be repeated. Maximum 12 hrs.

5290 Quaternary Problems (4) Interdisciplinary approach to interpretation of physical and biological phenomena directly or indirectly influenced by Pleistocene glaciation. Prereq: Elements of geology (3 quarters) or consent of instructor. (Same as Botany 4240) 3 hrs and 1 lab or field period.

5311 Quaternary Geology of North America (4) Development of quaternary landscapes as influenced by climatic change in conjunction with glacial, periglacial, fluvial, and eolian processes; regional characterization of quaternary stratigraphy, sedimentology, and geomorphology for North America. Prereq: 1410, equivalent, or consent of instructor.

5322 Quaternary Paleogeography (4) Perturbation, processes, and deposits of large-scale and regional sedimentary basins; large scale tectono-sedimentary basins; glacio-eustatic changes; paleoclimatic evidence; late Pleistocene environments. Prereq: 4110 or consent of instructor.

5323 Quaternary Field and Lab Techniques (4) Field methods for description and sampling of Quaternary deposits and lacustrine sediments; identification of pollen and plant macrofossils; laboratory analyses of fossil-plant assemblages from Quaternary sites in eastern North America. Prereq: 1410, equivalent or consent of instructor: 2 hrs and 2 labs.

5340 Seminar in Local Stratigraphy (1) Stratigraphy of Knoxvile area.

5350 Selected Topics in Geology (1) Presentation of graduate research, topics from current literature, and student papers. May be repeated. Each quarter except summer for resident full-time graduate students. S/NC only.

5370 Mesofabric Analysis (4) Techniques of gathering, processing, and interpreting tectonic mesofabric data. Prereq: 3210 and consent of instructor. 1 lab period. Prereq: 1 of the preceding courses each quarter except summer for resident full-time graduate students. S/NC only.

5460 Photogeologic Interpretation (4) Advanced photogrammetric techniques to obtain geological measurements from aerial photographs. Practice in photo interpretation of imagery collected in geological features. Prereq: Consent of instructor.

5470 Plate Tectonics and Orogeny (4) Geometry and kinematics of plate motion are used to devise models of geosynclines, fold belts, metamorphic and plutonic belts, with recent and ancient examples. Prereq: 3310. 3 hrs and 1 seminar or lab.

5520 Igneous Petrology (4) Genesis and emplacement of igneous, magmatic, chemical, and textural properties of resulting igneous rocks. Laboratory emphasizes petrographic description and classification of rocks in thin section. Prereq: 3310 and 4550. 2 hrs and 2 labs.

5530 Metamorphic Petrology (4) Physical and chemical characteristics of metamorphic environments, and effects on texture, chemical composition, and mineral equilibria. Laboratory emphasis on petrographic description and interpretation of metamorphic rocks in thin section. Prereq: 3310 and 4550. 2 hrs and 2 labs.

5540 Terrigenous Clastic Sedimentary Petrology (4) Field and microscopic analysis of terrigenous clastic rocks of the continental and oceanic environments of the earth. Prereq: Consent of instructor. Maximum 4 hrs.

5550 Carbonate Sedimentology (4) Environments of deposition of modern and ancient carbonates. Prereq: 3310 or consent of instructor. Recommended: 4550. 3 hrs and 1 lab.

5570 Advanced Structural Geology (4) Brittle and ductile deformation features with organic belts in context of tectonic evolution. Course readings from recent literature and discussion of ongoing research. Prereq: 3370 or consent of instructor. 3 hrs and 1 lab or seminar.

5610 Analytical Techniques in Geology (1) Survey of sampling procedures and sample preparation, collection and treatment of data and application of modern analytical techniques to geological problems. S/NC only.

5611 Atomic Absorption Analysis (1) Application of atomic absorption spectrophotometry to chemical analysis of bulk geological samples: minerals, rocks, and ores. Prereq: 5610 or consent of instructor. 1 lab.

5612 Electron Microprobe Analysis (2) Theory and application of electron microprobe for chemical analysis of solid particles such as minerals. Prereq: 5610 or consent of instructor. 2 labs.

5616 X-Ray Diffraction Analysis (1) Application of x-ray diffraction procedures in identifying crystalline substances. Prereq: 5610 or consent of instructor. 1 lab.

5617 X-Ray Fluorescence Analysis (1) Application of x-ray fluorescence to chemical analysis of bulk geological samples, such as minerals, rocks, and ores. Prereq: 5610 or consent of instructor. 1 lab.

5633 X-Ray Diffraction: Single Crystal Techniques (3) Single crystal x-ray diffraction techniques, emphasis on precession and Weissenberg photography, Crystal symmetry and diffraction, reciprocal lattice and Ewald sphere construction, space group determination and application to geological problems. Prereq: Knowledge of introductory crystallography and consent of instructor.

5640 Clay Mineralogy (4) Origin of clay minerals; structures and properties of clay minerals; application of mineralogical techniques in clay mineral studies. Prereq: 5310 and 5630 or equivalent. 2 hrs and 2 labs. A

5650 Thermodynamics for Geologists (3) Principles
of chemical thermodynamics related to geologic processes. Prereq: Chemistry 1101-20 and calculus of a single variable or equivalents.

5655 Aquatic Geochemistry (4) Introduction to and applications of equilibrium thermodynamics to earth surface environments, including geochemistry of natural waters, weathering reactions, and early diagenesis. Prereq: Chemistry 1110-20. Chemistry 1120 may be cores. With consent of instructor. Recommended prereq: 5656. 3 hrs and 1 lab.

5680 Physical Geochemistry (4) Theory and practice of thermodynamics as applied to geologic situations: phase equilibria, kinetics, geothermometers/thermometers, and petrological systems. Prereq: 5656. 4 hrs and 1 lab.

5690 Cathodoluminescence Petrology (2) Application to geological problems. Prereq: 3160 and 4550 or consent of instructor. 1 hr and 1 lab.

5710 Advanced Paleontology (4) Fossil invertebrates.

5720 Paleontological Nomenclature and Techniques (4) Codification of biologic nomenclature as it applies to paleontology. Prereq: techniques in preparation and illustration of paleontologic materials and manuscript preparation for publication. 3 hrs and 1 lab.

5760 Biostratigraphy (3) Application of paleontologic data to stratigraphic study, codification of stratigraphic nomenclature, and recommended practice. Prereq: 3260 and 3360. 1 hr and 1 2-hr seminar.

5820 Strata-bound and Stratiform Sulfide Deposits (4) Classification, distribution, characteristics and genesis of strata-bound and stratiform sulfide deposits. Prereq: 5850 or consent of instructor. 2 hrs and 2 lab/field seminar periods.

5830 Magmatic Mineral Deposits (4) Classification, distribution, characteristics and genesis of mineral deposits related to magmatic processes. Magmatic segregation deposits of ultramafic-mafic association and porphyry Cu-Mo deposits. Prereq: 4110 or 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 paragenesis from textures. Typical samples from different types of ore deposits, such as tuffic, lead-zinc, and porphyry Cu Mo deposits. Prereq: 4110 or consent of instructor. 2 hrs and 2 lab/field/semester periods.

5850 Regional Studies in Geology (1-3) Literature study and seminars on specific regions of geologic interest, supplemented by field trip. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs.

5860 Coal Depositional Environments (4) Coal stratigraphy and depositional environments. Carboniferous rocks of Appalachian region. Prereq: 3360 or 4130.

5915 Regional Geomorphology (4) Selected geographic regions. Most have common elements such as history, development, related processes which have produced genetically similar assemblages of landforms. May be repeated with consent of department. (Same as Geography 5915.)

5920 Process Geomorphology (4) Gradational processes operating on or near earth's surface; application of analytical methods in lab and field. Prereq: 1450 and 4510. 3 hrs and 1 lab or field period.

6000 Doctoral Research and Dissertation (1-5) Prerequisite: Graduate standing. E

**6710 Seminar in Geochemistry (3) Prereq: 4610 or consent of instructor.

**6810 Seminar in Geomorphology (3) Prereq: 4510 or consent of instructor.

*Not available for graduate credit for geology majors.

*Registration for 6000-level courses may be repeated with consent of department. Maximum 9 hrs per course.

Germanic and Slavic Languages

MAJORS

German

German Language and Literature

Ph.D.

Emeritus Professors: H. W. Fuller, Ph.D. Wisconsin; R. L. Hiller, Ph.D. Cornell.

Professors: A. M. Kratz (Head), Ph.D. Ohio State; J. E. Fellen, Ph.D. Pennsylvania; D. M. Flaum, Ph.D. Indiana; J. C. Osborne, Ph.D. Northwestern; M. P. Rice, Ph.D. Vanderbilt.

Associate Professors: N. A. Leuckner, Ph.D. Wisconsin; D. E. Lee, Ph.D. Stanford; D. M. Melmore, Ph.D. Chicago; J. R. Ritenhohf, Ph.D. Connecticut.

Assistant Professors: C. Hodges, Ph.D. Chicago; J. I. Kolodziej, M.A. Indiana.

The Department of Germanic and Slavic Languages offers two advanced degrees, the Master of Arts (M.A.) in German and the Doctor of Philosophy (Ph.D.) in German Language and Literature.

THE MASTER'S PROGRAM

The department requires a minimum of 45 quarter hours including 21 hours of coursework above 5000 level and 9 hours of Thesis 5000.

THE DOCTORAL PROGRAM

The candidate for the doctoral degree must complete a minimum of 81 quarter hours of course work beyond the Bachelor's degree in addition to 36 hours of doctoral research and dissertation. At least 45 quarter hours of the minimum must be taken in 5000 or 6000 courses. Of these 45 hours, a minimum of 18 hours must be chosen from the program seminars (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 minimum of 10 hours of the minor field or fields must be taken in a cognate field. Students must complete a minimum of 18 hours of 5000 or 6000 courses. Students must show a fluent command of German, both oral and written, and knowledge of two foreign languages. French and another language such as Italian, Latin or Russian, appropriate to the field of research. A comprehensive examination, both written and oral, on German language and literature in an allied field or fields, must be passed before the student may be admitted to candidacy. The student will be examined on an extensive reading list which covers the whole range of German literature, and will be expected to show familiarity with major works of world literature. The candidate will be required to defend the dissertation in an oral examination, which will cover also the general area of the dissertation. Central emphasis is put on the doctoral dissertation as a final test of the candidate's scholarly qualifications.

The field of study is divided into (1) German literature and (2) German (or Germanic) philology or linguistics. A student may concentrate on one or the other. Dissertation and seminar research topics will be chosen in accordance with the varying preferences and special interests of the faculty. Detailed programs will be established in each case by the student's faculty committee.

German

3010-20-30 Elements of German for Upper Division and Graduate Students (3, 3, 3) Elements of language, elementary and advanced readings. Open to graduate students preparing for language examinations, and upper division students desiring reading knowledge of the language. Undergraduate credit only. No credit for students having completed elementary German.

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). May be repeated. S

4170 Theatrical German (1-3) Performance in one or more German plays. Prereq: Intermediate German equivalent or consent of instructor. May be repeated with consent of department. W, Sp.

4210-20-30 Studies in German Literary Types (3, 3, 3) 4210—Lyric poetry. 4220—Drama. 4230—Narrative prose. Prereq: 9 hrs of 3000 courses (exclusive of 3010-20-30) or equivalent.

4250 Introduction to Descriptive Linguistics (3) (Same as French, Russian, Spanish, and Linguistics 4250.) F

4260 Introduction to Historical and Comparative Linguistics (3) Linguistic change, protolanguages. Phonological and morphological change. Cultural, historical, sociological influences upon the development of language. 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, or 3010-20, or courses in English translation. May be repeated. Su

4270 Introduction to Germanic Linguistics (3) Phonetics and phonemics of German. German grammar and vocabulary from descriptive point of view. Dialects of German. Other Germanic languages.

4310-20 History of German Language (3, 3)

4530 German Civilization (3) Prereq: Intermediate German or equivalent.

4810-20-30 Advanced Conversation and Composition (3, 3, 3) Prereq: 3810-20-30 or equivalent or consent of department. F, W, Sp

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

5100 German Phonetics and Advanced Grammar (3) Advanced work in phonetics, pronunciation, and selected topics in German grammar. For teachers and prospective teachers. Prereq: Consent of instructor.

5101 Foreign Study (1-12) See page 104. E

5200 Seminars (3) Bibliography, methods, illustrative problems; preparation of papers. F
5210-20-30 College Teaching of German (1, 1, 1) Required of all M.A. or Ph.D. candidates, except those whose previous teaching experience warrants excusal from this requirement or who wish to pursue voca-
tional other than teaching. F; W; Sp

5410-20-30 Medieval German Language and Literature (3, 3, 3) 5410—Introduction to Middle High German. 5410—Readings in Medieval German Literature. F; W; Sp

5500 Studies in German Literature (3) Content varies. May be repeated. Maximum 9 hrs. Su

5510 German Humanism and the Reformation (3)

5520 German Baroque Literature (3)

5530 The Enlightenment and the Rococo (3)

5540 German Classicism (3)

5560 German Romanticism (3)

5570 German Realism and Naturalism (3)

5580 Modern German Literature (1889-1945) (3)

5590 Modern German Literature (1945-1955) (3)

5600 German Literary Theory and Criticism (3) W

5610-30-40-50-60 Directied Readings in German Lan-
guage and Literature (3, 3, 3, 3, 3) E

5710 Introduction to Old Norse (3) Phonology, morphology, and syntax of Old Norse. Representa-
tive readings in Old Norse.

5720 Readings in Old Norse Prose (3) Intensive readings of Old Norse prose works. Icelandic saga as literary genre.

5730 Readings in Old Norse Poetry (3) Intensive read-
ing of Eddic poems as a literary genre and repository of ancient Germanic customs, legends, and mytholo-
gy.

6000 Doctoral Research and Dissertation (3-15) Prerequisite: 36 hours of coursework in the department. Undergraduate credit only. No credit for students having completed 1 yr of Elemen-
tary Russian.

6250 Introduction to Descriptive Linguistics (3) (Same as Spanish, Linguistics, and German 4250.) F

6260 Introduction to Historical and Comparative Lin-
guistics (3) (Same as French, Spanish, Linguistics, and German 4260.) W

6271 Introduction to Slavic Linguistics (3) (Same as Linguistics 4271.)

**Greek**

See Classics

**History**

<table>
<thead>
<tr>
<th>Course Title</th>
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<td>History</td>
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<td>History</td>
<td>M.A., Ph.D.</td>
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**Professors:**

J. Morrow (Head), Ph.D. Pennsylvania; P. H. Bergeron, Ph.D. Vanderbilt; E. V. Chmiel, Ph.D. Washington; R. E. Duncan, Ph.D. California (Berkeley); L. P. Graf, Emeritus (Emilendorf); Ph.D. Harvard; A. G. Haas, Ph.D. Chicago; P. H. Hao, Ph.D. Harvard; R. W. Haskins, Emeritus, Ph.D. California (Berkeley); C. O. Jackson, Ph.D. Emory; M. M. Klein, Emeritus (Emilendorf) E; Ph.D. Columbia.

**Associate Professors:**


**Assistant Professors:**


1Distinguished Service Professor.

2Alumni Distinguished Service Professor.

The Department of History offers graduate study leading to the Master of Arts and Doctor of Philosophy degrees. The M.A. program includes a thesis and non-thesis option and also offers a non-thesis concentra-
tion in historical preservation. The doctoral program has concentrations in American or European history. Detailed information may be obtained from the Director of Graduate Studies in History.

All incoming students will be advised by the Director of Graduate Studies.

The MASTER'S PROGRAM

**Admission Requirements:**

1) Successful completion of a baccalaureate degree, preferably with a major in history; (2) Acceptable scores on the Graduate Record Examination (general and subject history); (3) Successful completion of the M.A. degree.

**Non-Thesis Option:** A total of 45 hours of coursework is required. A student must complete 5240, 5270, 6 hours of reading courses (5211-26 and 6 hours of 6000-level seminars. A total of two-hour written examination on one field and a final oral examination on the other field is given at the end of the program. As many as 18 related hours may be taken in courses outside the department for either option.

**Concentration in Historic Preservation:**

This option is a non-thesis program requiring 47 total hours, 26 hours outside the department, and 21 hours leading to the Master of Arts degree. Required courses are 6 hours of 5215 or 5216 and 5226. Students will be examined in two fields: historic preservation and either American history to 1815 or American his-
tory since 1789.

**Retention and Termination:** A 3.0 overall GPA is required of graduate students to remain in good standing. The Graduate Awards and Review Committee monitors the progress of all graduate students each quar-
ter.

**THE DOCTORAL PROGRAM**

**Admission Requirements:**

1) Acceptable scores on the Graduate Record Examination (general and subject history); (2) Successful completion of the M.A. degree.

**Residence and Course Work:** Students are required to offer a minimum of 75 credit hours in course work beyond the Bachelor’s degree. No fewer than 45 hours must be in courses that are not offered by the University, including one 6000 seminar. Students must take 5240 and 5270 or have their equivalent elsewhere. Candidates who have not written a Master’s thesis must take two 6000 seminars. Students transferring from another institution may count up to 36 hours of coursework toward the required 75 hours. All students pursuing the Ph.D. degree must take a minimum 9 related hours outside the department. No fewer than 6 quarters of the 9 quarters of residence work (3 of which must be consecutive quarters) shall be under the supervision of the staff of UT.

**Language Requirements:** Candidates must possess a reading knowledge of one foreign language and such additional lan-
guages as may be determined by the student’s committee. Under normal circum-
stances, those specializing in European history will need two languages. The commit-
tee may also specify any other research tools, such as statistics, essential for the student’s preparation. Upon student peti-
tion, the committee may accept the equivalent of a language A or B better performance in appropriate statistical course and History 5290.

In the foreign language requirements may be satisfied in one of two ways:

(a) By examination. When the student is ready to take a language examination he/she should consult with the advisor. The appropriate form is to be sent to the Department of History a minimum of 30 days in advance of the examination. The examination may be offered at The Graduate School.

(b) By course work. Upon consultation with the advisor, a student may elect to complete an appropriate 3010-20-30 sequence in a language department or an intermediate sequence in a language in which no 3010-20-30 sequence is available. Satisfactory completion requires that a stu-

**THEODORE ROBERT GOULDING**

History/College of Liberal Arts 135
dent must have at least a B in the final quar-

Comprehensive Examination: The comprehensive examination which will be both written and oral must be taken after all course work is completed, language require-
ments fulfilled, and at least nine months before the degree is expected. This exam should normally be taken before beginning the ninth quarter of work toward the doctor.
ate. The candidate must present four fields, distributed as follows: one major field (histo-
y; two minor fields (history; and one minor field, which may be in history or out-
side the department. In any case, the student is required to have 9 hours of grad-
uate work outside the History Department. Three of the four areas listed below must be re-
presented by a major or a minor field, or both.

I. Ancient and Medieval
(1) Ancient Near East
(2) Greece
(3) Rome
(4) Early Middle Ages, 375-1122
(5) Late Middle Ages, 1095-1450

II. Early Modern
(1) Renaissance and Reformation
(2) Europe, 1559-1815
(3) American History to 1815
(4) Latin America 1492-1825

III. Modern
(1) Europe, 1815-1914
(2) European World Since 1914
(3) United States, 1815-present
(4) Latin America, 1789-present
(5) East Asia, 1641-present
(6) Middle East, 1798-present

IV. National, Regional, and Local
(1) England, 1485-1763
(2) Great Britain, 1700-present
(3) France, 1559-1815
(4) France, 1559-1815
(5) Germany, 1555-1806
(6) Germany, 1806-present
(7) Russia, 1806-1900
(8) Russia, 1900-present
(9) Colonialism and Imperialism
(10) Diplomatic History of the States
(11) Social and Cultural History of the United States
(12) The South
(13) Frontier and Westward Movement
(14) Afro-American

Dissertation and Final Examination: Orig-
inal research forms the basis for the dis-
sertation. After the dissertation has been com-
pleted, a final oral examination will be given on the dissertation in its historical con-
text.

3060-70 History of Western Religious Thought and Institutions (3, 3) (Same as Religious Studies 3640)

3140-49 History of England (3, 3, 3) 3140—To 1660; 3150—1660 through the Reform Bill of 1632; 3160—1832 to the present. Medieval state, church, and society; origins of Anglo-American law monar-
chy and parliamentary government, Restoration, seventeenth century revolutions, commercial, agri-
cultural and industrial revolutions; class conflict, empire, warfare, state, world wars, economic crisis.

3311-21 History of Tennessee (3, 3) 3311—Eight-

3412 The Reformation (3) Reformation, Counter Ref-
or, and Wars of Religion. 1517-1618. (Same as Religious Studies 3412.)
6710 Seminar in Medieval Institutions (3)
6770 Seminar in Central European History (3)
6810 Seminar in Latin American History (3)
6890 Seminar in Twentieth-century America (3)
6930 Seminar in Twentieth-century America (3)
6940 Seminar in the History of the South (3)
6910 Seminar in the Civil War Era (3)
6930 Seminar in Central European History (3)

NOTE: Registration in topics and seminar courses may be repeated for credit with consent of department.

Human Services
4300 Working Within the System (6) Survey of context within which need for human services arises, and analysis of process by means of which such services are provided. Prereq: Consent of instructor.

Latin
See Classics

Mathematics

MAJOR

DEGREES

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

Professors:
G. E. Albert (Emeritus), Ph.D. Wisconsin;
J. S. Bradley (Head), Ph.D. Iowa; J. H. Carruth,
Ph.D. Minnesota; C. E. Clark, Ph.D. Louisiana;
R. E. Cline, Ph.D. Purdue; R. J. Daverman,
Ph.D. Wisconsin; D. J. Deissart, Ph.D. Maryland,
D. D. Dobson, Ph.D. Cornell; E. D. Eaves (Emeritus);
Ph.D. Texas; H. Frandsen, Ph.D. Illinois;
D. A. Gardiner; Ph.D. North Carolina State;
R. F. Gregory (Emeritus), Ph.D. Illinois;
T. G. Hallam, Ph.D. Missouri; D. B. Hinton, Ph.D.
Tomasson (Emeritus), Ph.D. Chicago;
L. S. Husch, Ph.D. Florida State;
G. S. Jordan, Ph.D. Stanford; H. M. McCannell,
Ph.D. Duke; H. T. Mathews, Ph.D. Tulane;
D. D. Miller (Emeritus), Ph.D. Michigan;
K. R. Kimble, Ph.D. Ohio State; V. Kuo,
Brown; D. F. Anderson, Ph.D. Chicago;
B. S. Rajput, Ph.D. Illinois; K. C. Reddy*, Ph.D.
Indian Institute of Technology (India);
W. P. Schafer, Ph.D. Maryland; S. Serban, Ph.D.
Cornell; F. W. Stallmann, Ph.D. Giessen (Germany);
E. Wachspress, Ph.D. Rensselaer Polytechnic
Institute; W. R. Wade, Ph.D. California (Riverside);
C. G. Wagner, Ph.D. Duke; J. J. Walsh, Ph.D.
SUNY (Binghamton).

Associate Professors:
V. Alexiades, Ph.D. Delaware; N. Alikakos, Ph.D.
Brown; D. F. Anderson, Ph.D. Chicago;
V. A. Dougalis, Ph.D. Harvard; J. Dydek, Ph.D.
W. F. Herlitzius; K. R. Kinste, Ph.D. Ohio State;
Y. Kuo, Ph.D. Cincinnati; B. A. Kupersmidt**, Ph.D.
Massachusetts Institute of Technology; J. H. Lee
(Emiratus); Ph.D. Duke; H. L. Lurie*, Ph.D.
Wisconsin; R. Rowlett, Ph.D. Virginia; H. Simpson,
Ph.D. California Institute of Technology; J. Smith,
Ph.D. California (Berkeley); K. Soni, Ph.D. Oregon
State; F. W. Soni, Ph.D. Oregon State;
K. R. Stephenson, Ph.D. Wisconsin; C. Sundberg,
Ph.D. Wisconsin.

Assistant Professors:
5. Baele, Ph.D. Cornell; L. Barker, Ph.D. Florida
State; J. Cohen, Ph.D. Washington; S. Eliner, Ph.D.
Cornell; L. L. Gross, Ph.D. Cornell; S. Hulthammer*;
Ph.D. Carnegie Mellon; C. Karakashian, Ph.D.
Harvard; S. Lenthart, Ph.D. Kentucky; J. L. Long,
Ph.D. Michigan State; S. Mataly, Ph.D. Purdue.

*Space Institute, Tullahoma.

The Mathematics Department has three graduate degrees: (1) the Master of Mathematics degree, intended primarily for teachers of high school mathematics, (2) the Master of Science degree, designed to prepare students for industrial employment and for college and university teaching and research. Contact the department office for additional information.

MASTER OF MATHEMATICS PROGRAM
Before admission, the applicant must have either (a) certification for teaching secondary mathematics in at least one of the states of the United States, or (b) three years of successful elementary or secondary teaching experience. Evidence of the requirement being met must be supplied by the student.

Applicants for admission to this program must take the Graduate Record Examination (aptitude portion), and have had at least one year of college mathematics including analytic geometry.

The following requirements must be met:
1. Computing: 45 hours of work in courses numbered above 4000 and that credit be received for a 3-hour seminar or course, or a maximum of 3 hours of upper division work in an area outside of mathematics at the 5000 level.
2. 9 hours of additional work from mathematics courses numbered 5000 or above or from courses in other departments selected in consultation with the advisor.

Passing a comprehensive examination upon completion of all course work.

THE MASTER OF SCIENCE PROGRAM
The department offers two options for this degree. The first option requires a thesis for which 9 hours must be earned along with 36 additional hours of acceptable courses numbered above 4000. Of the additional hours, 9 may be in an area outside the department and 21 must be in courses in mathematics numbered above 5000.

After two quarters of graduate study, a student whose supervisory committee gives its approval may choose the non-thesis option, for which 45 hours of work in courses numbered above 4000 are required. Of these, 30 hours (at least 24 which are in mathematics) must be in courses numbered above 5000. Of the 45 hours, 15 in courses approved by the supervisory committee may be taken in fields other than mathematics.

For this option it is also required that a written comprehensive examination be passed, and that credit be received for a 3-hour seminar or reading course (5980-5995) in which a term paper or project is required. A student offering mathematics as a minor for the Master's degree is required to obtain at least 9 hours of resident graduate credit in courses numbered above 4000 and approved by both the major department and the Department of Mathematics.

THE DOCTORAL PROGRAM
For the Ph.D. in Mathematics, the student must meet the following four requirements:
1. Satisfy either of the following: A, the standard option or B, the mathematical ecology option.
2. A student intending to work in mathematical ecology may complete either option but he/she is encouraged to complete the mathematical ecology option. A student may elect to switch from either option to the other option provided that the constraints of the latter option have not been violated. A student's status after electing such a transfer is determined by the student's supervisory committee and the Applied Mathematics Committee.

A. Standard option: Pass Written examinations covering four subjects, at least three of which must be from the following list:
   a. Algebra 5510-20-30
   b. Functions of a Complex Variable 5110-30
   c. Topology 5910-20-30
   d. Functions of a Real Variable 5210-20-30

   e. Linear Analysis 5240-50-60
   f. Partial Differential Equations 5450-60-70
   g. Ordinary Differential Equations 5870-80-90

   h. Numerical Mathematics 5655-65-75
   i. Mathematical Statistics 5750-60-70

   Students may not take examinations in both d. and e. nor may they take examinations in both f. and g. as their comprehensive examination subjects. Those students who choose four from this list must choose two from a. through e. and the students who choose only three from this list must choose one from a. through e.

A student selecting only three from the above list will also be required to pass a written exam on an area of applied mathematics (e.g., fluid dynamics, mathematical ecology) approved as an examination subject for that student by the Graduate Committee and the Applied Mathematics Committee.

For a given student and a given area, the Graduate Committee will appoint a section of faculty whose responsibility is to submit a list of topics and references to the Graduate Committee and the Applied Mathematics Committee for approval.

A student may take as many of the written examinations as desired at any time these exams are given subject to the following conditions:

a. The exams to be taken must be approved in advance by the student's supervisory committee.

b. At most 4-n exams may be taken at any one time, where n denotes the number of exams previously passed by the student.

c. A student may take a collection of written examinations a maximum of four times, but no one failing five exams, counting possible repetitions, will be permitted to take another round of exams.

2. Mathematical ecology option

Pass written examinations covering three subjects in mathematics: one must be mathematical ecology and two must be from the list under the standard option.

Students may not take examinations in both d. and e., nor may they take examinations in both f. and g. At least one exam must be chosen from a. through e.

A student may take as many written examinations as desired at any time these exams are given subject to the following conditions:

a. The exams to be taken must be approved in advance by the student's supervisory committee.

b. At most 3-n exams may be taken at any one time, where n denotes the number of exams previously passed by the student.

c. A student may take a collection of written examinations a maximum of three times, but no one failing four exams, counting possible repetitions, will be permitted to take another round of exams.

3. Pass a written examination in ecology, covering material selected from nine hours of coursework outside of mathematics at the 5000 level or above.
The course submitted for examination must be prepared, administered, and graded by instructors of the course involved, along with at least one member of the Mathematics Education section. The student must obtain written agreement to participate in the examination from instructors of these courses and from at least one member of the Mathematics and education section, before submitting materials to the committees for approval.

b. A student may take the written examination in either French, German, or Russian; this requirement is to be met prior to the examination in the area of specialization. The doctoral committee may require that the student pass a second language exam.

III. Pass an intensive exam in the field of specialization. This exam will be given by a committee consisting of the department head at some time after the requirements in I. have been met. A student may take this specialty exam only twice.

IV. Take a one-year, 6000-level sequence in mathematics or some other area of concentration. The use of the course selected to fulfill this requirement must be approved by the department head and the student’s doctoral committee. (Such approval may occur after completion of the course.)

Note: Math 3050, 3060, 3090, 3100, 3110, 3310, 3320, 3330, 3510, and 3740, are intended primarily for students preparing to teach in elementary or secondary schools. Any 3000 or 4000 course in the department whose course number ends in “zero” may be offered as an honors version. In this case, the last digit will appear as an “8” and the title will be preceded by the word “Honors” in the timetable and on the student’s transcript. Honors versions of courses listed in the Graduate Catalog are awarded honor credit. Such courses may be offered upon the initiative of interested faculty, students, or the department head (though in all cases subject to the approval of the department head).

3050 Elementary Probability and Statistical Analysis (3) Combinatorial problems; sample spaces, sets, and events; statistical independence; axiomatic probability theory; random variables and their distributions; simple random processes. Does not satisfy requirements of major or minor in mathematics. Prereq: 1550-60 or equivalent. W, Sp

3060 Elementary Statistical Analysis (3) Elementary probability distributions used in statistics: binomial, Poisson, and normal and their properties; sampling theory; confidence intervals and statistical tests of hypothesis; least squares and linear regression. Does not satisfy requirements of major or minor in mathematics. Prereq: 3050 or consent of instructor. Sp, Su

3090 Polynomials and Rings (3) An introduction to abstract algebra, beginning with study of integers followed by more general notion of rings, integral domains, and fields. Emphasis is given to certain ring theoretic properties shared by integers and polynomials over certain fields. Prereq or coreq: 3100 or consent of instructor.

3100 Logic and Sets (3) Elements of mathematical logic; elementary algebra of sets. Primarily for students in the College of Education. Does not satisfy requirements of major or minor in mathematics. Su

3110 Real Number System (3) Laws of arithmetic; rational numbers; real numbers; and complex numbers. Prereq: 1 yr of college mathematics. Primary for students in the College of Education. Does not satisfy requirements of major or minor in mathematics. Su

3150 Introduction to Numerical Algorithms and Programming (3) (Same as Science 3150) E

3155 Introduction to Numerical Algorithms (3) (Same as Computer Science 3155) E

3215 Discrete Structures II (3) (Same as Computer Science 3215.)

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. F

3320 Non-Euclidean Geometry (3) Foundations of geometry. Elliptic and hyperbolic plane geometry. Prereq: 1 yr of college mathematics. W

3330 Transformational Geometry (3) Fundamental transformations in Euclidean geometry. Classification of isometries and similarities; symmetries of a polygon; inversions. Prereq: 1 yr of college mathematics. Sp

3350-60 Intermediate Analysis (3, 3) Real number system, functions, sequences, limits, continuity, uniform continuity, differentiation and Riemann integration. Must be taken in sequence. Prereq: 2840-50-60. F, W


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

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: 2830 or 2850. E

3861 Mathematical Models in the Life Sciences (3) Introduction to difference equations and differential equations. Mathematical modeling techniques applied to biological phenomena. Does not satisfy requirements of major or minor in mathematics. Prereq: 1841-51 or consent of instructor.

3920-30 Topology of Euclidean Spaces (3, 3) Topics will include topology of line and plane, separation properties and connectedness of sets, completeness of closed sets. Prereq: 1 yr of complex, continuity, continuous functions, homeomorphisms, continua, and topological invariants. Must be taken in sequence. Prereq: 3810, 2860, or consent of instructor. W, Sp

3990 Studies in Mathematics (1-4) Credit determined at registration. Prereq: Consent of instructor. May be repeated with consent of department. Maximum 9 hrs.

4000 Mathematics and Microcomputers for Teachers (3) Primarily for students in the College of Education. Does not satisfy requirements of major or minor in mathematics. Prereq: 1 yr college mathematics. Su
4990 Studies in Mathematics (1-4) Credit determined
and Fourier transform methods. Prereq: 2860 or 4050.

4620-30-Sturm-Liouville boundary value
tems of linear differential equations and the matrix
curvature, torsion, asymptotes, local coordinates, Frenet
Curves, surfaces, parametrizations, singular points,
transformation. Prereq: 3510 or consent of instruc-
tor. Credit available only to satisfy MBA core require-
ment. Prereq: Math 1550 or equivalent.

5052 Mathematics for Business Decisions (3)
Exponential functions, linear and quadratic models, 
monotone functions, numerical analysis, differential 
and integral calculus. Application of mathematics to business 
and economics. Prereq: 3150 or 3155, and 4225 or consent 
of instructor. (Same as Computer Science 5655-65-
60). F, W, Sp, A

5110-20-30 Theory of Functions of a Complex Vari-
able (3, 3, 3) Functions of a complex variable, Cauchy's 
integral theorem and contour integration, homotopy, 
conformal mapping, and elementary functions. Prereq: 
5480-50-60. F, W, Sp

5210-20-30 Theory of Functions of a Real Variable 
(3, 3, 3) Measure spaces, measurable functions, 
Lebesgue integral, bounded variation, differentiable 
functions, bounded variation, change of variable, 
continuity, uniform convergence, and computer implemen-
tation. Prereq: 4510-20-30. Must be taken in sequence.

5370-90 Mathematical Principles of Fluid Mech-
anics (3, 3, 3) Equations of motion, compressible 
flows, flows of compressible perfect gases, shock waves 
in perfect fluids, viscous flows and boundary layer phe-
nomena, additional special topics. Prereq: 4530 or 4710 or 
consent of instructor. A

5430 Integral Equations (3) Solution of integral equa-
tions by means of Fredholm, Volterra, and Hilbert.
Prereq: 4510-20-30.

5440 Calculus of Variations (3) Variational problems 
and functionals, normal and abnormal extremals,
Legendre's condition, conjugate points, Jacobi's con-
tition, sufficient conditions for weak extremum. Prereq: 
4510-20-30 and 4610. Su

5450-60-70 Introduction to Partial Differential 
Equations (3, 3, 3) Linear first-order equations in two 
variables; properties of elliptic, hyperbolic and parabolic 
equations, separation of variables for heat, wave, and 
Laplace equation. Prereq: 4510-20-30 and 4610 or consent 
of instructor. F, W, Sp, A

5455 Finite Difference Methods for Partial Differen-
tial Equations (3) Finite difference techniques for solution 
of parabolic, elliptic, and hyperbolic equations. Com-
puter representation of solutions, stability, and conver-
gence; nonlinear problems; boundary layers; solution of 
linear systems. Prereq: 3150 or 3155, and one 4000-level mathematics course. (Same as Computer Science 5455.) F

5456 Finite Element Methods (3) Finite element tech-
niques for solution of ordinary and partial differential 
equations. Variational principles, local bases, rates of 
convergence, and computer implementation. Prereq: 
3150 or 3155, and 4225 or consent of instructor. (Same as Computer Science 5465.)

5475 Advanced Topics in Numerical Partial Differen-
tial Equations (3) Finite element methods for eigenvalue 
problems. IV problems, BV problems with singulari-
ties. Other topics, such as special methods, further 
study of finite difference methods, etc. at discretion of 
prereq: 4545-65. (Same as Computer Science 5475.) Sp

5480-90 Mathematical Programming (3, 3) Optimiza-
tion of functions or variables subject to constraints.
Prereq: 3150, 4060 and 4530, W

5510-20-30 Introduction to Higher Algebra (3, 3, 3) 
Group theory, rings, modules. Prereq: 3150 or consent of 
faculty. Prereq: 4510-20-30 and 4610. Must be taken in sequence. F, W, Sp, A

5550-70-80 Theory of Matrices in Numerical Analy-
sis (3, 3, 3) Matrix algebra, eigenvalues and eigenvectors, 
characteristic polynomials, spectral theory. Examples from relevant applied 
fields. Must be taken in sequence. F, W, Sp, A

5655-65-75 Numerical Mathematics (3, 3, 3) Analysis 
of direct and iterative methods for solution of linear algebraic equations; linear least squares prob-
lem; theory of differential equations; Runge-Kutta methods for ordinary differential equations. Systems of nonlinear equations and nonlinear least squares problems. Approximation methods. Polynomial and ratio-
nal approximation theory. Prereq: 4225-35-45 or consent 
of instructor. (Same as Computer Science 5655-65-
75, F, W, Sp, A

5750-60-70 Advanced Mathematical Statistics (3, 3, 3) 
Distribution functions and mathematical expecta-
tion. Standard univariate and multivariate theoretical 
distribution and its characteristic functions. Modern sampling theory of statistical inference, topics from 
sequential analysis. Prereq: 4510-20-30. Must be taken in sequence. F, W, Sp, A
6610-20-30 Advanced Ordinary Differential Equations (3, 3, 3) Theory of ordinary differential equations from advanced viewpoint. Topics from current literature. Subject matter varies according to interests and preparation of students. Prereq. or coreq.: 5810-20-30 or 5820-20-30 or consent of instructor.


6810-20-30 Topological Algebra (3, 3, 3) Topics chosen from topological semigroups, topological groups. Lie groups; transformation groups; topological lattices; relations in topological spaces; topological rings, fields, algebras. Prereq. or coreq.: 5910-20-30.

6910-20-30 Modern Topology (3, 3, 3) Technical background to current literature in topology. Topics vary from year to year.

6940-50-60 Introduction to Algebraic Topology (3, 3, 3) Homology, cohomology, and homotopy theories. Homology and cohomology groups, the Eilenberg-Steenrod axioms, cup and cap products, duality theorems, homotopy equivalence, higher homotopy groups, fiber spaces, spectral sequences. Prereq.: 4160 and 5920.

6951 Seminar on Topology (1-3) Topics selected and topics vary from year to year.

6955 Seminar Applied Mathematics (1-3) May be taken for S/N or letter grade.

NOTE: Registration for 6000-level courses may be repeated with consent of department.

Microbiology

MAJOR

**DEGREES**

Microbiology

M.S., Ph.D.

**Professors:**

A. Brown (Head), Ph.D. Chicago; R. W. Beck, Ph.D. Wisconsin; J. M. Becker, Ph.D. Cincinnati; T. C. Monie, Ph.D. Maryland; W. S. Riggsby, Ph.D. Yale; B. T. Rouze, Ph.D. Guelph (Canada); G. S. F. and D. Idaho; J. M. Weisburd, Ph.D. (Emun), Ph.D. Kansas; David C. White, Ph.D. Rockefeller; C. J. Wust, Ph.D. Indiana.

**Associate Professors:**

D. A. Bemis, Ph.D. Cornell; D. A. Brian, Ph.D. D.V.M. Michigan State.

**Assistant Professors:**

R. N. Moore, Ph.D. Texas (Austin); K. M. Sirodot, Ph.D. Michigan State; G. Stacey, Ph.D. Texas (Austin).

The Department of Microbiology offers both the M.S. and Ph.D. degrees. Students have the option of selecting from a variety of graduate research programs. For a departmental brochure, contact the Department Head.

**Admission Requirements:**

Students are expected to have completed an undergraduate program with a 3.0 or better GPA on a 4.0 system. Included in the undergraduate course credits should be (1) a full year of general biological science, (2) one year of calculus, (3) two years of chemistry, including one year of organic, (4) one year of physics, and (5) an introductory course in microbiology. In many cases deficiencies in requirements may be remedied by taking appropriate courses during the first year of graduate study. The department also requires the general portion of the Graduate Record Examination. A satisfactory score on each part is 500. Students with rare exceptions. Three letters of recommendation should be submitted by current or former faculty members.

**The Graduate Program:**

Each new graduate student meets with an advisory committee chaired by the departmental Director of Graduate Studies to plan a program of study for the first one or two quarters until a research advisor is selected. All first year students participate in a laboratory rotation program during the first quarter of study. This program allows the student to adjust smoothly to the research programs of the department, to develop a background of research procedures and concepts, and to facilitate the selection of a research professor. Usually the student selects a research professor toward the end of the laboratory rotation period. This period facilitates the selection of and carrying out of a suitable research program and in the naming of a thesis or dissertation committee.

**The MASTER'S PROGRAM**

The program leading to the M.S. degree is designed to provide the student with broad basic knowledge, to permit the acquisition of technical competence in the fundamentals of research, and to encourage creative and independent thinking. Two to three calendar years are usually needed for the course of study which has the following requirements: (1) 45 hours including thesis credits; (2) a 3.0 GPA in all courses taken for graduate credit after 18 hours of credit have been earned in courses graded on the A-F system; (3) a 3.0 GPA in courses taken in the department; (4) a complete course sequence in biochemistry; (5) coursework in at least five of the subdisciplines recognized by the department: microbial physiology, parasitology, bacteriology, virology, mycology, immunology, microbial genetics, microbial ecology, molecular biology, and applied microbiology; and (6) presentation of a research proposal and its oral defense.

**THE DOCTORAL PROGRAM**

The program leading to the Ph.D. degree is designed to develop the student's ability to pursue independent and original research in microbiology and allied fields, to teach both oral and written communication of the results of research to the scientific community, and to train effective teachers. Students may enter the program after receiving either a Bachelor's or Master's degree. Students who enter with a Bachelor's degree usually take three or four years; those with the Master's degree usually take three or four years to complete the degree. Departmental requirements are: (1) a 3.0 GPA in all courses taken for graduate credit after 18 hours of credit have been earned in courses graded on the A-F scale; (2) a 3.0 GPA in courses taken in the department; (3) satisfactory performance in at least one quarter as a teaching assistant; (4) two quarters of physical chemistry; (5) one course in statistics; (6) courses in at
least five of the sub-disciplines listed in the Master's program; (7) satisfactory performance in a comprehensive examination that must be passed before admission to candidacy; and (8) the presentation of a written research proposal and its oral defense.

4110 Physiology of Bacteria (3) Modern concepts of bacterial physiology and metabolism including cell structures and function. Prereq: 3700 and 12 hrs of organic chemistry. F

4119 Bacterial Physiology Laboratory (2) Prereq: 3519. Coreq: 4110. F

4120 Bacterial Diversity (3) Exploration of various bacterial groups and alternative strategies evolved with respect to physiology and metabolism. Prereq: One year of organic chemistry and 3700 or consent of instructor. Recommended prereq: 4110. W

4140 Molecular Genetics (3) Transmission and expression of genetic information at the molecular level. Emphasis is on bacterial and viral systems, but unique features of eukaryotic genetic systems are included. Prereq: 3700 or consent of instructor. W

4149 Techniques in Microbial Genetics (2) Practical experience in basic techniques in experimentation in microbial genetics. Coreq: 4140. W

4150 Microbial Ecology (3) Application of ecological principles to study microbial communities. Emphasis on functional roles of microorganisms in natural environments. Prereq: 3700. 1 yr of organic chemistry, Biology 3130, or consent of instructor. Sp

4159 Experimental Microbial Ecology (3) Survey of techniques for assessment of microbial forms, functions, activities, and interactions in a variety of habitats. Prereq: 3519. Coreq: 4150 or consent of instructor. 1 hr and 1 lab. F

4270 Immunology (3) Principles of inflammation and immunity, immunoglobulin structure and theories of formation, complement, hypersensitivities, cell cooperation in immune mechanisms, abnormalities of the immune system. Prereq: Biology 3120. (Same as Zoology 4720.) F

4279 Advanced Immunology Laboratory (2) Laboratory exercises designed to accompany 4270. Prereq or coreq: 4270. F

4320 Pathogenic Bacteriology (3) Disease producing microorganisms including bacteria, rickettsia, and chlamydia. Prereq: 3200. W

4329 Pathogenic Bacteriology Laboratory (2) Techniques for isolation, cultivation, and identification of pathogenic bacteria. Prereq: 3200. Coreq: 4320. W

4340 Medical Mycology (3) Disease causing fungi; cytology and physiology, pathogenesis and immunity; emphasis on methodology of isolation and identification. Prereq: 3700. Sp

4339 Medical Mycology Laboratory (2) Prereq: 3519. Coreq: 4330. Sp

4420 Molecular Virology (3) Molecular aspects of the replication, assembly, and expression of viruses, with emphasis on bacteriophage. Prereq: 3700. F

4430 Medical Virology (3) General virology with emphasis on medical aspects. Prereq: 3200. Sp

4439 Medical Virology Laboratory (2) Laboratory procedures for isolation, handling, and culturing of animal viruses. Prereq: 3519. Coreq: 4430. Sp

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

5002 Non-Thesis Graduation Completion (3-15) Required for the non-thesis student who is 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

5011-12-13-14-15-16 Mini-course in Microbiology (1, 1, 1, 1, 1, 1) Selected, advanced topics in microbiology, concentrated in time and subject matter. Consult department for offerings each quarter. Prereq: as posted. May be repeated. Maximum 9 hrs. S/NC only.

5135 Recombinant DNA (3) History, principles and basic discoveries leading to development of current recombinant DNA techniques. Basic plasmid and bacteriophage molecular biology applied to the development of recombinant DNA techniques. Prereq: 4140 or consent of instructor.

5139 Recombinant DNA Laboratory (3) Practical details and procedures applicable to recombinant DNA methodology and techniques. Utilization of available vectors, experimental conditions and linker immobilized nucleic acid hybridization. Prereq: Consent of instructor. (Same as Life Sciences 5139.)

5310 Selected Topics in Microbiological Research (3) Literature surveys and laboratory methods and techniques for isolation and recombination of microbiological research. May be repeated.

5360 Topics in Immunochemistry (4) Molecular and genetic aspects of immunoglobulin synthesis. Theoretical and practical exercise in immunochemistry. Prereq: 4270, Biochemistry 4110-20 or equivalent.

5510-20-30 Research Problems (3, 3, 3)

5720 Microbial Physiology (3) Lectures and seminars dealing with current advances in bacterial physiology including growth and cell structure. Prereq: 4110; Biochemistry 4110-20.

5730 Pathogenesis of Infectious Disease (3) Host response to infection. Derangement of host-microbe interaction stimulated by microbial invasion, exotoxins, endotoxins and other factors related to virulence. Alteration of goal of medical controls resulting from progressive infection. Prereq: 4320.

5750 The Oncogenic Viruses (3) Lectures and special laboratory exercises dealing with known tumor-inducing viruses. Prereq: 4430 or consent of instructor. 2 hrs and 1 lab.

5760 The Bacterial Viruses (3) Lectures and discussions dealing with bacterial viruses with emphasis on the biological and chemical consequences of bacteriophage infection. Text supplemented by readings from literature. Prereq: 4420, Biochemistry 4110-20.

5819 Molecular Genetics Laboratory (3) Principles and methods of research in molecular genetics. Fundamental genetic concepts (mutation, complementation, recombination) at molecular level. Studies of lactose operon of Escherichia coli. Prereq: 4110 and Biochemistry 4110-20 or consent of instructor.

5910-20-30 General Seminar (1, 1, 1) Reviews of current literature. May be repeated with consent of department. S/NC only. E

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

6310 Seminar in Immunology (1) Readings and discussions based on current literature. May be repeated. S/NC only. E

6330 Seminar in Microbial Pathogenesis (1) Readings and discussions based on current literature. May be repeated. S/NC only. F, W, Sp

6330 Seminar in Microbial Physiology (1) Readings and discussions based on current literature. May be repeated. S/NC only. E

6340 Seminar in Molecular Genetics (1) Readings and discussions based on current literature. May be repeated. S/NC only. E

6350 Seminar in Virology (1) Readings and discussions of current literature. May be repeated with consent of department. S/NC only. E

6370 Current Topics in Environmental Microbiology (3) Reading, discussions, and critical evaluation of current literature. May be repeated. Maximum 8 hrs. S/NC only. F

6410 Concepts of Immunity (3) Discussion and readings of recent advances in immunobiology and immunopathology.

6420 Current Topics in Biological Membrane Research (1) (Same as Biochemistry 5420) S/NC only.

6720 Advanced Topics in Microbial Physiology (3) Prereq: 5720. May be repeated with consent of department.

6730 Advanced Topics in Microbial Pathogenesis (3) Prereq: 5730. May be repeated with consent of department.

6740 Advanced Topics in Virology (3) Prereq: 4420 or 4430. May be repeated with consent of department.

6760 Advanced Topics in Microbial Genetics (3) Prereq: 4140. May be repeated with consent of department.

6810-20-30 Problem Seminar (1, 1, 1) Research problems and methods, critical analysis of experimental data and validity of conclusions. May be repeated with consent of department. S/NC only.

Music

MAJOR

DEGREES

Music

M.M., M.A.


Assistant Professors: W. Hawthorne, Ph.D. Cincinnati; D.M.A. Yale; J. Plondke, M.M. Northwestern; E. Schroeder, Ph.D. Stanford; G. M. Spier, M.M. Indiana.

The Department of Music offers the degrees of Master of Music with concentrations in performance, accompanying, composition, theory, choral conduct, instrumental conducting, additional emphasis in church music, and music history and literature, and the Master of Arts with a major in Music with concentrations in theory and musicology.

Applicants for these degree programs must have completed an undergraduate degree approximately equivalent in music requirements to those required in degrees conferred by UTK, appropriate to the prospective area of concentration on the Master's level.

Applicants who plan to pursue the degree in performance (applied music) are required to audition for the appropriate area committee. Applicants for admission to the program in composition must submit scores and tape recordings of representative works. All applicants are required to take the Diagnostic Examinations in music theory and music history and literature.

Specific course requirements will be prescribed by the department for all degree programs and elective courses must have the approval of the student's advisor. Each student is responsible for the selection of his/her graduate committee. The student's
major area professor normally serves as chair of the Master's committee. One or two additional members from the major area (or related area, when necessary) serve on the committee along with one member from each of the remaining areas: music history, music theory, and music performance. When the student has chosen his/her committee, the Coordinator of Graduate Studies must be notified immediately in writing.

All concentrations require a written and oral comprehensive final examination.

THE MASTER OF MUSIC PROGRAM

The department requires a minimum of 45 quarter hours of coursework for the Master of Music degree. These hours are specifically distributed according to the area of concentration. All areas require coursework in music history/literature and/or theory and allows for elective courses. Music theory and composition require a thesis.

The choral conducting concentration requires a project and a seminar in choral performance. The instrumental conducting concentration requires a conducting performance and a seminar and practicum course sequence. All performance concentrations require a recital. THE MASTER OF ARTS PROGRAM

The department requires a minimum of 45 quarter hours including 21 hours of coursework above the 5000 level and 9 hours of thesis. A reading knowledge of French or German must be demonstrated by applicants before being admitted to candidacy.

3122 Orchestration (3) Advanced techniques in instructional writing with emphasis on scoring for the concert orchestra. Prereq: 3112 or consent of instructor.

3240 The Symphony (3) Survey of symphonic literature from precursors of classical symphony to present.

3260 Chamber Music (3) Survey of chamber music from 1750 to present.

3271 History of Opera (3, 3) Dramatic, vocal and orchestral elements in opera of Italian, French, and German School. 3271—1600-1800; 3281—1800 to present.

3340 Oratorio (3) Choral works other than those appropriate for use in church.

**3500 Flute (1-4)

**3505 Oboe (1-4)

**3510 Bassoon (1-4)

**3515 Clarinet (1-4)

**3520 Saxophone (1-4)

**3525 Horn (1-4)

**3530 Trumpet (1-4)

**3535 Trombone (1-4)

**3540 Baritone (1-4)

**3545 Tuba (1-4)

**3550 Percussion (1-4)

**3555 Voice (1-4)

**3560 Violin (1-4)

**3565 Viola (1-4)

**3570 Cello (1-4)

**3575 String Bass (1-4)

**3580 Piano (1-4)

**3585 Harpsichord (1-4)

**3590 Organ (1-4)

**3595 Guitar (1-4)

**3597 Composition with Electronic Media (1-3) Prereq: Consent of instructor.

**3599 Composition (1-3) Prereq: Consent of instructor.

3600 Evolution of Jazz (3) Study of origin, development and styles of jazz music and its exponents.

4002 Suzuki Piano Method (2)

4003-04-05 The Organ and its Literature (3, 3, 3) Development of keyboard music literature from Middle Ages to present; problems of style and interpretation; pedagogical literature and methods; organ design. Prereq or coreq: 2310-29-30-40 and consent of instructor.

4035 Keyboard Literature Before 1750 (2) Survey of music for harpsichord and other keyboard instruments from Elizabethan period through J.S. Bach.

4036-37-38 Advanced Piano Literature (2, 2, 2) Piano music of pre-classic period to present. Prereq: Consent of instructor.

4040 Special Topics in Pedagogy (1-3) Prereq: Consent of department head. May be repeated. Maximum 6 hrs.

4041 Styles in Opera Acting (3) Study and practices of styles in opera acting based on historical and national characteristics. Prereq: 3015 or consent of instructor.

4045 Projects in Opera Theatre (1-3) Prereq: Consent of instructor. May be repeated.

4046-47-48 Song Literature (2,2,2) Study of song literature from 1750 to present including performance. Prereq: Consent of instructor.

4050 Advanced Instrumental Conducting (3) Development of knowledge and skill literature in instrumental conducting; study of various periods and composers and relationship of different styles to the conductor's art; musical analysis and practice in conducting. Prereq: Music Education 4430 or equivalent.

4055-56-57 Elementary and Intermediate Piano Pedagogy (2, 2, 2) Piano methods and materials designed for teaching pre-college level students. Prereq: Consent of instructor.

4060 Advanced Choral Conducting I (3) Development of refinement of conducting techniques: chant and changing meters. Prereq: 4510 or equivalent.

4074 Music in Christian Worship (3) History and philosophy of church music; liturgies and liturgical music: music in non-liturgical worship. Prereq: Consent of instructor.

4084 Church Music Methods and Administration (3) Prereq: Consent of instructor.

4085 Harpsichord Techniques (1) Techniques literature, performance practice, continuous playing, and basic tuning and maintenance. Requires a thorough keyboard background. Prereq: Consent of instructor. May be repeated. Maximum 3 hrs.

4113 Pedagogy of Music Theory (3) Techniques, methods, and materials involved in college-level theory programs. Prereq: Consent of instructor.

4117 Choral Arranging (3) Analysis of scores and writing of arrangements for men's, women's and mixed choruses. Prereq: 3112 or consent of instructor.

4124 Marching Band Arranging (3) Study and application of techniques employed in scoring for marching band. Prereq: 3112 or equivalent.

4134 Concert Band Arranging (3) Study and application of techniques employed in scoring for concert band. Prereq: 3112 or equivalent.

4147 Harmonic Analysis (3) Study of harmonic progressions from Biblical times to present.


4242 Music of Canada (3) Survey of folk and art musics of Canada; comparisons and contrasts with musics of the United States. Recommended prereq: 1210.

4261-71 Introduction to Ethnomusicology (3, 3) Basic attitudes and techniques of ethnomusicology. Survey of music cultures throughout world. 4261—Pacific, Near East and Asia; 4271—Africa, Europe and Americas.


4290 Gregorian Chant (3) Chants of Latin rite. Masses and Offices examined as functional music as well by type.

4340-50 Works of Bach (3, 3) Detailed examination of sonatas, chamber, keyboard, and orchestral works; cantatas, motets, passions and oratorios. 4340—Instrumental works; 4350—vocal works.

4400 Jazz Directing (1) Rehearsal techniques for jazz ensembles: special conducting techniques, repertoire, library systems, programming, and supervised laboratory experience in rehearsing university jazz ensembles. Prereq: Enrollment in Applied Music with jazz emphasis or consent of instructor.

**4500 Flute (1-4)

**4505 Oboe (1-4)

**4510 Bassoon (1-4)

**4515 Clarinet (1-4)

**4520 Saxophone (1-4)

**4525 Horn (1-4)

**4530 Trumpet (1-4)

**4535 Trombone (1-4)

**4540 Baritone (1-4)

**4542 Composition for Media (1-3)

**4545 Tuba (1-4)

**4550 Percussion (1-4)

**4555 Voice (1-4)

**4560 Violin (1-4)

**4565 Viola (1-4)

**4570 Cello (1-4)

**4575 String Bass (1-4)

**4580 Piano (1-4)

**4585 Harpsichord (1-4)

**4590 Organ (1-4)

**4595 Guitar (1-4)

**4597 Composition with Electronic Media (1-3) Prereq: Consent of instructor.

**4599 Composition (1-3) Prereq: Consent of instructor.

4640 Jazz Pedagogy (1) Methods and materials relating to teaching of jazz and administering of jazz pro-
5001 Project in Choral Conducting Performance (1-3) Public performance; critical document; recording project. May be repeated. Prereq: Consent of instructor.

5002 Non-Thesis Graduation Completion (1-15) 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

5003 Church Music Performance Project (1-3) May be repeated. Maximum 3 hrs.

*5010 Organ Literature Seminar (3) Topics vary. Prereq: Organ literature.

5012-22-32 Pedagogy of Voice (2, 2, 2) Survey of voice production processes in singing including: voice classification, quality, diction registration, breath support, and control. 5022—Examination of teaching materials, preparation of programs for various vocal categories and levels of study. Observation of studio teachings. 5032—Analysis of the vocal problems of a selected group of students. Supervised teaching. Prereq: 4012-22-32 or consent of instructor.

*5020 Piano Literature Seminar (3) Topics vary.

5033-34-35 Advanced Diction for Singers (2, 2, 2) Practical performance and application of diction theory. Prereq: 2055-65-75 or equivalent.

*5040 Vocal Literature Seminar (3) Topics vary.


5050 Graduate Recital (3)

5051 Opera Performance (3)

5052 Vocal Chamber Music Performance (3)

5054 Lecture Recital (3)

5055-56 Practicum for Instrumental Conductors (1, 1) Intern experience in choral music and in an instrumental field other than the area of major interest. S/NC only.

5057 Instrumental Conducting Seminar (3) Rehearsal and performance problems and techniques allied to score reading and preparation. Particular attention to individual problems. Prereq: 4050 or equivalent.

5060 Advanced Choral Conducting II (3) Expansion and continued refinement of conducting technique; development of choral rehearsal skills. Prereq: 4560 or consent of instructor.

5061 Choral Conducting Seminar (3) Score reading and preparation; problems in interpretation, performance practices, and conducting techniques of individual. May be repeated. Prereq: 5060 or consent of instructor.

5062-63-64 Choral Literature (2, 2, 2) Choral music from Middle Ages to present with consideration of historical development of major choral genres.

*5070 Opera Production (1-3) Prereq: Consent of instructor.

5080 Instrumental Conducting Performances (1) Jury performance; conducting band or orchestra in public.

*5090 Special Topics in Performance (1-3) Prereq: Consent of department head.

*5100 Independent Study in Music Theory (1) Prereq: Consent of department head.

5114 History of Music Theory (3) Work and contributions of theorists from ancient Greece to 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. Prereq: Consent of instructor.

*5126 Practicum in Computers and Music Research (3) Programming languages, design and implementation of projects in musical analysis, composition and indexing. Prereq: Consent of instructor.

*5180 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.

5231-32 Recital Project (2,2) Preparation and accomplishment of full recital. 5232—Vocal recital. 5233—Instrumental recital. Prereq: Consent of instructor.

*5270 Composer Seminar (3) Topics vary. Prereq: Consent of instructor.

5315 Band Literature (3) Band literature and origins of band emphasizing its important, expanded cultivation during past century in United States and Europe.

5350 Music in the Middle Ages (3) Emphasis on early Christian chant; medieval secular song; early theory, and the development of polyphony and musical notation.

5352 Music in the Renaissance (3) From 1400 to 1600. Mass, motet, chansons, madrigal, and other vocal and instrumental forms and genre.

5353 Music in the Baroque Period (3) From 1600 to 1750; rise of opera and oratorio, church and secular cantata, instrumental forms, performance practice.

5355 Music in the Classic Period (3) Preclassic music (Rococo) and music of Haydn, Mozart and early Beethoven. Includes background of other cultural and artistic activities.

5357 Music in the Romantic Period (3) Survey from Beethoven through post-Romantic instrumental and vocal styles.

5359 Music in the Twentieth Century (3) From 1890 (Debussy) to the present (Stockhausen and others).

5361-71 Ethnomusicology (3, 3) Attitudes and techniques of ethnomusicology. Survey of music cultures throughout world; interview and transcription projects. 5361—Pacific, Near East and Asia; 5371—Europe, Africa and Americas.

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 era 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)

*5551 Accompanying and Coaching (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.

*5598 Composition (1-3) Prereq: Consent of instructor.

**5600 Chamber Music Ensemble (1)

**5602 Woodwind Choir (1)

5603 Small Jazz Ensembles (1) May be repeated. Maximum 12 hrs.

**5604 Jazz Ensemble (1)

5605 Studio Orchestra (1) May be repeated. Maximum 12 hrs.

*5606 Trombone Choir (1)

*5610 Percussion Ensemble (1)

*5611 Harp (1)

*5612 Baroque Ensemble (1)

*5620 UT Singers (1)

*5630 Chamber Singers (1)

*5632 College Choir (1)

*5634 Saxophone Choir (1)

*5640 Opera Theatre (1)

*5642 Opera Workshop (1)

*5650 Concert Band (1)

*5652 Campus Band (1)

*5654 Varsity Band (1)

*5656 Laboratory Band (1)

*5657 Marching Band (1)

*5670 Symphony Orchestra (1)

*5680 Concert Choir (1)

*5682 University Chorus (1)

*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; R. E. Aquila, Ph.D. Notre Dame; J. G. Brckenkirk, Ph.D. Michigan; L. B. Cebik, Ph.D. Nebraska; R. B. Edwards, Ph.D. Emory; G. C. Gruber, Ph.D. Michigan; B. C. Postow, Ph.D. Yale; D. Van de Vate, Jr., Ph.D. Yale.


Assistant Professors: H. P. Hamlin, Ph.D. Georgia; E. R. Jones, Ph.D. Chicago; M. Lavin, Ph.D. Stanford.

THE MASTER’S PROGRAM

The department offers both an M.A. with a thesis and a non-thesis M.A. The latter is available only to students who have passed the doctoral comprehensive and are ready to begin writing a dissertation, but who have not written a Master’s thesis.

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 18 quarter courses or their equivalent, exclusive of credit for the thesis and dissertation) of which no fewer than 45 hours shall be in courses numbered over 5000. The specific number and distribution of courses will be determined by the student’s faculty committee.

Doctoral students must demonstrate competency in one foreign language, normally French or German. This may be done by passing the doctoral language examination administered by the Romance Language or German Departments, or by passing French 3030 or German 3030 with a B or better. In special circumstances and upon petition by the student, the department’s graduate committee may accept a substitute language for French or German.

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 a M.A. program of graduate study with a concentration in philosophy of religion and other religious studies. Details concerning the program can be obtained either from the Philosophy or Religious Studies Departments.

Courses below 4000 may not be taken for graduate credit by philosophy majors except with special permission. Registration in any course in the 5000 or 6000 series (except 5050) 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.

3111 Ancient Western Philosophy (4) F, W

3121 Medieval Philosophy (4) F, Sp

3131 Seventeenth- and Eighteenth-century Philosophy (4) E

3141 Nineteenth-century Philosophy (4) F, Sp

3151 Contemporary Philosophy (4) Survey of recent movements in philosophy. F

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 law. A

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. F, W, Su

3420 Philosophy of Literature (4) Study of the nature, functions, value and epistemic principles of literary arts. A

3430 The Concept of Woman (4) Nature of woman as conceived by major western philosophers from Plato to Simone de Beauvoir. (Same as Women Studies 3430.) F, W


3510 Existentialism (4) E

3550 Marxism as Philosophy (4) W

3590 Business Ethics (4) Ethical problems as they confront both business as social institution and individuals in business. May not be taken for graduate credit by philosophy majors. Sp

3605-06 Professional Responsibility (4, 4) 3605—Critical analysis of selected classical texts from philosophy, religious studies, and social studies; nature of responsibility, professionalism, and application of concepts of responsibility to professional activity. Illustrations from variety of professional fields of practice. 3606—Application of theoretical principles and analytical skills developed in 3605 to selected case studies and other detailed descriptions of professional practice from following professional fields: Engineering Architecture; Business/Accounting; and at least one of (a) Law/Politics; (b) Helping Professions (Social Work; Human Services; Religious Ministry); (c) Teaching. (Same as Religious Studies 3605-06.)

3650 Philosophy and Religion in India (4) (Same as Religious Studies 3650.) F

3660 Buddhist Philosophy and Religion (4) (Same as Religious Studies 3660.) F, Sp

3671 Religion and Philosophy in China (4) (Same as Religious Studies 3671.) 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 Symbolic Logic (4) Techniques for formal analysis of deductive reasoning (propositional logic and quantification theory.) Sp Prereq: 1810 or 2510 or consent of instructor

3910 Contemporary Aesthetics (4) Philosophical discussion of contemporary art. F, W, Sp

4000 Special Topics (4) A student- or instructor-initiated course to be offered at convenience of 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.)

4200 Classical Indian System of Philosophy: The Moksha Tradition (4) (Same as Religious Studies 4200.)

4310 Intermediate Ethics (4) Topics in metaethics or ethics.

4370 Theoretical Issues in Medical Ethics (4) Prereq: 2310 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. May be repeated.

4620 Philosophy of Mind (4) Problems of mind and body in relation to consciousness and personal identity. Prereq: 8 hrs philosophy or consent of instructor.

4630 Philosophy of Language (4) Prereq: 8 hrs philosophy or consent of instructor.

4710 Philosophy of Natural Science (4) 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 Sciences (4) Examination of methods of inquiry and modes of explanation in social sciences. Prereq: 3770 or 2 yrs social science.

4810 Contemporary Metaphysics and Epistemology (4) Prereq: 8 hrs philosophy or consent of instructor.

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

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

5050 Symbolic Logic (4)

5080 Philosophy of Logic (4) Nature of logic; epistemological, metaphysical and axiological assumptions and implications in various theories of logic. Prereq: 4510 or equivalent.

5101 Foreign Study (1-12) See page 104. E

5102 Off-campus Study (1-12) See page 104. E

5103 Independent Study (1-12) See page 104. 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—Hellenic or Medieval. 5130—Modern, before Kant. 5140—Kant. 5150—Nineteenth Century. 5160—Twentieth Century.

5250 Studies in the History of American Philosophy (4) Intensive, critical work on major philosopher or school.

Physics

3230 Heat and Thermodynamics (3) Concepts of temperature and heat; laws of thermodynamics; applications of laws to simple physical and chemical problems. Prereq: F, W, Su

3610-20 Electronics (3, 3) Electronic components and circuits of interest to physicists. Prereq: 2310-20 or 2210-20 and calculus. 3 labs. F, W, Su

3830 Nuclear Electronics Laboratory (3) Elementary circuits of interest in nuclear instrumentation are designed and built, and their characteristics are tested as a function of various parameters. Prereq: 3610-20. Sp.

3710-30-30 Introduction to Atomic and Nuclear Physics (3, 3, 3) Special relativity and early quantum theory. 3720—Atomic and nuclear physics. 3730—Nuclear physics. Prereq: Mathematics 2860; 2320 for 3710; 2330 or 3710 for 3720-30. E

4010 Background of Physics (3) Survey of historical development and philosophical foundations of natural science. Classical theories of gravitation, electromagnetism, and relativity. Unifying mathematical principles underlying physical applications. Readings from important original papers, thought-provoking problems and order-of-magnitude calculations combining different fields of classical physics, and written report on independent study. Prereq: Senior standing in Physics or consent of instructor.

4020 Forefront of Physics (3) Survey of modern developments in physics: various forms of quantum mechanics, quantum electrodynamics, and theories of particles, fields and their interactions. Discussions of unsolved questions in physics, experimental and current interest, readings in recent literature, and applications in other fields, with final oral report and term paper. Prereq: 4010 or consent of instructor.

4050 Foundation of Physics (3) Selected topics from history and philosophy of classical and modern physics. Prereq: One year of general physics and consent of instructor. No. No student who has received a grade of C or better in 4010-20 may receive credit for 4050.


4160 Physical Acoustics (4) Considerations fundamental to the behavior of all forms of sound and ultrasound. Propagation of acoustic waves in the infrasonic, the audible, the ultrasonic, and the hypersonic ranges of frequencies. Prereq: 3110-20; 3230 and 1 hr and 1 lab.

4230-40 Modern Optics (4, 4) 4230—Geometrical Optics: Reflection and transmission of light at a dielectric interface, paraxial theory of interfaces, lenses, and mirrors; thin lenses, lens systems, ray tracing; polarization; imaging; laser light. 4240—Physical Optics: Mathematics of wave motion, superposition of waves; interference; Fraunhofer and Fresnel diffraction; Fourier optics; holography. Prereq: 4310 or consent of instructor. 3 hrs and 3 hrs lab. W, F.

4310-20-30 Electricity and Magnetism (3,3,3) 4310—Electromagnetism in vacuum and matter. 4320—Magnetism, coupled electric and magnetic fields. 4330—Maxwell’s equations, electromagnetic waves. Must be taken in sequence. Prereq: 2230 and Mathematics 2860.

4510-20 Atomic Physics Laboratory (3, 3, 3) Experiments in: fundamental particle properties, photodetectors, conduction of electricity through gaseous, atomic and molecular spectroscopy, x-ray, Prereq or coreq: 3710-20-30. 3 labs. E

4540-50 Experimental Nuclear and Radiation Physics (4, 4, 5) Quantitative measurement of charged particles and electromagnetic radiation with matter; theory and characteristics of various detectors; statistics of counting; nuclear physics; applications of radioactive techniques for investigating the nucleus and nuclear radiation. Prereq: 2330, 1 hr and 6 hrs lab. F, Su

4580 Principles of Nondestructive Testing (3) Detection and characterization of discontinuities in materials by nondestructive physical measurements. Ultrasonic, electromagnetic, holographic and penetrating radiation techniques are discussed. Prereq: 2310-20-30 and consent of instructor. (Same as Engineering Science 4580)

4590 Magnetic Induction Phenomena (3) Theory and application of magnetic induction phenomena: nondestructive testing with eddy currents, induction heating, magnetic levitation, forming, pumping, and flow measurement. Prereq: 4320 or equivalent; 2 hrs and 1 lab. (Same as Engineering Science and Mechanics 4590)

4640 Kinetic Theory (3) Transport properties: discussion of scattering theory and classical distribution function. Prereq: 3230 or equivalent.


4660-70 Solid State Physics (3, 3) 4660-Symmetry and crystal structure, lattice dynamics, specific heat. 4670-Electrical properties of solids and magnetic properties. Must be taken in sequence. Prereq: 3230 or equivalent.


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

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

5080 Graduate Research Participation (3) Advanced research techniques under supervision of staff research director whose research area coincides with interests of students. Satisfactory standing of students in good standing. Prereq: Consent of department and research director. May be repeated with consent of department. S/NC only.


5210-20-30 Advanced Modern Physics (3, 3, 3) Basic principles of wave mechanics; one-electron atom; vector models; atomic and molecular spectroscopy; molecular binding; sensitivity; properties of nuclei and quantum distribution functions; scattering phenomena; nuclear models and forces; high-energy physics. Prereq: 3110-20, 3710-20-30, 4150-20, differential equations. Must be taken in sequence, F, W, Sp.


5440 Experimental Methods of Infrared and Raman Spectroscopy (3) Experimental equipment; instrumental techniques; detection systems; analytical methods. Analysis of vibrating rotating diatomic molecule. Prereq: 3710-20 or equivalent.


5640 Numerical Methods in Physics (3) Numerical methods available for solution of physical problems, particularly toward use of automatic computing machinery; analysis of errors. Prereq: 5610-20-30, or consent of instructor.

5720 Physics of Polyatomic Molecules (3) Introduces to electronic structure of molecules and physical processes of luminescence and operation of these molecules; theoretical and experimental aspects of intermolecular and intramolecular electron excitation energy transfer and charge transfer; energy transfer and charge transfer in such fields as organic molecular reactivity and organic scintillation. Prereq: 5210-20 or consent of instructor. Sp.

5910-20-30 Special Problems (3, 3, 3) Special assigned theoretical or experimental work on problems not covered in other courses. E


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


6260-70-80 Elementary Particle Physics (3,3,3) General physics of elementary particles; experimental methods; conservation laws; invariance principles; hadronic interactions; quark models; electroweak interactions; unification of elementary forces; attention to interplay between experiment and theory. Prereq or coreq: 6110-20-30. F, W, Sp.

6310 Electromagnetic Theory of Light (3) Classical electron theory including theories of line breadth, dispersion, absorption, and scattering of light and x-rays; dielectric and magnetic properties of gases and solids. Optical properties of electromagnetic waves in isotropic media including reflection, refraction and polarization; and also theory of diffraction. Prereq: 5410-20. Su
6330 Special Relativity (3) Lorentz transformation; Einstein postulate; relativistic mechanics; relativistic electrodynamics. Prereq: 5310-20-30, 5410-20-30. 6310. F.

6330 General Relativity (3) Tensor calculus; general theory of relativity; gravitational field equations. Prereq: 6320. W

6420 Advanced Topics in Classical Theory (3) To meet special needs of students. Possible fields: advanced dynamics and hydrodynamics, electromagnet theory, statistical mechanics, including theory of nonergodic processes. Prereq: 5310-20-30, 5410-20-30, 5510-20-30. May be repeated with consent of department.

6430 Advanced Topics in Quantum Theory (3) To meet special needs of students. Possible topics: angular-momentum theory, beta-ray theory, theory of atomic spectra, molecular structure and valence theory, theory of radiation, electric and magnetic susceptibilities, high energy processes, scattering and collision processes, theory of fields. Prereq: 6110-20-30. May be repeated with consent of department.

6500-10-20 High Temperature Plasma Physics (3,3,3) Same as Electrical Engineering 6500-10-20.) F., W, S

6610 Interaction of Radiation with Gases (3) Interaction of electromagnetic radiation with atoms and molecules; oscillator strength, interaction of charged particles with atoms and molecules in rotation; transition and light emission. Electron interaction, transport and capture; electron swarm and electron beam experiments. Prereq or coreq: 6110-20-30. F.

6620 Interaction of Electrons with Solids (3) Collisions with free electrons; stopping power; electron slowing down spectra; energy straggling; nuclear scattering; electron diffraction in solids; techniques in electron spectroscopy; applications to dosimetry. Prereq or coreq: 6110-20-30. W.


6710-20-30 Advanced Solid State Physics (3, 3, 3) Lattice dynamics; phonons; Brillouin zones; heat capacity; energy band structure of solids; cohesive energy; work function. Crystal oscillator strengths; effective mass approximation. Dia-, para-, and ferro-magnetism; neutron diffraction. Fermi surface. Superconductivity. Phonon and electron scattering from phonons, electrons, and defects. Excitation; polaron and electron excited states. F-center; dislocations; and other defects. Prereq: 4670, 5210-20. Prereq or coreq: 4670; 6110 for 6710, 6120 for 6720. A

6810 Vibrational Problems in Molecular Spectra (3) Normal coordinates and potential functions; group theoretical treatment and selection rules in gases and condensed phases. Laseraman spectroscopy and nonlinear optical phenomena. Prereq: 5420 or equivalent. (Same as Chemistry 8810). 

6830 Molecular Vibration-Rotation Theory (3) Molecules as vibrating and rotating systems possessing specific symmetry properties; quantum mechanical theory of symmetric and asymmetric molecular vibrations including vibration-rotation interaction theory; intensities and energies of molecular transitions; methods of analysis and in high resolution molecular spectroscopy. (Same as Chemistry 6820.)

The University maintains in the College of Liberal Arts a Bureau of Public Administration for the purpose of promoting sound governmental administration through research, publication, and consultation. The Director is the Head of the Political Science Department, Thomas D. Unger.

Note: Registration in any courses in the 5000-5000 series may be repeated for credit with consent of the department.


3546 U.S. Constitutional Law: Civil Rights and Liberties (4) Judicial interpretation of first amendment, equal protection clause of fourteenth amendment and right to privacy.

3555 Minority Group Politics in the United States (4) Content varies from quarter to quarter. May be repeated with consent of department. Maximum 8 hrs. W

3565 Introduction to Public Administrative Organization and Management (4) Course covers policy-making theory, line and staff services, politics of organization, leadership, personnel and fiscal management, administrative responsibility. Recommended prereq: 2510-20. F, W, Sp


3605 Political Change in Developing Areas (4) Characteristics and problems of political changes with primary focus on developing areas. F, Sp

3615-16 Dynamics of Black African Politics (4, 4) W

3621 Government and Politics of the People's Republic of China (4) Chinese political setting, political structures, participation and selected policy areas. F

3625-26 Latin American Government and Politics (4, 4) F, W

3631-32 Government and Politics of the Soviet Union (4, 4) F, W

3635-36 Politics in Western Democracies (4, 4) Political culture, patterns, and institutions of Western democratic systems. F, W

3710 State Politics (4) Focus on formal and informal setting of state government. 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 institutions and processes in metropolitan areas. W

3760 Urban Policy Process (4) Analysis of urban problems and policies in metropolitan areas. Sp

3796 Contemporary Problems of Soviet Foreign Policy (4) Sp

3801 Studies in Ancient Political Thought (4) Classical Greek and Roman political thought. F

3802 Studies in Medieval Political Thought (4) From Augustine to Luther: emphasis on problems and theories of religion and politics. W

3803 Studies in Early Modern Political Thought (4) Machiavelli through the Enlightenment. W
5210-20 Seminar in World Politics (3, 3) Research in world problems and organization. F; W; Sp.

5211 Directed Readings in Political Science (3) May be repeated with consent of instructor and student's advisor. Maximum 9 hrs. May be taken for letter grade or S/NC. E

5250 Seminar in African Politics (3) Selected topics in African politics.

5270 Seminar in the Politics of Development (3) Selected topics dealing with political problems of less developed countries. F

5310 Seminar in Comparative Government (3) Selected topics in modern governments.

5340 Seminar in Latin American Government (3)

5710 Seminar in the Politics of Administration (3) Basic assumptions and techniques of research for personnel management. W or Sp.

5720 Seminar in the Politics of Development (3) Examination of public administration in context of American political system with emphasis upon imperialism, intervention, and the Cuban Revolution, nationalism, foreign assistance, trade and aid policies, and African politics.

5740 Seminar in Organizational Analysis (3) Approaches to and methods used in comparative organizational analysis.

5750-55 Seminar in Public Management (3, 3) Selected problems dealing with political processes associated with community development.

5765 Law and the Administrative Process (3) Constitutional position; decisional processes, regulation and management; limitations on governmental action; questions of structure, role, and administrative choice. E

5790 Seminar in Public Personnel Management (3) Functions and organizations of personnel administration in public service. Sp.

5810 The American Political Process (4) Principal patterns of political activity linking citizens and political institutions. Sp.


5831-32 The Systematic Study of Politics (3, 3) Scope, methods and procedures of analysis in political science. F; W

5840 Ethics, Values, and Morality in Public Administration (3) Moral-ethical values and dilemmas confronting administrators in American political system.

5850 Seminar in Comparative State Politics (3) Intensive readings in comparative state politics focusing on environment of state politics, institutions and policy making.

5910-20 Quantitative Political Analysis (3, 3) Methods and techniques in quantitative political analysis. F; W

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

6210 Advanced Studies in International Politics (3)

6310 Advanced Studies in Political Theory (4) Research into selected topics. F

6440 Advanced Studies in Comparative Politics (3) Research into selected topics. Sp.

6510-20 Advanced Studies in American Constitutional Law (3, 3) Systematic investigation of federal relationships, civil liberties, courts in political setting, judicial institutions, personnel, and public policy content. W

6610 Advanced Studies in Public Administration (3) Research into selected topics. W; Sp.

6710 Directed Research in Political Science (3) May be repeated with consent of instructor and student's advisor. Maximum 9 hrs. May be taken for letter grade or S/NC.

6810-20 Advanced Studies in the Political Process (3, 3) Open to advanced graduate students upon approval of instructor. F; W

Psychology

MAJOR

DEGREES

Psychology

M.A., Ph.D.

Professors:

W. H. Calloun (Head), Ph.D. California (Berkeley);

G. M. Burghardt, Ph.D. Chicago; A. G. Burstyn,

Ph.D. Chicago; J. F. Byrne,* Ph.D. Tennessee;

C. F. Cohen, Ph.D. Kansas; H. J. Fine, Ph.D.

Syracuse; S. J. Handel, Ph.D. Johns Hopkins;

L. Handler, Ph.D. Michigan State; J. E. Lawler,

Ph.D. North Carolina; R. P. Lonon, Ph.D.

Rochester; J. F. Lubar, Ph.D. Chicago;

J. C. Malone, Ph.D. Duke; K. R. Newton, Ph.D.

Tennessee; R. H. Pollock, Ph.D. Michigan;

N. L. Rasch,* Ph.D. Pennsylvania; F. Sammelja,

Ph.D. Keio (Japan); R. R. Strader, Ph.D.

Tennessee; E. D. Sundstrom, Ph.D. Utah;

W. S. Verplanck (Emeritus), Ph.D. Brown;

R. G. Wahter, Ph.D. Washington; J. A. Wiberly,

Ph.D. Syracuse.

Associate Professors:

J. M. Barlow,* Ph.D. Tennessee, N. W. Dye,* Ph.D.

Tennessee; E. A. Elliott,* M.S.W. Tennessee;

D. S. Freeman,* Ph.D. Tennessee; M. G. Johnson,

Ph.D. Johns Hopkins; R. J. Kandialski,* Ph.D.

Tennessee; K. A. Lawler, Ph.D. North Carolina;

S. Loucks,* Ph.D. Tennessee; J. W. Lounsbury,

Ph.D. Michigan State; A. McIntyre, Ph.D. Yale;

W. G. Morgan, Ph.D. Tennessee; M. J. O'Connell,*

Ph.D. Tennessee; R. S. Sautauds, Ph.D. Florida

State; C. B. Travis, Ph.D. California (Davis).

Assistant Professors:

L. T. Laurence,* Ph.D. Tennessee.

Psychology/College of Liberal Arts
The Department of Psychology offers the Doctor of Philosophy degree with concentrations in clinical, school, community, social, developmental, experimental, cognitive, physiological, and comparative psychology, psycholinguistics, psychometrics, and learning. The department does not normally admit students to the Master's program; however, a Master's may be earned as part of the doctoral program. For detailed information, write to the Department of Psychology.

THE DOCTORAL PROGRAM

Requirements for the Ph.D. are:

1. During the first year, students are expected to complete a one-year sequence in statistics, with options offered either by the Departments of Psychology, Statistics, or Educational and Counseling Psychology.
2. All students must, before beginning the second year of study, achieve a score at the 85th percentile or more on the Psychology portion of the GRE.
3. By the end of the second year, each student is expected to have attempted the doctoral comprehensive examination, a mandatory, broad essay exam covering general psychology. Students are allowed at least two attempts to pass this exam.
4. After passing the comprehensive exam, and upon the positive recommendation of the appropriate program committee and the Department, students are approved to undertake doctoral study with supervision provided by a doctoral committee.
5. An examination in the student's area of concentration in the third year.

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, upon referral by a physician.

4210 Topics in Social Psychology (3) Intensive analysis of selected research topics. Prereq: 3120 or Sociology 3130. (Same as Sociology 4120.)
4230 Sensory Processes and Perception (3) Survey of sensory and perceptual processes with emphasis on audition and vision. Prereq: 3150. Recommended: 2520. F
4239 Laboratory in Sensory Processes and Perception (3) Prereq or coreq: 4230.
4480 Organizational-Industrial Psychology (3) Cannot be taken for credit by students who have credit for Management 3460.
4510 Personality Theories (3) Survey of major approaches to understanding human personality and its development. Prereq: 2540, 3550 or 3560.
4610 Group Processes (3) Study and experience of theory and techniques of group processing and facilitation. Those participating in 4610 are expected to continue in 4620 and 4630. Prereq: 3616-26 and consent of instructor.
4650 Symbolic Processes (3) 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 (3) Theories and descriptions of phonology, syntax, and semantics as applied to psychology and related disciplines. Recommended: 4650 or linguistics background.
4670 Cognitive Development (3) Theory and research on development of language and thinking in children and adolescents. Prereq: 3210 or 3550.
4710 Physiological Psychology (3) 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
4770 Psychology and the Law (3) Psychological aspects of the legal system. Prereq: Junior standing.
4830 History and Systems of Psychology (3) Evolution of field of psychology, focusing on classic schools of thought and recent developments. Prereq: 9 hrs of upper-division psychology.
4850 Learning Theories (3) Classical and current views on learning and cognition.
4860 Programmed Learning (3) (Same as Curriculum and Instruction 4860.)
4870 Contemporary Research in Behavior of Women (3) Study of interaction of cultural and biological factors in determining the behavior of women, with emphasis on physiological mechanisms involved. (Same as Women's Studies 4870.) Sp
4880 Afro-American Psychology (3) Review and analysis of psychological literature on Afro-Americans. Prereq: Consent of instructor. (Same as Black Studies 4880.)
5000 Thesis (1-15) P/N only. E
5002 Non-Thesis Graduation Completion (3-15) Required for the non-thesis student not otherwise registered during any quarter when such a student uses university facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. S/N only. E
5017 Colloquium in Ethology (1) May be repeated. Maximum 6 hrs. (Same as Zoology 5017.) S/N only.
5019 Research Practicum (1-3) Required of all first-year students. May be repeated. Maximum 9 hrs. S/N only.
5020 Advanced Psychological Statistics (3) Methods of Research in Applied Psychology (3) Techniques and principles for designing and conducting psychological research in natural settings.
5029 Practicum in College Teaching (2) Supervised participation in college teaching. S/N only.
5100 Developmental Psychology (3) Prereq: 3550 or Educational Psychology 2430. (Same as Educational Psychology 5100.) F, Sp, Su
5110 Clinical Aspects of Human Sexuality (3) Nature of sexuality, societal attitudes toward sexual identity, application, intimacy and isolation including psycho-social and psychosexual identity and models for decision making. Intended for graduate students in clinical psychology, social work, and community and mental health professions. Prereq: Consent of instructor.
5170-80-90 Proseminar in Industrial and Organizational Psychology (3, 3, 3) (Same as Management 5170-80-90.) F, W, Sp
5200 Topics in Developmental Psychology (3) Prereq: 5120 or equivalent and consent of instructor. May be repeated. Maximum 6 hrs.
5300 Readings and Special Problems in Psychology (1-5) May be repeated. Maximum 20 hrs. S/N only.
5319 Field Work in School Psychology: Level 1 (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: Consent of instructor. May be repeated. Maximum 6 hrs. S/N only. F, W, Sp
5325 Behavioral Interventions (3) Principles and techniques for planning, implementing, and evaluating interventions derived from social learning theory. Focuses on interventions by people in community (teachers, supervisors, etc.) Includes token economies and strategies for self-control.
5350-80-90 Seminar in Psychology (3, 3, 3) May be repeated. Maximum 18 hrs.
5400 Psychophysics and Scaling Methods (3) Prereq: One course in statistics.
5420-30-40 Advanced Psychological Statistics (3, 3, 3) Must be taken in sequence. W, Sp, Su
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 in Psychometrics (4) Basic ideas and orientation in psychometrics. All graduate students who plan to take one or more courses in psychometrics required to take course. Prereq or coreq: 4640.
5510 Instrumentation for Psychological Research (3)
5520 Theory of Measurement (3) Reliability, validity, scaling and equating, norms, combining tests into scales. Prereq: 1 qtr or graduate-level statistics and 5500 or consent of instructor.
5530 Issues in Applied Psychological Measurement (3) Applications of measurement in community and organizational research. Prereq: Statistics 5050-70 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: 1 qtr calculus or consent of instructor.
5550 Advanced Social Psychology (3) Interaction between individual and group, theories of group behavior. Prereq: 3120.
5580 Theories of Personality (3)
5581 Psychodynamic Approach to Clinical Psychology (3) Basic concepts. Selection of theorists with examination of work with patients. Prereq: Admission to doctoral program in Clinical Psychology or consent of instructor.
5582 Behavioral Approach to Clinical Psychology (3) Human development and strategies for behavior change from viewpoint of social learning theory. Dis-
5583 Phenomenological Approach to Clinical Psychology (3) Normal development and psychopathology, emphasis on existential theory. Comparison of underlying assumptions of different theories. Prereq: Admis-
sion to doctoral program in Clinical Psychology or consent of instructor.

5589 Adult Psychological Assessment (3) Basic concepts and techniques of adult assessment, including intelligence tests and personality tests. Prereq: Admission to doctoral program in Clinical Psychology or consent of instructor.

5591 Seminar in Object Relations Theory (3) European and American conceptions of normal and psychopathological development of object relations, practical significance for psychotherapy and psychoanalysis. Prereq: Admission to doctoral program in Clinical Psychology or consent of instructor.

5592 Descriptive Psychopathology (3) Diagnostic criteria of the DSM-III. Examples from written case histories and recorded interviews. Prereq: Admission to doctoral program in Clinical Psychology or consent of instructor.

5601 Dynamics of Psychopathology (3) Psychodynamic view of psychological distress and its symptoms of major psychoses, neuroses and adjustment disorders. Prereq: Admission to doctoral program in Clinical Psychology or consent of instructor.

5610-20 Psychology of Learning (3, 3) Prereq: 3210 or Educational Psychology 3730. F; W

5620 Psychology of Development (3, 3) Prereq: 3210 or Educational Psychology 3730. F; W

5680 Neural Basis of Behavior (3) Neuronanatomy; basis and symptomatology of neurological syndromes encountered in clinical psychology. Prereq: M.A. in psychology or equivalent.

5690 Psychopharmacology (3) Review and evaluation of pharmacology as it relates to psychology. Prereq: Consent of instructor. S, A

5702 Community Psychology (3) Psychological aspects of research, evaluation, intervention, and planning in community psychology, systems for primary and secondary prevention, planning of social systems, and relevance of federal policies. Prereq: Consent of instructor.

5750 Ethological Psychology (3) Evolutionary and physiological basis of comparative psychology and implications for human behavior. Prereq: Introduction to animal behavior or equivalent.

5760 General Vertebrate Neuroanatomy (3) Lecture and laboratory dealing with structure and function of central and peripheral nervous system. Prereq: 4716, 4719, or consent of instructor. (Same as Zoology 5760.)

5769 Advanced Techniques in Physiological Psychology (3) Animal and human laboratory procedures central to research in physiological psychology. Prereq: 4710, 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 5790.)

5823 Child Psychiatric Assessment (3) Introduction, development of program, objective tests, projective techniques. Prereq: S100 and Admission to Clinical Training Program or consent of instructor.

5860 Interpersonal Assessment (3) Focus on objective tests such as MMPI and Leary System of interpersonal diagnosis. Prereq: 5580 or equivalent and admission to Clinical Training Program or consent of instructor.

5869 Practicum in Psychodiagnostic Appraisal (3) Prereq: Admission to doctoral program in Clinical Psychology or consent of instructor. May be repeated. Maximum 6 hrs.

5870 Projective Techniques in Assessment (3) Diagnosis of personality disorders using case history and mental status; projective techniques. Prereq: 5601 or equivalent and admission to Clinical Training Program or consent of instructor.

5879 Practicum in Psychological Appraisals (3) Prereq: 5869.

5950-60 Theory and Practice of Consultation (3, 3) Issues in consultation, models of consulting process, and evaluation of consulting techniques. Must be taken in sequence. Coreq: 5956-69 and consent of instructor. (Same as Educational Psychology 5950-60.) W; Sp

5956-69 Practicum in Psychological Appraisal (2, 2) Coreq: 5805-60-70. Prereq: Consent of instructor. Must be taken in sequence. (Same as Educational Psychology 5956-69.) S/NC only. W; Sp

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

6050 Seminar on Methods of Social Research (3) (Same as Sociology 6050.)

6089 Internship in Community Psychology (1-6) Supervised employment at departmentally approved internship site(s). Prereq: Consent of instructor. May be repeated. Maximum 12 hrs. S/NC only.

6099 Internship in School Psychology (1-6) Supervised employment at departmentally approved internship sites. Prereq: Consent of instructor. May be repeated. Maximum 18 hrs. S/NC only.

6100 Seminar in Community Psychology (3) Evaluation, research, intervention, and systems for delivery of services in communities. Prereq: 5702.

6150 Seminar in Program Evaluation (3) Techniques for designing and conducting research to evaluate effectiveness of programs. Prereq: Statistics 5050-

6159 Practicum in Program Evaluation (3) Designing, conducting, and analyzing results of program evaluation in school or community setting. Prereq: 6150 and consent of instructor.

6250-60-70 Seminar in Industrial and Organizational Psychology (3, 3, 3) (Same as Management 6250-60-70).

6310 Seminar in Motivation and Emotion (3)

6319 Field Work in Psychology: Level II (2) Supervised on-the-job traineeship in school psychology. Limited to students fully admitted to doctoral program in School Psychology assigned to program approved field settings. Prereq: 5950-60. May be repeated. Maximum 6 hrs. S/NC only. F, W, Sp

6320 Seminar in Research Methods (3)

6330 Seminar in Learning (3)

6340 Seminar in Developmental Psychology (3)

6350 Seminar in Thinking (3)

6370 Seminar in Theoretical Psychology (3)

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

6385 Hypnosis and Imagery (3) Demonstration and practice of hypnotic induction methods, survey of clinical applications of hypnosis and imagery. Prereq: Consent of instructor.

6390 Seminar in Psychotherapy (2) Treatment of current case, focusing upon psychodynamics, psychopathology, and therapeutic techniques employed. Prereq: Consent of instructor.

6395 Seminar in Assessment (3) Seminar for advanced graduate students in clinical psychology, to deal with current research on methods of evaluating the status of individuals seeking clinical aid.

6400 Seminar on Changing Concepts in Clinical Psychology (3) New developments in field in relation to their impact on experimentation and systems of thought. Prereq: M.A. in psychology or equivalent.

6405 Seminar in Psychopathology (3) Prereq: Consent of instructor.

6410-20-30 Psychotherapy (3, 3, 3) Theories and principles. Prereq: Consent of instructor.

6411 Seminar in Group Processes (2) Theory and practice of group therapy; communication skills. Prereq: Admission to Clinical Training Program or consent of instructor.

6412 Seminar in Inference in Psychotherapy (3) Uses of actuarial and inferential data for assessment of strategies and tactics used in psychotherapy. Prereq: Admission to Clinical Training Program or consent of instructor.

6413 Seminar in Techniques of Behavior Modification (2) Practical applications of systematic desensitization, operant conditioning, aversive conditioning and related techniques for modification of behavior disorders. Prereq: Admission to the Clinical Psychology Program.

6414 Seminar in Marital and Family Therapy (2) Evaluating marital and family problems; methods of investigation. Psychodynamic, behavioral, and systems theory concepts. Prereq: Admission to the Clinical Psychology Program.

6415 Introduction to Psychoanalytic Psychology (3) Prereq: Consent of instructor.

6429 Assessment Laboratory (2) Coreq: 5589, 5689, 5870, or 5879. May be repeated. Maximum 12 hrs.


6450 Advanced Psychometrics (3) Construction and standardization of psychological tests, questionnaires, and rating scales; theory of errors or measurements; item analysis, scaling, equating, and norms development. Prereq: 4650, 5440, and 5500. May be repeated. Maximum 9 hrs.

6491 Field Placement (1-4) Required of all students second year and beyond in full-time residence in the clinical training program. May be repeated. Maximum 24 hrs. S/NC only.

6492 Psychology Clinic Placement (1-4) Required of students assigned to Psychology Clinic. May be repeated. Maximum 24 hrs. S/NC only.

6493 Advanced Clinical Activity (1-4) May be repeated. Maximum 12 hrs. S/NC only.

6494 Field Experience in Clinical Psychology (1-4) For students who have finished internship with placement in clinical psychology in local area. May be repeated. Maximum 12 hrs. S/NC only.

6500 Seminar in Psychometrics (3) Seminar for advanced graduate students in psychometrics or quantitative psychology, to deal with advanced theories, methodologies, and their applications. Prereq: 4640, 5500 or equivalent, and consent of instructor. May be repeated. Maximum 9 hrs.

6510 Ethical and Professional Issues in Psychology (3) (Same as Educational and Counseling Psychology 6510.)

6550 Seminar in Advanced Social Psychology (3)

6575 Seminar in Mental Health Administration (3) Theory and problems in organization and management of mental health administration.


6702 Social Ecology (3) Seminar on current topics: ecological psychology, quality-of-life, social impact assessment, and environmental classification. Prereq: Consent of instructor.

6710 Seminar in Physiological Psychology (3)

6720 Seminar in Comparative and Ethological Psychology (3)

6800 Field Work in Industrial and Organizational Psychology (1-15) (Same as Management 6900.)

*May be repeated for credit with the approval of the department.
Religious Studies

Professors: C. H. Reynolds (Head), Ph.D. Harvard; D. L. Duncan, Th.D. Harvard; W. L. Humphreys, Ph.D. Union; D. E. Linge, Ph.D. Vanderbilt; F. S. Lushby, B.D. Colgate Rochester; R. V. Norman, Jr., Ph.D. Yale.

Associate Professors: J. L. Fitzgerald, Ph.D. Chicago; M. Levering, Ph.D. Harvard.

Assistant Professor: M. Harris, Ph.D. Harvard.

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 described under Philosophy.) Graduate courses in religious studies further provide opportunity for students in a variety of disciplines to pursue work in religious studies as a graduate concentration.

4360-70-80 History of Western Religious Thought and Institutions (4, 4, 4) 3060—First Century to Fifth Century. 3070—Sixth Century to Fifteenth Century. 3080—Sixteenth Century to 1900. (Same as History 3060-70-80.)

3411 The Renaissance (3) (Same as History 3411.)

3412 The Reformation (3) (Same as History 3412.)

3440 Religion of Primitive Peoples (3) (Same as Anthropology 3440.)

3605-06 Professional Responsibility (4, 4) (Same as Philosophy 3605-06.)

3850 Philosophy and Religion in India (4) (Same as Philosophy 3850.) F

3860 Buddhist Philosophy and Religion (4) (Same as Philosophy 3860.) F, W

3871 Religion and Philosophy in China (4) (Same as Philosophy 3871.) S

3890 Philosophy of Religion (4) (Same as Philosophy 3890.) F, Sp

4111-21 Modern Religious Philosophies (4, 4) Examination of the religious implications of major thinkers and movements. 4111—Nicolas of Cusa to Hume. 4112—The twentieth century. Prereq: 9 hrs of philosophy other than logic. (Same as Philosophy 4111-12.)

4200 Classical Indian Systems of Philosophy: The Moksha Tradition (4) Basic writings and philosophical principles of the traditions of Samkhya, Yoga, and Vedanta. Prereq: 3650 or 3660. (Same as Philosophy 4200.)

4210 Topics in Ancient Israelite and Ancient Near Eastern Religions (4) Prereq: 3110-20 or consent of instructor. May be repeated. Maximum 8 hrs.

4310 Jesus and Paul Compared (4) Jesus' teaching and activity in the context of the first-century Palestine Judaism; analysis of what the Apostle Paul made of the tradition of and about Jesus. Recommended prereqs: 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.

4550 Topics in American Religion (4) Prereq: One of the following: 3510, 3520, 4410, or consent of instructor. May be repeated. Maximum 8 hrs.

4540 Development and Underdevelopment (4) (Same as Sociology 4540.)

4610 Topics in Western Religious Thought and Institutions (4) Selected figures, issues, and institutions. Seniors and graduate students only, except by consent of department. Prereq: 3060-70-80. May be repeated. Maximum 12 hrs.

4640 Topics in Early Christianity and Hellenistic Religions (4) Selected figures, issues, and institutions. Seniors and graduate students only, except by consent of department. Prereq: Consent of instructor. May be repeated. Maximum 12 hrs.

4670 Topics in Eastern Religions (4) Selected figures, issues, and institutions. Seniors and graduate students only, except by consent of department. Prereq: 3650-60-71-72. May be repeated. Maximum 12 hrs.

4810-20-30 Readings and Research in Religious Studies (3-4, 3-4, 3-4)

4840 Readings in Selected Languages Related to Religious Studies (3-4) Prereq: Consent of instructor. May be repeated. Maximum 12 hrs.

4940 Sociology of Religion (4) (Same as Sociology 4940.)

5010 Foreign Study (1-12) See page 104.

5102 Off-campus Study (1-12) See page 104.

5103 Independent Study (1-12) See page 104.

5310-20 Topics in Religion and Society (4, 4)

5335 Orientation to Medical Ethics (4) (Same as Philosophy 5335.)

5365 Applied Ethical Theory (4) (Same as Philosophy 5365.)

5510-20 Topics in the History of Religion (4, 4)

5660 Topics in Afro-American History (3) (Same as History 5660.)

5710-20 Topics in Religious Thought (4, 4)

Romance Languages

MAJORS

French

MA, M.A., Ph.D.

Professors: Y. M. Washburn, (Acting Head) Ph.D. North Carolina (Chapel Hill); E. E. Barrette, Ph.D. California (Berkeley); C. W. Cobb, Ph.D. Tulane; J. C. Elliott, M.A. Illinois, W. H. Heflin, Ph. D. Florida State; T. B. Irving (Emeritus), Ph.D. Princeton; F. D. Maurino (Emeritus), Ph.D. Columbia; M. Petrovska, Ph.D. Kentucky; C. Pinsky, Ph.D. California, (Berkeley); J. O. Swain (Emeritus), Ph.D. Illinois; A. M. Vazquez-Bigi, Ph.D. Florida State; H. Wallace, Ph.D. North Carolina, (Chapel Hill).

Associate Professors: F. F. Eves (Emeritus), Ph.D. Wisconsin; E. J. Campion, Ph.D. Yale; R. M. Dykes, Ph.D. Illinois; M. H. Haneleman, Ph.D. Florida; K. D. Levy, Ph.D. Kentucky.

Assistant Professors: W. F. Eyes (Emeritus), Ph.D. Wisconsin; E. J. Campion, Ph.D. Yale; R. M. Dykes, Ph.D. Illinois; M. H. Haneleman, Ph.D. Florida; K. D. Levy, Ph.D. Kentucky.

DEGREES

French

M.A., Ph.D.

Spanish

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

Professors: A. S. Allen, Ph.D. California (Berkeley); W. S. Byers (Emeritus) Ph.D. Columbia; C. K. Duncan, Ph.D. Harvard; F. D. Maurino (Emeritus), Ph.D. Pennsylvania State; G. V. Rogers, Ph.D. Georgia; B. S. West, Ph.D. North Carolina, (Chapel Hill); J. B. Wood, Ph.D. Southern California.

The Department of Romance Languages offers two advanced degrees: the Master of Arts (M.A.) in French and Spanish; and the Doctor of Philosophy (Ph.D.) in Spanish. Inquiries should be addressed to the Head of the Department.

THE MASTER'S PROGRAM

Thesis Option:

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). If the student chooses to divide his/her work into a major and minor (French-Italian, Spanish-Portuguese, etc.), at least 36 hours must be taken in the major.


3. A written examination covering the course work and selected items from a master reading list.

4. A final oral examination covering the thesis.

Non-Thesis Option:

1. Completion of 45 quarter credits of which 33 must be in courses beyond 5000, including 5011 (French or Spanish, as appropriate). If the student chooses to divide his/her work into a major and minor (French-Italian, Spanish-Portuguese, etc.), at least 36 hours must be taken in the major.

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

Course Work and Residence: A dissertation (36 credit hours), and minimum of 81 credit hours in course work beyond the Bachelor's degree or its equivalent is required; maximum of 12 hours may be taken in courses at the 4000 level and the rest in courses above 5000, including a minimum of 18 hours in courses above 5000. All students must complete the series in methods of research (5151-61-71) for a total of 3 credits. No fewer than 54 quarter hours should be taken in courses pertaining to the student's major field. The minor shall consist of at least 18 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 specialization. In addition, 9 hours of courses above 4000 in a related discipline are required. This requirement may be waived in favor of additional course work in the major field.

Language Requirements: Students are expected to demonstrate written and oral fluency in Spanish as well as knowledge of two other foreign languages. One of these must be French; the second one should be chosen from such languages as German, Italian, Portuguese, Arabic or Hebrew in accordance with the student's field of concentration. Proficiency in Latin shall be required of all students specializing in an area related to philology or the medieval period.

Examinations: A comprehensive examination, both written and oral, covering the major and minor fields must be passed before a student can become an official candidate for the degree. This examination is to be held at the time deemed most appropriate by the student's major advisor and committee. The candidate is expected to defend the dissertation in a final oral examination.

French

3010-20-30 Elements of French for Upper Division and Graduate Students (3, 3, 3) Elements of lan-

guage, elementary and advanced readings. Open to graduate students preparing for language examina-

tions, and upper division students desiring reading knowledge of the language. Undergraduate credit only. No credit for those having had Elementary French. No auditors. F, W, Sp, Su
4720 Introduction to Romance Linguistics (3) (Same as French and Linguistics 4720). E
4410 Spanish Civilization (3) Prereq: Intermediate Spanish or equivalent.
4420-30 Latin American Civilization (3, 3) Prereq: Intermediate Spanish or equivalent. W: SP
4510 Special Topics in Nineteenth Century Spanish Literature (3) Prose, poetry and theatre in Spain in the nineteenth century. Genre, movement, or combination of several literary aspects. Prereq: Intermediate Spanish or equivalent. May be repeated with consent of department. Maximum 9 hrs. A


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

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

5011 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

5101 Foreign Study (1-12) See page 104. E

5102 Off-campus Study (1-12) See page 104. E

5103 Independent Study (1-12) See page 104. E

5110-20-30 Old Spanish (3, 3, 3) Medieval Spanish language and literature. A

5121 College Teaching of Romance Languages (3) Seminars, demonstrations, and practical applications of techniques and procedures for teaching and evaluating basic language skills, cultural aspects, and beginning literature. Required of all M.A. and Ph.D. students holding Graduate Teaching Assistantships except those whose previous training or experience warrants their being excused by department. F

5151-61-71 Bibliography and Methodologies of Research (1, 1, 1) (Same as French and Italian 5151-61-71.) S/NC only. A

5211-21 Don Quixote (3, 3, 3) Must be taken in sequence. A

5212-32 Golden Age Prose (3, 3, 3) 5212—La Celes- tina; critical study of Fernando de Rojas' life and work. Celestina; a medieval romance of Spain; Miguel de Cervantes; novel of the Renaissance; Felipe de Narvaez; the Grijalva expedition. 5232—Guzman de Alfarache and Spanish pictusque genre. A

5250-60 The Generation of '98 (3, 3, 3) Angel Ganivet, Giner de los Rios, Baroja, Unamuno, Valle Inclán, Benavente, Azorin, Perez de Ayala. A

5270 The Contemporary Novel (3) Civil War and post-Civil War period. A

5310 Directed Readings (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

5550-60 The Golden Age Theatre (3, 3, 3) 5550—Introduction to Spanish Theatre, Lope and Tirso. 5560—Castro, Alarcón, 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 stories as major literary genre in Spanish America. Reading and criticism of works of authors such as Dario, Quirce, Borges, Arendza, and Rufo. A

5633 Twentieth-century Latin American Theatre and Film (3) Readings from works of Carlos Sotorzano, Rodolfo Usigli, Coronado Nalvo Roxio, Roberto Arlt, Rene Marques and Sebastian Salazar Brodny. Presentation of films as adaptations of classics such as Dario Bambas, Letras de Caro, Goguendo 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, main and female relationships and society as context for woman's destiny. Readings from poetry and fiction, including such authors as Alfonso Storni, Delmiro Agustini, Gabriela Mistral, Silvina Balbich, Silvina Ocampo and Rosario Castellanos. A

5650-60 Advanced Syntax and Stylistics (3, 3) Readings and written imitations of modern literary styles in compositions, sketches, and original stories. A

5670 Problems in Linguistics: Romance Languages (3) (Same as French 5670). A

5610-20-30 Spanish Lyric Poetry (3, 3, 3) A

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

6210-20-30 Seminars 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

S., Ph.D.

Professors:

T. C. Hood, (Head), Ph.D. Duke; D. M. Betz, Ph.D.

Michigan State; J. A. Black, Ph.D. Iowa;

O. J. Champion, Ph.D. Purdue; D. Hastings, Ph.D.

Massachusetts; D. R. Ploch, Ph.D. North Carolina;

N. Shover, Ph.D. Illinois; S. Wallace, Ph.D. Minnesota.

Associate Professors:

D. Chilcote, Ph.D. Michigan State; S. Kurth, Ph.D.

Illinois; R. G. Perrin, Ph.D. British Columbia;

K. Van Liem, Ph.D. Washington State.

The Department of Sociology offers programs leading to the Master of Arts and the Doctor of Philosophy degrees. For a full statement of departmental requirements, students are referred to the Departmental Graduate Manual.

THE MASTER'S PROGRAM

The department offers both a thesis and non-thesis option for a Master's degree. For information concerning the Master's degree with thesis, see the General Requirements on page 22. Those interested in the non-thesis option should obtain details from the department.

THE DOCTORAL PROGRAM

Specific requirements for the degree of Doctor of Philosophy in Sociology include:

1. A minimum of 108 credit hours following the Bachelor's degree, exclusive of credits for the Master's degree, is required. Of this number, 36 hours shall be allocated to doctoral research and dissertation. A maximum of 12 hours credit outside the major may be taken in related fields, with the approval of the student's committee.

2. A written comprehensive examination covering sociological theory, research methodology, and two core 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 graduation, the candidate will be required to pass an oral examination on the doctoral dissertation. At the oral examination the candidate will be expected to show a thorough knowledge of sociological theory and methodology related to the research.

All registration for 3000- and 4000-level courses requires the consent of the instructor.

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 the origins of legal sanctions. Some attention is paid to law and law-like phenomena in formal organizations and primitive societies.

4110 Population Problems (4) Demographic factors and social structure; trends in fertility, mortality, population growth, migration, distribution, and composition; population policy.

4120 Topics in Social Psychology (4) (Same as Psychology 4120.)

4160 Theory of Attitudes and Values (4) Organization, functions and measurement of attitudes and values; approaches to attitude change; and relationship to attitudes, values and behavior.

4330 Urban Ecology (4) Examination of public, private, collective, and individual space. Classical school of ecology, its neoclassical reviewers, social area analysis, and cognitive symbolic ecology emphasized.

4410 Educational Sociology (3) (Same as Curriculum and Instruction 4410.)

4500 Criminology (4) Systematic inquiry into causes and control of crime and criminals: causation.


4520 Criminal Justice II: Corrections (4) Historical development of institutions and programs: juvenile training schools, prisons, probation, and parole. Analysis of operation and impact. Evaluation research and application to correctional programs. Recommend prereq: 4500.

4530 Community Organization (4) Structure: function; linkages; change and development and important community studies are reviewed and discussed. Emphasis on sociological analysis, not on the implementation of policy.

4540 Development and Underdevelopment (4) Critical examination of theories which attempt to explain differential development in modern world. In depth examination of development issues in selected regions of world. (Same as Religious Studies 4540.)

4560 Formal Organization (4) Analysis of bureaucratization processes, division of labor, delegation of authority, channeled communication under a system of rationality.

4700 Sociology of Aging (4) Roles and statuses with aging with respect to major social institutions, impact that rapidly increasing number of older people have on society; effect of society on older people.

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 Society Movements (4) Development, organization, and function of social movements; attention is given to the ideology, leadership and organization of contemporary religious and other types of social movements.

4940 Sociology of Religion (4) Interrelationship of society, culture, and religion. (Same as Religious Studies 4940.) A

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

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

5010 Professional Seminar (3) Limited to sociology students. May be repeated. Maximum 9 hrs. S/NC only. W, Sp

5210 Introduction to Sociological Theory (3) F

5230 Seminar in Sociology of Medicine (3) May be repeated with different instructors. Maximum 6 hrs.

5300 Methods of Sociological Research I (3) Assumptions and foundations of sociological research strategies and techniques.

5310 Seminar in Methods of Sociological Research (3) Major methodological issues in sociology; scaling techniques, reliability, validity, sampling, and quantitative methodology.

5320-30 Social Statistics (3, 3) General survey of parametric and nonparametric procedures in analysis of sociological data; assumptions underlying procedures; advantages, disadvantages, and special applications. Must be taken in sequence. F; W

5350-60 Statistical Analysis in the Social Sciences I, II (3, 3) Topics include multiple regression, analysis of variance, analysis of covariance, ordinal and nominal measures of association, sampling, significance tests, and confidence limits. Extensive use of social science computing packages.

5470 Foundations of Social Psychology (3) Current and classical theoretical perspective in social psychology. May be used for credit in psychology.

5480 Foundations of Social Conflict and Change (3)

5510 Delinquency and the Social Structure (3) Critical assessment of contemporary theories of delinquency, research findings related to them, and their implications for formal strategies of control and rehabilitation.

5520 Crime, Law, and Social Control (3)

5560 Seminar in Community (3)

5680 Historical Demography (3) Focus on general methodological principles to particular operating context of survey. Systematic exploration of survey problems through student participation in design and analysis of survey (2 qtrs). Prereq: 5303-10 or consent of instructor.

5660 Seminar in Social Attitudes (3)

5810 Seminar in Race and Culture (3) Critical examination of the theoretical and conceptual approaches in study of intergroup relations.

5830 Social Differentiation and Stratification (3) Various sources of differentiation in society, their relation to conflict in society, and their relationship to class structure in society.

5840 Seminar in Occupations (3) Occupations and their relation to individual and society; technology and occupations; labor markets and occupations; social organization and occupations.

5850 Seminar in Occupations (3) Continuation from material in Sociology 5640; interface between occupations and settings in which they are performed.

5870 Social Organization (3) Structure and function of human groups, with special attention to voluntary associations and administrative organizations.

5880 Seminar in Research Problems in Intergroup Relations (3) Research techniques and problems encountered in race and intergroup relations are explored; actual field research projects are performed.

5890 Sociology of Development and Modernization (3) Comparative approach to institutional and organizational correlates of modernization. Relations between urbanization, industrialization, and modernization.

5940 Social Theories of Sport (3) (Same as Physical Education 5940.)

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

6050 Seminar on Methods of Social Research (3) Experimental research projects. (Same as Psychology 6050.)

6220 Sociological Theory I (3) Prereq: 5410 or consent of instructor.

6230 Sociological Theory II (3) Prereq: 5410 or consent of instructor.

6230-40 Survey Design and Analysis (3, 3) Application of general methodological principles to particular operating context of survey. Systematic exploration of survey problems through student participation in design and analysis of survey (2 qtrs). Prereq: 5303-10 or consent of instructor.

6350 Field Research (3) Prereq: 5300-10 or consent of instructor.

6360 Field Research Practicum (3)

6410 Tutorials in Advanced Topics (3) Individual research. Prereq: Consent of department. 5410 and 6420 may be repeated in any combination for a maximum of 18 hrs.

6420 Special Topics (3) Topics of special interest or student-initiated courses which will not be regularly offered. Prereq: Consent of instructor. 6410 and 6420 may be repeated in any combination for a maximum of 18 hrs.

6530 Sociology of Law (3) Analysis of social and cultural factors influencing emergence and maintenance of law as social institution and affecting relations between law and deviant behavior; appraisal of theoretical and methodological issues encountered in studying law. A

6640 Seminar in Environmental Sociology (3)

6650 Urban and Regional Sociology (3) Prereq: Consent of instructor.

6660 Human Fertility (3) History, 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 growth; controversies on control of vital rates of growth. Prereq: 5650 or consent of instructor.

6670 Theory and Methods of Human Ecology (3) Theoretical perspective and research techniques of human ecology applied to selected research sites. Prereq: Consent of instructor.

6680 Theory and Research in Human Migration (3) Prereq: 5650 or consent of instructor.
College of Liberal Arts/Speech and Theatre

Master’s level, i.e., speech or theatre, with area concentrations in acting/directing, playwriting/dramaturgy, and design/technical production. The department of Speech and Theatre offers the Master of Arts degree in Speech and Theatre with area concentrations in acting/directing, playwriting/dramaturgy, and design/technical production.

In their prospective concentrations at the Master’s level, i.e., speech or theatre, applicants must have completed undergraduate degrees approximately equivalent in requirements to those specified for degrees conferred by The University of Tennessee, Knoxville.

The Graduate Record Examination is required of all applicants as well as a written comprehensive exam at the conclusion of coursework. All M.F.A. applicants must submit 3 letters of recommendation. Auditions before appropriate faculty are required of M.F.A. acting/directing applicants. Applicants for admission to M.F.A. design/technical theatre and playwriting programs must submit samples of their work.

For detailed information about the graduate program, contact the Director of Graduate Studies, Department of Speech and Theatre.

MASTER OF ARTS DEGREE

The departmental requirement for the M.A. degree in Speech and Theatre is 45 quarter hours (inclusive of hours taken toward a minor), at least 30 hours of which must be earned in courses numbered 5000 or above. Only 9 hours of thesis credit (Speech and Theatre 5000) may be included in the 45-hour minimum for the degree. Speech and Theatre 5110 is required of all M.A. students. Area concentration requirements are as follows:

Speech Communication:
(1) Speech 5010 and 5140.
(2) Three courses from the following: 4222, 4560, 5570, 5750, and 5770.
(3) One course from the following: 4560, 4571, 4591, 4930.
(4) One course from the following: 5210, and 5440.
(5) 36 of the required 45 hours (including thesis hours) must be taken in either Speech or Theatre courses numbered 4000 or above. Two-thirds of the total hours must be at the 5000 level or above. No courses in Theatre may be counted toward the speech concentration.

Theatre:
(1) 15 hours in theatrical history and criticism.
(2) At least 9 hours (and no more than 12 hours) in performance and production courses may be included in the 45-hour minimum for the degree.
(3) No more than 6 hours in projects courses.

MASTER OF FINE ARTS DEGREE

Curriculum

At least 90 quarter hours, 60 of which must be at the 5000 level or above are required for the degree of Master of Fine Arts in Theatre, which is normally to be completed in three consecutive years of full-time residence. Theatre 5110 is required in the first quarter of residence. Also required are Theatre 3611, 3252-53-54, and at least 6 hours in dramatic theory and criticism. 3252-53-54 may be waived by proficiency examination. Students passing this examination must complete 12 hours in advanced theatre history and dramatic theory/criticism, including at least one course from each of the two areas.

In addition to the core requirements listed above, each area of concentration has specific requirements:

Acting:
(1) one quarter of 5610, representing a significant project.
(2) Theatre 5670-71-72-73-74-75-76-77-78.
(3) One course in directing.
(4) Two hours each in voice and dance.

Directing:
(1) One quarter of 5610, representing a significant project.
(2) Theatre 4441-42.
(3) 6 hours of 5630.

Playwriting:
(1) One quarter of 5610, representing a significant project.
(2) Theatre 4951-52.
(3) 18 hours of 5250.
(4) 6 hours of 5610.

Dramaturgy:
(1) One quarter of 5610, representing a significant project.
(2) Three courses in dramatic theory/criticism.
(3) Theatre 5330, 4441-42.
(4) 3 hours of 5630.
(5) 18 hours of 5710.
(6) 12 hours in an arts and humanities area.

Phonetics:
(1) One year of language study.

Design/Technical Production:
(1) 18 hours of 5680.
(2) 3 hours in 5620-40-50-60.
(3) Theatre 4441 if lacking undergraduate foundation in directing.
(4) Theatre 4611

Students in the MFA program are evaluated annually by juried performance or portfolio submission. Continuance in the program is with the approval of the faculty committee for the MFA program. Satisfaction of the comprehensive examination is prerequisite to entry into the second semester. Thesis and oral defense (Theatre 5890, 9 hours minimum) must be completed satisfactorily before the degree is conferred.

Requirements for Second Master’s Degree

Students admitted to the MFA program who have already earned a Master’s or a doctoral degree may apply up to 15 credit hours from the previous graduate program to the MFA degree, with approval of the student’s committee, the Dean of the College of Liberal Arts, the Dean of The Graduate School.

Any such credits applied from a previous graduate program would be from courses that are directly relevant to the student’s MFA curriculum, and must have been earned within the time limits (5 years) established for completion of the MFA degree.

Speech

4220 Theories of Argumentation (4) Conceptual bases of argumentation from classical to contemporary theorists. Prereq: 2331 or consent of instructor. Sp

4351 Communication and Conflict (3) Communication as significant factor in development, management, and resolution of conflict at interpersonal, small group, organization, or societal levels.

4550 History of Rhetorical Theory (4) Western rhetorical theory from Plato to present.

4560 Rhetoric of the Women’s Rights Movement (4) Historical and critical study of public addresses in campaign for women’s rights from the 1850s to present. F

4571 British Oratory (4) Historical and critical study of British public address. Sp, A

4591 Persuasive Uses of Imaginative Literature (4) Topics in social and political uses of novels, plays, and poems. W

4611 Advanced Phonetics (4) Phonetic aspects of contemporary dialects of English language. Prereq: Consent of instructor.

4930 Studies in American Public Address (4) May be repeated. Maximum 12 hrs.

5010 Research in Speech Communication (3) Survey of methods and representative studies in speech communication.

5140 Communications Theory (3) Analysis of contemporary theories of human communication, emphasizing similarities and differences of communication processes in intrapersonal, interpersonal, and mass communications systems. F

5210 Topics in Group and Interpersonal Communication (3) May be repeated. Maximum 9 hrs. Sp

5440 Organizational Communication (3) May be repeated. Maximum 9 hrs. 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

4640 Ensemble Interpretation (4) Oral interpretive techniques of choral reading, readers theatre and chamber theatre. F, W

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

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

5110 Introduction to Graduate Research in Speech and Theatre (F) F

520 Directed Reading and Research (2) May be repeated. Maximum 9 hrs. E

5160 Theory and Production Techniques of Oral Interpretation (4) Literary, psychological, communicative, and aesthetic approaches to collection, adaptation, and oral presentation of literature. W, Sp

Theatre

3214-15 Technical Theatre (4, 4) Special techniques in scenery and property construction; stage management; and other technical theatre practice. Prereq: 2211-21, or consent of instructor. Must be
3321-42 Introduction to Scene Design (4, 4) 3321 — Problems in stage design with reference to space and movement; scale, and style; rudiments of rendering and ground plan preparation. 3322 — Play interpretation through scenic means; setting as environment for dramatic action; rudiments of model making. Must be taken in sequence. Graduate credit available to Theatre MFA students only.

3252-53-54 History of the Theatre (4, 4, 4) Drama in performance with particular emphasis on theatre architecture, scenic design, and acting styles. 3252 — Antiquity to the Renaissance. 3253 — The European Theatre, 1650-1850. 3254 — Modern Theatre. Grad- uate credit available to Theatre MFA students only.

3293-63 History of American Theatre (3, 3) Development of the theatre as social institution in American life. 3293 — from its beginnings to 1900. 3296 — from 1900 to present. Graduate credit available to Theatre MFA students only.

3321-22 Introduction to Lighting Design (4, 4) Mechanics of stage lighting; elementary theory; problems in basic lighting practice. Prereq: 2211-21 and consent of instructor. Must be taken in sequence. Graduate credit available to Theatre MFA students only.

3511-12 Introduction to Costume Design (4, 4) Costume design; the relationship of elements of design to design of stage setting; costume design techniques and approaches to design for complex dramas and varied dramatic forms. May be repeated. Maximum 8 hrs.

3520 Seminar in Writing (1-6) Sp may be repeated. Maximum 27 hrs.


5241 Studies in Scene Design (4) Advanced scene design techniques and approaches to design for complex dramas and varied dramatic forms. May be repeated. Maximum 8 hrs.

5310 World Theatre History (3) May be repeated. Maximum 9 hrs. F, W

5320 Studies in American Theatre History (3) May be repeated. Maximum 9 hrs. F, W

5330 Dramaturgy: Theory and Practice (4) Methods and materials. Prereq: Consent of instructor.

5341 Studies in Lighting Design (4) Scene design techniques and approaches to design for complex dramas and varied dramatic forms. May be repeated. Maximum 8 hrs.

5551 Costume Design and Production (4) Practical application and production of costume designs for the stage. Prereq: 2231, 3511, 3512, 4541, 4542, and/or consent of instructor. May be repeated. Maximum 8 hrs.

5601 Production Workshops (1-6) Directed experience in production collaboration. Prereq: Consent of instructor. May be repeated. Maximum 12 hrs.

5630 Projects in Light Design (3) May be repeated. Maximum 9 hrs. E

5640 Projects in Scene Design (3) May be repeated. Maximum 9 hrs. E

5650 Projects in Costume Design (3) Problems of play interpretation and theatrical costume design cen- tralizing around individual projects. Students will design costumes for complex play for public performance. May be repeated. Maximum 9 hrs. E

5652 Projects in Costume Technology (1-4) Individual- ized studies in costume technology in theatrical production. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.

5680 Projects in Technical Theatre (1-6) Problems of set design, interpretation, and execution. May be repeated. Maximum 9 hrs. E

5700-71-72-73-74-75-76-77-78 Master Class in Acting (5, 5, 5, 5, 5, 5, 5, 5, 5) Available to Theatre M.F.A. students only.

5700-71-72-73-74-75-76-77-78 Master Class in Acting (5, 5, 5, 5, 5, 5, 5, 5, 5) Available to Theatre M.F.A. students only.

5710 Seminar and Projects in Dramaturgy (3) Directed study and research. Prereq: Consent of instructor. May be repeated. Maximum 27 hrs.


5912 Play Production in Secondary Schools (4) Prin- ciples and methods for directing high school dramatic productions. (Same as Curriculum and Instruction 5912.) Su

5950-60-70 Studies in Dramatic Theory and Criti- cism (3, 3, 3) F; W; Sp

5990 Project and Thesis (1-6) Available to Theatre MFA students only. Prereq: 45 hrs toward MFA and approval of advisor. May be repeated. Maximum 12 hrs. S/N/NC only.

Speech Pathology
See Audiology and Speech Pathology

Zoology

MAJOR

Zoology

M.S., Ph.D.

Professors:
A. C. Echternacht (Acting Head), Ph. D. Kansas; R. M. Bagby, Ph. D. Illinois; D. L. Bunting, Ph. D. Oklahoma State; J. G. Carlson (Emeritus), Ph. D. Pennsylvania; D. A. Eltre, Ph. D. Minnesota; B. Hochman, Ph. D. California (Berkeley); E. T. Howley, Ph. D. Wisconsin; K. W. Jeon, Ph. D. London (England); J. R. Kennedy, Ph. D. Iowa; J. N. Liles, Ph. D. Ohio State; J. A. MacCabe, Ph. D. California (Davis); S. E. Rachel, Ph. D. Wisconsin; L. E. Roth, Ph. D. Chicago; C. A. Shivers, Ph. D. Michigan State; J. J. Tanner (Emeritus), Ph. D. Colorado; N. G. Welch, Ph. D. Florida; G. L. Whiston, Ph. D. Iowa.

Associate Professors:
K. D. Burnham, Ph. D. Iowa; T. T. Chen, Ph. D. Florida; D. J. Fox, Ph. D. Johns Hopkins; N. Greenberg, Ph. D. Rutgers; M. A. Handel, Ph. D. Kansas State; G. F. McCracken, Ph. D. Cornell; M. J. Lan, Ph. D. Pennsylvania; S. L. Pimm, Ph. D. New Mexico State; G. A. Vaughan, Ph. D. Duke.

Assistant Professors:

Research Assistant Professor:
J. L. Gittelman, Ph. D. Sussex (Brighton, England).

1Alumni Distinguished Service Professor.

The Department of Zoology offers the Master of Science and Doctor of Philosophy degrees with concentrations in aquatic biology, biochemistry, zoology, cell biology, molecular biology, physiology, genetics, ethology, and reproductive and developmental biology.

Requirements for admission: Applicants for graduate study are expected to have a background no less extensive than that required of undergraduate majors in this department. This includes a knowledge of the basic principles of cell biology, genetics, and ecology. Other requirements for admission are: (1) generally zoology or general biology, 12 quarter hours; (2) upper division zoology, 18 quarter hours; (3) chemistry, two years including 12 quarter hours of general inorganic; (4) mathematics, 9 quarter hours including differential and integral calculus; (5) physics, 12 quarter hours; (6) Graduate Record Examination scores (general and subject biology); and (7) a grade point average of 3.0 out of 4.0. Otherwise superior students, deficient in one or more of the above requirements, may be admitted at the discretion of the 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 three areas of zoology as determined by a quality-
ing examination. Students must take this examination during the winter quarter of the first year and may repeat the examination following the winter quarter of 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 third quarter of the initial 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 comprehensive examination will be an oral and written examination in zoology and in allied fields in which the candidate has had training; (3) the candidate for the Ph.D. degree must possess a reading knowledge of at least one foreign language in which there exists a sizeable amount of literature 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 third quarter of a language course. This requirement for the first language must be fulfilled before the student can take the comprehensive examination.

The student's faculty committee may require of the student any level of training or proficiency in a second foreign language but may not require that the student take the official language examination in the second language.

3050 Comparative Vertebrate Embryology (3) Developmental morphology of selected vertebrates. 2 hrs and 3 labs. F, Sp.

3060 Comparative Vertebrate Anatomy (5) Phylogeny and anatomy of organ systems. Dogfish shark and cat primarily used in laboratory. 3 hrs and 2 labs. W.


3110 General Entomology (5) Introduction to insects; basic structure, development, behavior; classification of insect orders and representative families; interpretation and use of keys. Prereq: Biology 3130 or consent of instructor. 3 hrs and 2 labs. F.

3150 Invertebrate Zoology (5) Biology of invertebrates (except insects) with emphasis on ecology and behavior. Prereq: Biology 3130. 3 hrs and 2 labs. W.

3220 Physiology of Reproduction (3) (Same as Animal Science 3220). F, Sp.

3320 Histology (4) Study of animal tissues. Prereq: Biology 3120. 2 hrs and 2 labs. F.

3410 Bioethics (3) Relationship between biological discoveries and human values. Open discussion of selected dilemmas arising from new knowledge about medicine, behavior, resources, and technology. Sp.

4007-4017 Minicourse in Zoology (2 hrs each) Selected advanced topics in zoology, concentrated in time and subject matter. Consult departmental listing for actual topics offered. Prereq: As posted. May be repeated. E.

4040 Developmental Biology (4) Experimental morphogenesis at least a B in the third quarter of course effects and related topics with examples drawn primarily from invertebrates and vertebrates. Prereq: 3650. 2 hrs and 2 labs. W.

4120 Undergraduate Research Participation (2) Experiences in active research projects under supervision of staff members; Consent of instructor. E.

4140 Practicum in Zoology (1-3) Participation in practical application of zoology in community institutions, government organizations and industry. Approximate 15 hrs involvement per week. Prereq: Biology 3110, 3120, 3130 and senior standing. E.

4190 Mammalogy (4) Classification, evolution, distribution, reproduction, populations, and behavior. 2 hrs and 2 labs or field periods. F.

4200 Ichthyology (5) Classification, collection and identification, distribution, life histories, and economic importance of fishes. Prereq: Consent of instructor. 2 hrs and 2 labs or field periods. F.

4210 Cell Physiology (5) Development of modern concepts in cell physiology from point of view of information and control which examines kinetics and integration of cellular activities. Prereq: Cell biology, or any physiology, and organic chemistry. Recommended prereq: Biochemistry. 3 hrs and 1 lab. Sp.

4250 Environmental Physiology (4) Physiological mechanisms in animal kingdom and relationships to animal ecology and to survival of animals in diverse environments. Prereq: Biology 3120-30, 2 yrs chemistry. W.

4250 Comparative Animal Physiology Laboratory I (1) Coreq: 4250. W.


4270 Immunology (3) (Same as Microbiology 4270.)

4280 Comparative Endocrinology (5) Comparative analysis of the physiology and morphology of endocrine glands in vertebrates and invertebrates. Their role and interaction in maintenance of the organism and species. Prereq: 3080 or equivalent. W.

4290 Herpetology (4) Classification, distribution, life histories, collection and identification of amphibians and reptiles, primarily of local species. 2 hrs and 2 labs or field periods. Sp.

4300 Ornithology (4) Morphology, physiology, behavior, reproduction, populations, evolution, field identification. 2 hrs and 2 labs or field periods.

4320 Microtechnique (4) Prereq: 3320 recommended. 2 hrs and 2 labs. W.


4369 General Genetic Laboratory (2) Mainly Drosohila experiments designed to illustrate basic principles of inheritance. Prereq: Biology 3110. W.

4380 Organic Evolution (3) Modern concepts of animal evolution. Prereq: Biology 3110. F.


4410 General Parasitology (4) Parasitic relationship: ecological, evolutionary, economic, cultural, and historical. Prereq: Biology 3130 or consent of instructor. 3 hrs, and 1 lab. W.

4510 The Culture of Animal Cells (2) A course designed to teach advanced students animal tissue and organ culture methods. One lecture and one laboratory per week. Prereq: Biology 3110-20, and permission of instructor.

4650 Introduction to Aquatic Ecology (4) Physical chemistry of inland waters. Biotic communities are described; interrelationships explored. Prereq: Chemistry 1110-20-30, Biology 3130. 2 hrs and 2 labs. F.

4700 Arachnology (4) Biology of spiders, mites, sorps, and relatives. Prereq: 3110, or 3150. 2 hrs and 2 labs.

4720 Comparative Animal Behavior (4) Methods and principles. (Same as Psychology 4720.)

4729 Comparative Animal Behavior Laboratory (4) Laboratory and field studies. Coreq: 4720. (Same as Psychology 4729.)

4810-40-20 Insect Morphology and Taxonomy (4, 4, 4) Internal morphology and classification of general and specialized forms. 4820—Taxyonomy of major orders. 4830—Taxyonomy of minor orders and immature forms. Prereq: for 4820: 3530. 3110 or consent of instructor. 2 hrs and 2 labs. W; Sp; A.

4940 Physiology of Exercise (4) Functions of body in muscular work; physiological aspects of fatigue, and physical fitness. Prereq: 2920-30 or 3080. 3 hrs and 1 lab. F, Sp.

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

5017 Colloquium in Ethology (1) (Same as Psychology 5017.) S/NC only.

5050 Zoology Seminar (1) Advanced topics or controversial issues in zoology. May be repeated. Maximum 6 hrs. All senior Zoology majors encouraged to take. Required of all first- and second-year graduate students. S/NC only. W, Sp.

5075 Zooplankton Ecology (4) Secondary productivity in aquatic systems. Prereq: 4660 or equivalent. Su.

5080 Graduate Research Participation (3) Advanced research techniques studied under supervision of staff research director whose research area coincides with interests of student. Open to all graduate students in good standing. Prereq: Consent of department and research director. May be repeated with consent of department. S/NC only. E.

5110-20-30 Special Problems (2, 2, 2) E.

5180 Fresh Water Invertebrate Zoology (4) Ecology and taxonomy of fresh water invertebrates exclusive of insects. Laboratory and field study. Prereq: 3150.


5280 Insect Physiology (4) Functions and interrelationships of systems relative to metabolism, growth, coordination, movement, and reproduction. Prereq: 4810. 1 yr general chemistry or consent of instructor. 2 hrs and 2 labs. W.

5290 Quaternary Problems (4) (Same as Geology 5290 and Botany 5290.)

5350 Biometry (3) Statistical methods used in analysis of quantitative biological data. Prereq: 1 qr 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.

5610-20 Advanced Animal Physiology (5, 5) Primarily mammalian physiology; 5510—membrane neuron, central nervous system, muscle, cardiovascular system, and control mechanisms; 5520—respiratory, renal, gastrointestinal, and reproductive physiology; acid-base mechanisms, and metabolism. Should be taken in sequence if both courses are taken. Prereq: General undergraduate anatomy and physiology and Biochemistry 4110 or equivalent of consent of instructor. Biochemistry 4120 also recommended. (Same as Animal Science 5510-20.) 4 hrs and 1 lab. W; Sp.

5570 Animal Populations (3) Characteristics and methods of study of animal populations.


5730 Population Biology (4) Ecology and genetics of natural populations of plants and animals. Prereq: Biology 3110 and 3130. (Same as Botany 5730.)
5740 Physiological Ecology of Animals (2) Adaptive physiological responses of animals to natural changes in or extremes of physical and biotic environment. Emphasis on terrestrial vertebrates. Term paper including review of assigned topic with emphasis on creative development of special aspect. 1 2-hr lec. Su

5750 Physiological Ethology (3) Behavioral endocrinology and neurology from ethological perspective; reciprocal relationships of physiology and behavior in natural context. Prereq: Consent of instructor, or Psychology/Zoology 4720, or undergraduate course in physiology. W

5760 General Vertebrate Neuroanatomy (3) (Same as Psychology 5760.)

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.

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

6110 Advanced Topics in Cell and Molecular Biology (1-3) Readings and discussions of recent advances in cell biology. Prereq: Biology 3120 and consent of instructor. May be repeated with consent of department. Maximum 12 hrs.

6210 Seminar in Physiology (2) Two physiology courses or consent of instructor. May be repeated. Maximum 6 hrs.

6310 Seminar in Cytology (2) May be repeated. Maximum 6 hrs.

6350 Seminar in Developmental Biology (2) Internal regulation in differentiating cells. Prereq: 3050, 4050, Biochemistry 4110-20. W

6510 Seminar in Genetics (2) Prereq: General genetics. May be repeated. Maximum 6 hrs. F

6550 Seminar in Aquatic Biology (2) Prereq: Any 2 of 4200, 4660, Botany 5061, or consent of instructor. May be repeated. Maximum 6 hrs. F, W, Sp

6710 Seminar in Ecology (2) Prereq: Consent of instructor. May be repeated. Maximum 6 hrs. W
Robert L. Summit, Dean
Reid I. Collmann, Associate Dean

The major campus of the College of Medicine is located in Memphis, Tennessee. The College, however, is a statewide organization with other units in Chattanooga, Jackson, and Knoxville.

In addition to the Department of Medical Biology listed here, the Knoxville Unit has several clinical departments with faculty dedicated to graduate and postgraduate medical education.

The College of Medicine traces its origin to the establishment of the medical Department of the University of Nashville in 1851. Later, through a merger of four medical schools, it became The University of Tennessee College of Medicine and moved to Memphis in 1911.

Medical Biology/Memorial Research Center

Professors:
- C. B. Looizzo, (Acting Chairman) M.D. Buenos Aires (Argentina); W. Farkas, Ph.D. Duke; J. E. Fuhr, Ph.D. St. John’s (New York); C. C. Congdon (Emeritus)
- J. P. McDonald, Ph.D. Pennsylvania State; J. C. Parker, Jr., M.D. Medical College (Virginia); P. W. Wiggler, Ph.D. California (Berkeley); C. J. Wust, Ph.D. Indiana (Bloomington).

Associate Professors:
- R. Carroll, Ph.D. Cornell; W. T. Hanna, M.D. Ainshams (Egypt); A. T. Ichiki, Ph.D. California (Los Angeles); E. C. Schroeder, D.V.M. Michigan State.

Assistant Professor:

The Department of Medical Biology of The University of Tennessee College of Medicine-Knoxville Unit was formed from the faculty of The University of Tennessee Memorial Research Center and Hospital in 1978. The Research Center was established in 1956. Its faculty has research, education, and service interests in cancer, blood dis-

eas, metabolism, neuroscience, birth defects, cytogenetics and clinical genetics. Courses in these areas are offered to students at the graduate and undergraduate levels. Elective courses are also available to students in the College of Medicine.

The faculty with the College of Veterinary Medicine participates in the graduate program leading to M.S. and Ph.D. degrees in Comparative and Experimental Medicine. Other advanced degree students can do thesis research in the department by arrangement with other life science departments at the University.

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

5080 Graduate Research Participation (3) Advanced research techniques studied while conducting individual biomedical research projects under supervision of faculty. Prereq: Consent of instructor. Open to all graduate students. May be repeated with consent. Maximum 9 hrs. S/NC only. E

5210 Principles of Oncology (3) Lectures, classroom discussion, and case reports surveying the major topics in the study of cancer. Prereq: Upper division Biology background preferably to include immunology. May be repeated. Maximum 9 hrs. F, W, Sp

5220 Special Topics in Cancer (1-3) Special topics in oncology. Prereq: 4210 and consent of instructor. May be repeated. Maximum 9 hrs. F, W, Sp

5310 Principles of Hematology (4) Lectures, classroom discussion, and case reports surveying the major topics in clinical hematology. Prereq: 4310 and consent of instructor. May be repeated. Maximum 9 hrs. F, W, Sp

5320 Special Topics in Hematology (1-3) Special topics in clinical hematology. Prereq: 4310 and consent of instructor. May be repeated. Maximum 9 hrs. F, W, Sp


5410 Molecular Basis for Metabolic Disease (5) Metabolic disorders of humans and animals. Emphasis on molecular mechanisms in inborn errors of metabolism, toxic reactions, and deficiency states. Clinical and pathologic correlations. Prereq: Biochemistry 4110-20 or equivalent. W, A

5420 Special Topics in Metabolic Disease (1-3) Bio-

5430 Metabolism of Drugs (2) Drug mechanisms of action: membrane transport, enzyme reactions, drug receptors, ionization, stereochemistry and metabolic pathways. For students interested in biochemical pharmacology. Prereq: Biochemistry 4110-20. Sp

5450 Clinical Genetics (3) Human genetic disorders: lectures, case presentations and new developments in diagnoses and research. Prereq: General Biology and general Genetics background or consent of instructor.

5510 Special Topics in Neuropathology (1-3) Special topics in neuropathology. Prereq: Pathobiology 5010 or equivalent or consent of instructor. May be repeated. Maximum 9 hrs.

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

6110 Advanced Topics in Medical Biology (2) New developments in biologic research applicable to clinical medicine. Primarily for doctoral candidates in Comparative and Experimental Medicine. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs. F, W, Sp

College of Nursing

Sylvia E. Hart, Dean
Barbara M. Reid, Associate Dean for Student Affairs
Dorothy B. Stephens, Assistant Dean for Clinical and Business Affairs

MAJOR
Nursing

DEGREE
M.S.N.

Professors:
S. E. Hart (Dean), Ph.D. New York;
D. H. Goodfellow, Ph.D. Peabody; M. E. Groer, Ph.D. Illinois; J. N. Mozingo, Ph.D. Walden.

Associate Professors:
P. G. Droppeeman, Ph.D. Tennessee; J. Greene, Ph.D. Vanderbilt; B. M. Reid, Ph.D. Texas.

Assistant Professors:
K. P. Conlon, M.S.N. New York (Buffalo);
M. Donnelien, M.S.N. New York (Buffalo);
M. M. Fenske, M.N. Florida; L. L. Harrison, Ph.D. Tennessee; S. M. Thomas, Ph.D. Tennessee;

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 or educators 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.

ADMISSION REQUIREMENTS
1. Meet requirements for admission to The Graduate School.
2. Hold a Bachelor's degree in Nursing. If the Bachelor's degree is not in Nursing, the applicant must successfully complete the equivalent of an upper division major in nursing as part of the M.S.N. program.
3. If the number of qualified applicants exceeds the number that can be accommodated, preference will be given to applicants:
   a. whose undergraduate GPA is a 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
In addition to The Graduate School Requirements for Advanced Degrees on p. 19:
1. Students must complete 60 quarter hours of graduate level coursework with a cumulative GPA of 3.0 or higher.
2. The 60 credit hours must include the following components:
   Core requirements
   23 hrs
   Clinical concentration
   20 hrs
   Role preparation option
   11 hrs
   Electives
   6 hrs
   Total
   60 hrs
3. A Master's thesis is not required, but those students who wish to complete a thesis as a part of their program may substitute the thesis for the 6 elective hours.
4. All students must successfully complete a comprehensive final examination, written (or written and oral) for the non-thesis option and oral (or oral and written) for the thesis option.
5. Students may choose either primary care, secondary/tertiary care nursing or parent-child nursing as their clinical concentration option. Students selecting the primary care nursing option must complete 5450, 5460, 5550. Students selecting the secondary/tertiary care nursing option must complete 5120-30 and 5310. Students selecting the parent-child nursing option must complete 5220, 5255, and either 5230 or 5245. A special track in the M.S.N. program designed to prepare associate degree nursing faculty will be discontinued in 1987.
6. The core requirement that must be completed by all students regardless of clinical option includes the following courses: 5010, 5020, 5030, 5070, 5210, 5680 and a graduate level statistics course that must be approved in advance by the student's faculty advisor.
7. Students may select a role preparation option in teaching, management, or advanced clinical practice. Students selecting the teaching option must complete 6 hours of graduate level courses in education and 5930. Students selecting the management option must complete 6 hours of graduate level management courses and 5730. Students selecting the advanced clinical practice option must complete 5560 and 5680 if their clinical option is primary care, 5320 and 5340 if their clinical option is secondary care, 5520 and 5540 if their clinical option is community mental health, or 5265 and 5270 if their clinical option is parent-child nursing. Except for electives, all courses taken in other colleges must be approved in advance by the student's faculty advisor.
8. Students whose baccalaureate degrees are not in nursing must complete the equivalent of a baccalaureate nursing major by taking or challenging a series of undergraduate nursing courses as determined by each student's major advisor.
9. If a student’s clinical laboratory performance for any undergraduate or graduate nursing course is determined unsatisfactory, the grade for that course will be an ‘F’ regardless of any grades related to the theoretical component of the course.

10. If a student’s clinical laboratory performance for any undergraduate or graduate nursing course is characterized by unethical or unprofessional behavior, the student will be required to withdraw from the program.

11. A student will be required to withdraw from the program if a grade of ‘D’ or ‘F’ is received for any required undergraduate or graduate nursing course.

**REQUIREMENTS FOR SECOND MASTER’S DEGREE**

1. Students must complete 60 hours at the graduate level (with a cumulative GPA of 3.0) unless they already have Master’s or doctoral degrees. For the latter up to 15 hours may be applied to the second Master’s degree, with approval of the student’s committee, Dean of the College, and Vice Provost and Dean of the Graduate School.

Any hour so applied would be from courses in the first degree program that are directly relevant to the second. Hours from the first program to be applied to the second shall have been earned within the time limits (six years) established for the second.

Reduction of hour requirements, when appropriate, will not be used to reduce the residency requirements of the second Master’s degree.

2. The 45 to 60 hours must include the following components:

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<tr>
<th>Core requirement</th>
<th>Crs</th>
<th>Hrs</th>
<th>Notes</th>
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<tr>
<td>Total</td>
<td>Core</td>
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<tr>
<td>Clinical concentration option</td>
<td>20-30 hrs</td>
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<td>Role Preparation option</td>
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<td>Electives</td>
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<td>Total</td>
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4330 Nursing in the Specialties (2-4) Application of principles from behavioral, physical, social and nursing sciences to solution of nursing problems. Exploration of role, applications, and nursing intervention employed in all phases of nursing practice. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs. E

5210 Secondary/Tertiary Nursing of Adults (6) Role of the clinical nurse specialist in assisting individuals and families to optimal health; application of advanced nursing, physiological, developmental and psychosocial theories to delivery of health and nursing care to adults and their families who are experiencing acute illness, episodic and related crises. Prereq: 5010, 5030, 5070. 3 hrs and 3 labs. W

5215 Nursing in Secondary Care Settings (4) Application of physiological, psychosocial, developmental, and nursing theories and concepts to care of hospitalized adults; utilization of assessment criteria to social theories to diagnosis, orders, intervention and evaluation of outcomes. For MSN students in ADN teaching track only. Prereq: 5010, 5030, 5070 and physical assessment course. Coreq: 5015. 1 hr and 3 labs. E

5210 Advanced Parent Child Nursing Research (4) Utilization of research process to identify and investigate common clinical nursing situations. Prereq: 4440 or equivalent, graduate level statistics course. W

5220 Parent-Child Nursing (6) Care of childbearing and child-rearing families; health promotion and recognition of threats to health of mothers and children; child-bearing or child-rearing in acute care or community settings. Prereq: 5010, 5030, 5070. 4 hrs and 2 labs W

5225 Advanced Parent Child Nursing (6) Continuation of 5220. Role of clinical specialist in working with childbearing or child-rearing families, application of advanced physiological, psychosocial, and nursing theories to care of childbearing or child-rearing clients and families. Prereq: 5220. Coreq: 5210. 4 hrs and 2 labs. E

5252 Nursing Care of Mothers and Children (4) Application of principles from behavioral, physiological, developmental, and nursing theories and concepts to nursing care of pediatric or maternity clients and families. For MSN students in ADN teaching track only. Prereq: 5010, 5030, 5070 and physical assessment course. Coreq: 5015. 1 hr and 3 labs. E

5255 Parent-Child Nursing Field Work I (8) Advanced clinical practical experience with patients in any and complex clinical situations. Prereq: 5220 or 5245. Coreq: 5680. Su


5270 Parent-Child Nursing Seminar (2) Issues and problems in delivering high quality parent-child nursery care; theories and concepts from 5680 as they affect role of parent-child clinical specialist. Prereq: 5680 Coreq: 5265. F

5310 Secondary/Tertiary Nursing Seminar (2) Identification of issues and problems involved in delivery of secondary/tertiary nursing care; further analysis and exploration of theories and concepts included in 5680 as they affect role of nurse as second-tertiary clinical specialist. Coreq: 5320. Prereq: 5680. F

5410 Principles of Community Mental Health (3) Exploration of historical and legislative mandates that impact community mental health; discussion of nursing and other mental health care provider roles within current mental health care delivery systems. W

5450 Family Centered Primary Care Nursing I (6) Primary, acute and chronic care of individuals and families in child bearing and child rearing stages of development; application of nursing process with emphasis on selected nursing, physiological and psychosocial theories. Prereq: 5010, 5030, 5070. 4 hrs and 2 labs. W

5450 Family Centered Primary Care Nursing II (6) Primary care nursing and health care management of individuals and families in middle and later life stages of development; application of the nursing process to management of selected episodic and chronic health problems. Prereq: 5020, 5450. Prereq or coreq: 5210. 4 hrs and 2 labs. W

5490 Community Mental Health Nursing: Individual (3) Application of nursing process within systems framework, to therapeutic intervention with individuals experiencing mental health problems; study of psychopharmacological issues; analysis of special clinical problems. Prereq: 5010, 5030, 5070. 2 hrs and 1 lab. W

5485 Psychosocial Nursing Assessment and Intervention (4) Application of psychosocial concepts and theories to care of hospitalized clients experiencing mental health problems and nursing intervention. For MSN students in ADN teaching track only. Prereq: 5010, 5030, 5070 and physical assessment course. Coreq: 5015. 1 hr and 3 labs. Su

5490 Community Mental Health Nursing: Family (3) Application of nursing process, utilizing communication and systems theories in therapeutic work with families experiencing mental health problems; current models of parent education. Prereq: 5020, 5480. Prereq or coreq: 5210. 2 hrs and 1 lab. Sp

5500 Community Mental Health Nursing: Group (3) Study of group leadership and group dynamic theory; utilization of leadership strategies in both structured and unstructured group processes. Prereq: 5480. 2 hrs and 1 lab. Sp

5510 Community Mental Health Nursing Field Work (6) Clinical and practical in a community setting providing opportunities to apply mental health nursing knowledge in planned interactions with individuals and groups at primary, secondary and tertiary care levels. Community and mental health systems assessment. Su

5520 Community Mental Health Nursing Field Work II (9) 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. F

5540 Community Mental Health Seminar (2)
Identification of issues and problems involved in delivery of community mental health nursing care; further analysis and exploration of theories and concepts included in 5680 as they affect the role of nurse as community mental health clinical specialist. Prereq: 5680. Coreq: 5520. F

5550 Primary Care Nursing Field Work 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: 5460. Coreq: 5680. Su

5560 Primary Care Nursing Field Work II (9) Continuation of 5550 with further emphasis on acquisition of nurse practitioner skills coupled with ability to function more autonomously. Prereq: 5550. F

5630 Teaching Strategies and Practicum (6) Analysis and application of curricular and teaching modalities; field placement with supervised opportunities to provide both classroom and clinical instruction to undergraduate nursing students. Prereq: 6 hrs approved education courses and 5310, 5510, 5550, or 5255. 2 hrs and 3 labs. F

5632 Directed Study in Technical Nursing Education (5) Philosophy, history, and contemporary issues in technical nursing and nursing education; teaching strategies for adult learner in community college; in-depth investigation of selected topics. Prereq: 9 hrs approved education courses and 5630. Su

5660 Primary Care Nursing Seminar (2) Issues and problems involved in delivery of primary nursing care: further analysis and exploration of theories and concepts included in 5680 as they affect role of nurse as primary care provider. Prereq: 5680. Coreq: 5560. F

5680 Advanced Nursing Seminar (3) Theories of leadership, motivation, power, conflict, authority, change and decision making and their application to advanced clinical nursing practice; examination and analysis of role of nurse as health care provider and client—family advocate. Prereq or coreq: 5310 or 5550 or 5510. Su

5730 Management Strategies and Practicum (5) Analysis and application of managerial and supervisory theories and strategies; field placement in nursing service facility with supervised practice in nursing service administration. Prereq: 6 hrs approved management courses and 5310, 5510, 5550, or 5255. 2 hrs and 3 labs.

5770 Special Topics (1-3) 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. E

5900 Graduate Seminar in Public Health (1-2) (Same as Public Health 5900, Nutrition and Food Science 5910, Physical Education 5900, and Social Work 5900.) S/NC only. E
School of Architecture

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

Professors:

Associate Professors:
M. D. Herz, B.Arch. Columbia; S. A. Kinzy, M.Arch. Illinois; W. E. Martella, B.Arch. California (Berkeley); M. S. Moffett, Ph.D. Massachusetts Institute Of Technology; V. Narancic, B.Arch. Belgrade; J. S. Rabun, M.A. Texas; M. A. Robinson, M.Arch. Pennsylvania.

Assistant Professors:

4101 Community Form (3) Patterns of community development. Selected historical and contemporary examples. Basic urban design issues and exemplary design approaches through lectures, readings, essays, and sketch studies. F

4430 Architecture and Preservation (6) Rehabilitation, restoration, and adaptive uses of existing buildings. F


4807 Tennessee Architecture (3) History of settlement patterns and building in Tennessee. F

4811 Special Topics in History, Theory and Criticism (1-4) Special topics in history-related subjects. May be repeated. Maximum 6 hrs.

4815 Criticism Seminar (3) Theories, function, and techniques of architectural criticism. Sp

4830 Introduction to Preservation (3) History and theory of architectural preservation and restoration. F

4831 Preservation Technology (3) Techniques of preservation: dating, methods of analysis, history of materials and technology used in old buildings. W

4832 Descriptive Analysis of Historic Buildings (3) Identification and analysis of characteristic elements of buildings from various architectural periods with emphasis on American architecture. Survey techniques. Sp

4833 Preservation Law (3) Legal aspects of contemporary preservation activity. F

4850 Elementary Structural Matrix Methods (4) Introduction to generalized matrix methods of analysis of structures. Development of member stiffness and flexibility matrices; assembly of structure stiffness and flexibility matrices. Prereq: Consent of instructor. (Same as Civil Engineering 4850 and Engineering Science and Mechanics 4850.) Su

4870 Architectural Photography (3) Photography as a design, research and presentation medium. Emphasis on architectural photography using black and white media. F, W, Sp

4871 Advanced Architectural Photography (3) Application of special photographic techniques with emphasis on color printing and processing. Prereq: Consent of instructor. F, W, Sp

4887 Structural Design for Protection Against Extreme Hazards (3) Probability, risk, human values, insurance. Survey of 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, fire phenomena, life safety and analysis, high-rise building fires. F


4900 Proxemics (4) (Same as Interior Design 4900.) Interior Design is the primary department.

4950 Environment as Code (4) (Same as Interior Design 4950.) Interior Design is the primary department.
**Graduate School of Biomedical Sciences**

**W.E. Barnett, Director**

**MAJOR**

**DEGREES**

Biomedical Sciences

M.S., Ph.D.

Professors:

D. Dilen, Ph.D. Tennessee; D. E. Olin, Ph.D. Rockefeller.

Assistant Professor:

C. Soumoff, Ph.D. California (Los Angeles).

Research Professor:


Research Associate Professor:

E. C. Uberbacher, Ph.D. Pennsylvania

Shared Faculty:

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

A. L. Stevens, Ph.D. Western Reserve; Ph.D. Utah; R. A. Popp, Ph.D. Michigan; Ph.D. California Institute of Technology; J. L. Epler, Ph.D. Florida State; R. J. M. Fry, M.D. New York.

W. E. Barnett (Director), Ph.D. Florida State;

H. L. Adler, Ph.D. Cornell; D. P. Allison, M.S. Tennessee; G. Bunick, Ph.D. Pennsylvania; W. L. Carrier, M.S. Tennessee; J. S. Cook, Ph.D. Princeton; J. N. Dumont, Ph.D. Massachusetts;

J. L. Eppler, Ph.D. Florida State; R. J. M. Fry, M.D. Dublin (Ireland); R. K. Fujimura, Ph.D. Wisconsin; C. W. Geaths, Ph.D. Oklahoma; W. M. Generoso, Ph.D. Missouri; D. G. Gosslee, Ph.D. North Carolina State; R. A. Griesemer, D.V.M. Ohio State; F. C. Harrman, Ph.D. Tennessee Medical Units; A. W. Haise, Ph.D. Indiana; K. B. Jacobson, Ph.D. Johns Hopkins; S. Kennel, Ph.D. California (San Diego); F. T. Kenney, Ph.D. Johns Hopkins; P. A. Lasley, Ph.D. New York (Buffalo);

F. W. Larkin, Ph.D. Florida State; H. A. Levy, Ph.D. California Institute of Technology;

A. C. Marchok, Ph.D. Connecticut; P. Mazur, Ph.D. Harvard; T. J. Mitchell, Ph.D. Wisconsin; S. Mitra, Ph.D. Wisconsin; S. K. Niyogi, Ph.D. Northwestern;

B. C. Pat, Ph.D. Calcutta (India); E. H. Perkins, Ph.D. Utah; R. A. Popp, Ph.D. Michigan;

R. J. Preston, Ph.D. Reading (England);

J. D. Regan, Ph.D. Hawaii; C. R. Richmond, Ph.D. New Mexico; L. B. Russell, Ph.D. Chicago;

G. A. Segal, Ph.D. Louisiana State; P. B. Selby, Ph.D. Tennessee; J. K. Selkirk, Ph.D. Syracuse;

N. H. Shugart, Ph.D. Tennessee; "F." L. Snyder, Ph.D. North Dakota; A. Solomon, M.D. Duke;

A. L. Stevens, Ph.D. Western Reserve;

P. A. Swenson, Ph.D. Stanford; R. L. Tyndall, Ph.D. Pennsylvania State; R. L. Ulrich, Ph.D. Rochester; V. R. Gopaul, Ph.D. Indiana;

L. C. Winters, Ph.D. Georgia; C. H. Wei, Ph.D. Wisconsin; W. D. Witschi, M.D. Berne (Switzerland); W. K. Yang, M.D. Taiwan, Ph.D. Tulane.

*Staff of Oak Ridge Associated Universities

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

**ADMISSION REQUIREMENTS**

A Bachelor's degree or its equivalent is required. Students with M.S., D.V.M., or M.D. degrees are also encouraged to apply. Completed applications, Graduate Record Examination scores and letters of reference should be sent to the address below. The student will need previous training in biology, calculus, physics, and organic and physical chemistry. A course in physical chemistry is offered by the School in order to meet the last requirement. It is recommended that deficiencies in meeting entrance requirements be eliminated prior to entrance.

Requests for application forms, information on admission, financial support, and housing should be sent to:

Director, University of Tennessee-Oak Ridge Graduate School of Biomedical Sciences, Biology Division, ORNL, Box Y, Oak Ridge, Tennessee 37831.

**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 (5150); Molecular Genetics (5170); Cell Biology (5180-90); Mammalian Physiology (5200); and Statistics for Biologists (5740).

2. Three quarters of Biomedical Sciences Laboratory (5310-20-30-40).

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

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

5. Passing both written and oral comprehensive examinations.

6. A dissertation reporting the results of original and significant scientific research. A minimum of 36 quarter hours of course 8000 is required.

7. A final oral examination on the dissertation.

8. A formal seminar presentation of the dissertation research.

**SPECIAL MASTER OF SCIENCE DEGREE PROGRAM**

The graduate faculty has designed a Master of Science program in Biomedical Sciences.
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 (5150); Molecular Genetics (5170); and Mammalian Physiology (5200). Additional credits may be obtained (20 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 30 quarter hours for thesis (maximum 15 quarter hours for credit courses including a minimum of 20 graduate courses including a minimum of 10 graduate courses including a minimum of 6 graduate courses and a minimum of 3 graduate courses). The student will need previous training in biology, calculus, physics, organic and physical chemistry.

3. For admission to candidacy: Completion of any required prerequisite courses and one quarter of graduate 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. Passing a final oral (or oral and written) examination as determined by the student's committee.

The courses below are not necessarily taken every year.

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

5070-80 Physical Chemistry (3, 3) Thermodynamics, phase equilibria; chemical equilibria, electromotive force, surface chemistry, electrolyte solutions, kinetics, conductance, viscosity, diffusion.


5140 Biophysics (3) Energy levels and excited stages of large molecules; optical instrumentation; adaptations to system perturbations; properties of macromolecules in solutions; molecular conformations; inter- and intramolecular forces; physical principles of microscopy. Coreq: 5070-80.

5150 General Genetics (3) Mendelian genetics, mitosis, and meiosis. Transmission genetics, mapping, and linkage.

5160 Advanced Genetics (3) Genetics of phage, bacteria, and eucaryotes. Mapping, linkage, mutation, cytoplasmic inheritance, mechanisms of recombination, chromosomal structure and replication. Prereq: 5150 or equivalent.

5170 Molecular Genetics (3) Molecular biology of genetic processes. Gene regulation; coding, protein synthesis; suppression of nonsense and nonsense mutations; mutagen mechanisms; complementation; recombination. Prereq: 5110-20, 5160.

5180 Cell Biology I (3) Structure and composition of major nuclear and cytoplasmic organelles of eukaryotic cells. Pertinent instruments and techniques; meiosis and mitosis; cell cycle; chromosome structure; nuclear RNA metabolism; nucleolus and ribosome biogenesis; survey of specialized cells. Structure of genetic transcription and translation in bacteria. Coreq: 5110.

5190 Cell Biology II (3) Comparative biochemical approach to cell structure and function. Membrane systems and metabolism; development and function of mitochondria, chloroplasts, peroxisomes and other organelles as related to metabolism and regulation; transport phenomena; cell cycle. Prereq: 5110, 5180. Coreq: 5120.

5200 Mammalian Physiology (4) Mammalian organ systems and their functions. Nervous, muscular, endocrine, digestive, respiratory, circulatory, reproductive, and excretory systems. Interrelationships of these systems and fundamental importance of interactions in contemporary biological research. Prereq: 5190.

5310-20-30-40 Biomedical Sciences Laboratory (3, 3, 3, 3) To study with both approaches and technologies in various areas of modern biology. Students spend a quarter in each of three or four laboratories conducting research in different areas of biomedical science. Required of all first-year students.

5430-60-90 Graduate Research Participation (3, 6, 9) Special advanced research project covering area not related to dissertation research. Topics chosen with consent of instructor. May be repeated.

5510-20-30-40 Special Topics in Biomedical Sciences (3, 3, 3, 3) Tutorials or formal lectures. Potential topics include x-ray diffraction and crystallography; experimental biophysics; physical chemistry of macromolecules, computer science, pathology, medical genetics, mammalian genetics, human genetics. Prereq: 5190-90 or consent of instructor.

5740 Statistics for Biologists (3) Application and interpretation of statistical methods in data analysis. Random variables, probability distributions, expected values, the normal distribution, tests of significance, confidence intervals, correlation and regression. Prereq: Introductory statistics or consent of instructor.

5800 Doctoral Research and Dissertation (3-15) P/ NP only. E


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. Enzyme expression, and nervous tissue. Lipid biochemistry of mammary, comparative aspects, particularly lipid pathways in bacteria and yeast. Prereq: 5110-20.

6251 Molecular Biology of RNA (3) RNA synthesis and metabolism in prokaryotes, eukaryotes, and their viruses. Prereq: 5110-20 or consent of instructor.

6252 Molecular Biology of DNA (3) DNA replication, repair, and recombination. Recent advances in mechanisms at molecular level using biochemical and genetic techniques. Prereq: 5110-20 or consent of instructor.

6270 Viral Carcinogenesis (3) History of viral oncolyse and descriptive catalog of tumor viruses. Biology of normal and transformed cells. DNA virus tumors; replication cycle: transformation; genetics, natural history. RNA virus tumors; endogenous and exogenous states; genetics; induction; transformation; natural history.

6280 Cancer Biology and Biochemistry (3) Pathology and nomenclature of cancer. Tumor immunology and immunotherapy. Biochemistry of tumor cells; enzymology, metabolism, membranes; DNA repair; regulation; strategies in chemotherapy.

6400 Membrane Biology (3) Transport kinetics, membrane biogenesis and turnover, endocytosis and exocytosis, receptor regulation, hormone-membrane biogenesis interactions. Prereq: 5110-20 and 5180-90 or consent of instructor.

6510 Techniques in Cell Biology (3) Application to specific research problems. Kind of data they yield, and cautions in data interpretation. Laboratory demonstrations may be arranged where appropriate. Prereq: 5180-90 or consent of instructor.

6540 Immunology (3) Structured lectures in modern immunology and emphasis on concepts and mechanisms at the cellular level. Topics: T-B cell interaction, soluble mediators, tolerance, surveillance, transportation mechanisms, immunoglobulin structure. Selected laboratory exercises. Prereq: 5180-90 or consent of instructor.

6600 Mammalian Genetics (3) Orderly presentation of known genetics variants affecting each organ system of experimental mammals, especially laboratory mouse. Prereq: 5150.

6610 Mammalian Biochemical Genetics (3) Combined biochemical and genetic approaches to problems of immunology, glgon synthesis, and control of enzyme synthesis. Prereq: 5110-20 and 5160 or consent of instructor.

6650 Microbial Genetics (3) Basic phenomena in microbial genetics: transduction, transformation, conjugation, and mutation. Genetics of bacteriophage. Prereq: 5160 or consent of instructor.

6750 Regulation of Intermediary Metabolism (3) Pathways involved in intermediary metabolism. Steady-state processes, "nonequilibrium" reactions, first enzymes, feedback inhibition, isozymes, multienzyme systems and compartmentation, covalent modification, positive and negative control, catalobility, repression, autoregulation, stringent control, attenuation, hormonal control, other selected topics. Prereq: 5110-20 or consent of instructor.
Ann E. Prentice, Director

MAJOR
Library Science

DEGREE
M.S.L.S.

Professors:

Associate Professors:

Assistant Professors:
M. H. Karnenzrock, Ed.D. Georgia; M. S. Stephenson, Ph.D. North Texas.

The Graduate School of Library and Information Science provides a program leading to the preparation of librarians and information scientists for work in all types of libraries and information centers. The program of study includes a graduate curriculum leading to the degree of Master of Science in Library Science.

Through a graduate level general purpose program with emphasis on the effective management of information resources in multiple settings, students learn to:
1. Examine critically the role and function of libraries and other information agencies in society, and to define and redefine that role as the needs of society demand;
2. Understand and use the concepts and procedures related to the selection, acquisition, organization, and dissemination of information;
3. Understand and apply the principles of management to the library and other information agencies;
4. Assume individual and collective responsibility for the well-being and development of their profession and of professional service.

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 general 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. 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.

Masters of Science in Library Science

The program leading to the degree of Master of Science in Library Science involves a total of 51 quarter hours of graduate courses, 18 hours of which form a core curriculum required of all students. Either a thesis or a non-thesis option is available, with 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.

FINANCIAL ASSISTANCE OPPORTUNITIES
Employment with the University of Tennessee Libraries may provide a work-study opportunity for selected students who wish to obtain experience in academic librarianship while pursuing the degree. Such students usually work at least 20 hours each week and thus may extend the period required for the degree. Similar opportunities exist with some other libraries and information agencies in the Knoxville area.

Work opportunities in a scientific-technical environment are available through subcontracts with Oak Ridge National Laboratory and the Department of Energy. A limited number of graduate assistantships are available through the School 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.

The SREB Academic Common Market applies to applicants from Arkansas, Georgia, West Virginia, and Virginia.

Information on financial assistance is available from the Director of the Graduate School of Library and Information Science.

4140 Librarians and Librarianship (3) Librarianship as an occupation; its organization, responsibilities, problems and prospects. F, W, Su

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.) W, Su

4160 School Library Media Program Management (3) Attitudes, knowledge and skills necessary to manage a school library media program at building and district levels. Curricular services and role of school library media program in curriculum development. Application of technology to program implementation. Prereq: 4150 or consent of instructor. Sp

4270 Organization of Library Collections I (3) Acquisitions, cataloging and maintenance of library collections. F, W

4310 History of the Book (3) History of writing and various methods of bookmaking from earliest times through 19th century. W

4320 Adult Materials and Reading Interests (3) Fiction and subject categories, popular and standard; evaluation of materials to meet adult interests; consideration of selection aids.

4330 Introduction to Reference Materials (3) Basic information sources and services for all libraries. F, W, Su

4750 Utilization of Instructional Media (3) (Same as Curriculum and Instruction 4750 and Vocational-Technical Education 4750.) E

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

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

5110-20-30 Problems in Library Science (3, 3, 3) May be repeated with consent of school. E
5140 Research Methods in Library Science (3) Research methods applicable to librarianship. Process and conduct of research; analysis of published research. W, Sp, Su

5210 Sources and Services for the Social Sciences (3) English and non-English language and bibliographical sources in education, economics, political science, history, geography, anthropology, psychology, and sociology; organization of collections for optimum use. Prereq: 4330. W

5220 Sources and Services for the Natural Sciences (3) English and non-English literature and bibliographical sources in mathematics, physics, astronomy, chemistry, geology, biology and medicine; organization of collections for optimum use. Prereq: 4330. Sp

5300 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: 4330. Su

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. F, Sp

5245 Technical Services Management (3) Issues and developments in larger collections: departmental organization and procedure, cooperative programs, national and international bibliographic standards, catalog automation programs. Prereq: 4270, 5240. May be taken concurrently with 5240 with consent of instructor.

5250 Government Publications (1) Acquisition, organization and utilization of United States federal government publications, legislative, executive and judicial branches. Prereq: 4330 or consent of instructor. F

5250 Government Publications II (1) Acquisition, organization and utilization of publications of state and local governments in U.S., publications of foreign governments and intergovernmental organizations: United Nations, UNESCO. Prereq: 4330 or consent of instructor. W

5270 Legal Bibliography (3) Introduction to literature of Anglo-American jurisprudence. Use of reports, statutes, administrative regulations and decision, treaties, periodicals and indexes as bibliographic tools. Sp

5300 Library Management (3) Management and organization concepts applicable to libraries and librarians. F, Sp

5310 Multitype Networks (3) Organization, structure, governance, planning, evaluation and services in state, regional, national, and international networking of information. W, Sp

5330 Academic Libraries (3) Persistent and current problems. Topics vary depending upon needs and interests of group. W

5360 Special Libraries and Information Centers (3) Development and present status, scope and objectives, administration and organizational problems, acquisition, organization, and use of information. W

5370 The Library in the Community (3) Public library as social agency; role in education and communication systems of community. F

5380 Seminar in Library and Information Science (3) Advanced study of varying topics. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.

5400 Library Facilities (3) Problems inherent in planning and construction of library quarters. Interrelationships of staff, materials, and user space requirements. Sp, Su


5610 Nonbook Resources (3) Selection, processing, storage and utilization; films, video technology, sound recordings and microforms as information media. Prereq: 5500 or consent of instructor. F, Sp

5615 Serials (3) Serials collections: selection, acquisition, bibliographic control, process, storage, maintenance, and public service. Prereq: 5500 or consent of instructor. W

5530 Contemporary Publishing (3) Creation, production, marketing, and distribution of materials acquired by libraries, with special attention to various types of publishers. F

5540 Archives and Manuscripts (3) Problems involved in acquisition, organization, description, storage, preservation and utilization. Prereq: Consent of instructor. W

5550 Records Management for Information Professionals (3) Functional elements and objectives of records management within organizations, emphasizing control of creation, distribution, retention, storage, retrieval, protection, and disposition regardless of medium. Prereq: 4330, 4270, or consent of instructor. Sp

5605 Development of Children's Literature (3) Children's literature from earliest times to 20th century. Representative titles of particular periods. W


5625 Resources for Young Adults (3) Critical survey of library materials for young adults with emphasis on personal, vocational and recreational needs and interests. Evaluation, selection, and utilization for school and public libraries. W

5635 Library Services and Programs for Youth (3) Philosophy and objectives of public and school library services for children and young adults. Reading, listening and viewing guidance for individuals and groups. Program planning, implementation and evaluation. Prereq: 5615 or 5625 or consent of instructor. Su

5645 Traditional Literature and Oral Narration (3) Nature of traditional materials and principles of collection; reference sources for folk literature; history and techniques of storytelling; use of traditional materials with all age groups. F

5691 Advanced Production of Audiovisual Software (3) (Same as Curriculum and Instruction 5691.)

5700 Automation of Library Processes (3) Computer concepts and operations; applications to basic library operations: acquisitions, catalogs, circulation and serials. Prereq: 4270, 5500, or consent of instructor. F, W, Su

5710 Introduction to Information Science (3) Content and method of information science; application of research findings to general library practice. F, Su

5715 Information in Society (3) Characteristics of an information society, nature of knowledge and information, use and effect of media. W

5720 Information Systems Analysis and Design (3) Examination and evaluation of tools and methodologies in library/information center systems planning and implementation. Role and training of systems analyst, systems study from planning through implementation and evaluation, and related topics. Prereq: 5700 or consent of instructor. W

5725 Organization of Materials for Information Storage and Retrieval (3) Principles and techniques in organization and description of materials for input to information storage and retrieval systems: indexing, abstracting, document representation,thesaurus construction and maintenance, related topics. Prereq: 5710 or consent of instructor. W

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. Sp

5750 Information Technologies (3) Computer-based and non-computer related media and methods for information storage, retrieval, and transfer within and external to library environment; existing and prototype hardware and software and interfacing of these technologies. Prereq: 5700 or consent of instructor. Sp
Graduate School of Planning

J.A. Spencer, Director

MAJOR DEGREE
Planning M.S.P.


Assistant Professors: P. Fisher, Ph.D., Florida State; A. Loeb, Ph.D., Missouri.

The Graduate School of Planning offers a program of studies leading to the professional degree of Master of Science in Planning. Students take a core curriculum in the theory, techniques and practice of urban and regional planning. Each student also selects a concentration in one of the following areas: land use planning, transportation planning, analytical methods in planning, regional planning and development, real estate development planning, environmental planning, economic development planning, or other faculty approved specialization.

The M.S.P. degree program prepares planners for a diversity of career opportunities in both the public and private sectors. Graduates are candidates for professional positions in regional, city, county, and metropolitan planning agencies; in local, state and federal agencies concerned with physical, economic and administrative planning; in private business and organizations dealing with development problems; and in private consulting practice.

The Graduate School of Planning is accredited by the Planning Accreditation Board, a joint undertaking of the American Institute of Certified Planners and the Association of Collegiate Schools of Planning. All inquiries about the program should be addressed to the Director of the School.

Admission Requirements: All applicants should submit two letters of recommendation with their applications. Reference letters should be from teachers familiar with the applicant’s undergraduate or, where applicable, graduate academic record. If the applicant has had prior planning experience, a letter from a supervisor or other person familiar with the work of the applicant should also be provided. All applicants must submit a statement of career goals. Graduate Record Examination scores are not required, but applicants are encouraged to submit them.

The M.S.P. degree is approved for SREB Academic Common Market participation in Arkansas, Kentucky, South Carolina and West Virginia.

THE MASTER’S PROGRAM

Each student will be required to demonstrate competence in individual research. This may take either of two forms.

Option I—Complete a thesis for 9 hours credit;

Option II—Complete a major study with acceptable documentation. In order to be eligible for the major study option, the student must have completed at least 24 hours of graduate course work and have attained at least a 3.5 cumulative grade point average (at the time of approval of the major study proposal). The student meeting these criteria may present a proposal to his/her committee for a major study which will include at least 9 hours of subsequent elective course work related to the study topic. The proposal shall justify the selection of the topic, problem or issue and the approach to the study.

Each student will be required to complete a minimum of 72 hours credit of which 46 hours must be in courses offered in planning.

The following courses are the required core curriculum for the M.S.P. degree: 5001, 5060, 5100, 5110, 5130, 5140, 5141, 5150 or 5155, 5180, 5280, 5285, 5340, 5400, and 5465.

Each student is required to develop an area of concentration in addition to the core curriculum. After selecting the area of concentration, usually by the end of the second quarter, the student takes a prescribed set of courses in the subject area. Further enhancement of the concentration is gained by taking added elective courses in the subject and by focusing the thesis or major study on the subject. Specialty courses are drawn from the School curriculum and from other departments in the university.

A student may propose an individualized specialty program, consisting of at least 12 hours of coursework, subject to approval of the student’s committee. A work internship is recommended, but not required, during the summer between the first and second year of the program. Students who do not have prior experience in comprehensive plan preparation are advised to enroll in an intensive nine credit hour synthesis project course sequence. It normally requires two academic years to complete the program. Transfer credits from other institutions or programs may be accepted, up to a maximum of 15 quarter hours; subject to approval of the School and The Graduate School.

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 comprehensive plan, implementation devices. Planning issues in society. Not for credit for M.S.P. degree. F

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

5001 Thesis and Major Paper Proposal Writing (1) Preparation of thesis or major paper proposal. F

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

5005 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 (3) Communications in planning operations and in planning process.

5060 Planning Graphics (1) Graphics in planning: presentation techniques, mapping, three dimensional modeling and land form analysis.
5100 Theory of Planning (3) Analysis of nature and objectives of planning process; role of planner and planning function in public decision-making. Prereq: 5110. W

5110 Introduction to Planning (4) History of planning, familiarization with operations of contemporary planning concept of systems, current trends and issues. Relationship between planning and society in which it occurs. Designed for GSP students. F, Su

5130 Planning Research Methods (3) Research techniques in subject areas associated with city and regional planning. Research tools, data collection and analysis as basis for planning and decision-making. F, Su

5140 Urban and Regional Analysis (3) Past, present and possible future patterns of urban and regional structures drawing on contemporary theories, models, and empirical research.

5141 Statistics for Planners (4) Applications of basic descriptive and inferential classical and nonparametric techniques in planning research. Data organization and display; measures of location, dispersion and association; data transformations; some basic probability theory; selected one and two sample tests; correlation and regression analysis. Prereq: 5130 or consent of instructor. W

5145 Library Research for Planning (1) Survey of publications of interest to planners, including resources and research techniques. Use of facilities and collections of UTK library. F

5150 Microcomputer Applications in Planning I (3) Microcomputer in planning and government: hardware and software available for development and implementation of planning related applications; evaluation of microcomputer hardware and software.

5151 Microcomputer Applications in Planning II (3) Intermediate-level study in use of microcomputers tailored to specific interests of students; intensive study of one or two selected aspects of microcomputer applications: programming, graphics, modeling and simulation, or data base management; microcomputer application development using appropriate tools. Prereq: 5150. W

5155 Computer Concepts in Planning I (3) Mainframe computers in data management and analysis; fundamental computer concepts.

5156 Computer Concepts in Planning II (3) Intermediate-level study in computer concepts, tailored to specific interests of students; in-depth study of computer programming, graphics, data base management, or information systems; computer application development. Prereq: 5155.

5160 Planning and Utilities (3) Planning for adequate water supply and sewage waste disposal in the urban environment. Impacts of utility patterns on area development and problems of utility service policies.


5170 Planning for Historic Preservation (3) Planning for preservation, restoration and conservation of historical buildings, areas and sites as related to comprehensive planning process. National, state, and local government planning; designation of sites, legislative needs, financing and administrative organizations.

5175 Environmental Planning (3) Role of planners and planning in maintenance of balance between natural and built environment. (Same as Ecology 5175.)

5180 Planning Analysis and Forecasting (4) Methods of quantitative analysis and modeling in urban and regional studies. Population, employment, and economic base studies with emphasis on forecasting techniques. Prereq: 5130. Sp

5190 Development Planning in the Third World (3) Seminar on urban and regional development in Third World nations. Population growth, settlement patterns, economic base, land-frame work of integrated resource management. (Same as Ecology 5180.)

5230 Urban and Site Design (3-4) Principles of design of residential subdivisions and some components of physical community such as shopping centers, institutional complexes, central business districts. Problems of reviewing alternative designs against each other or written regulations. Extensive laboratory experience. Prereq: 5060. F, Sp, Su

5270 Planning and Transportation (3) (Same as Civil Engineering 5270.) W

5280 Planning Methods (6) Preparation of comprehensive plans. Tooling up studies and preparation of integrated plans for land use, public facilities and transportation.

5285 Planning Methods II (3) (Sequence to 5280.)

5300 State and Regional Planning (3) Theory and practice of planning at state, sub-state, and metropolitan levels.

5315 TVA, Planning and Development (3) Review and evaluation of TVA's record and achievements as the nation's leading experiment in river basin planning and development.

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. W

5345 Impact Assessment (3) Process, principles and methods associated with assessment of impact of projects or programs.

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.

5370 Natural Resource Management and Environmental Assessment in Developing Countries (3) (Same as Ecology 5370 and Botany 5370.)

5380 Housing (3) Nature and demand for housing in U.S. and abroad with emphasis on U.S. experience. Private market processes and public influences. Problems of change in housing supply, impact of new technology, and governmental programs to improve supply and quality of housing. Coreq: 5110 or consent of instructor.

5400 Legal Aspects of Planning (3) Legal basis for planning and guiding community development. Legal tools of planning. Prereq: 5110.

5410-30 Special Topics in Planning (1-3, 1-3, 1-3) Lecture, group discussion, and individual research and study on specialized topics in planning not covered in depth in other courses. May be repeated. Prereq: Consent of instructor. E

5440 Planning and Land Use Controls (3) Development and administration of zoning, subdivision regulations, and related devices. Prereq: 5400.

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.

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. F

5470 Economic Development Planning for Urban Areas I (3) Planning process employed in changing economic base policies and regions, including institutional and organizational problems.

5475 Economic Development Planning for Urban Areas II (3) Application of principles learned in 5470 to specific case studies. Prereq: 5470.

5500 Synthesis (9) Problem-oriented experience to integrate knowledge from previous courses. Interrelationships stressed; student required to use judgment in evaluation and creation of plans and policies addressed to real world situations. Extensive laboratory experience. Prereq: Required planning courses or consent of faculty. F, W

5670 Social Planning (2-3) Theory, philosophy and implications of programs for planned social change. Consideration of major social planning issues in diverse fields of service: aging, corrections, education, health, social services. Prereq: Consent of instructor. (Same as Social Work 5670.) F

Graduate School of Social Work

*Effective January 1986, the Graduate School of Social Work became the College of Social Work. Academic program offerings include the Baccalaureate in Social Work, the Master of Science in Social Work, and the Ph.D. with a major in Social Work.

Ben P. Granger, Dean
Lou M. Beasley, Associate Dean, Nashville
Roger M. Noce, Associate Dean, Knoxville
Nellie P. Tate, Associate Dean, Memphis
Paul M. Campbell, Acting Director, Office of Continuing Social Work Education

MAJOR

Social Work M.S.S.W., Ph.D.

Professors:
B. P. Granger (Dean), Ph.D. Brandeis
L. M. Beasley, Ph.D., Denver; M. H. Bloch, M.S.
Ohio; State; R. C. Bonovich, D.S.W. Washington
State; G. W. Fryer, Ed.D. Columbia
H. Hayyam, D.S.W., Pennsylvania; D. McLarnan
Emeritus), M.S.S.W. Tennessee; M. K. Mullins,
Ph.D. Chicago; R. M. Noce, D.S.W. Tulane;
B. Orchard (Emeritus), M.S. Western Reserve;
H. Rubenstein, Ph.D. Chicago; S. W. Spencer
Emeritus), M.S. New York School of Social Work.

Associate Professors:
W. J. Bell, D.S.W. Tulane; M. Cetingok, Ph.D.
Washington; C. T. Cruthirds, D.S.W. Tulane;
C. Faver, Ph.D. Michigan; M. G. Feit, Ph.D.
Pittsburgh; A. E. Moses, D.S.W. California
(Berkeley); R. B. Rowen, Ph.D. Arizona; N. P. Tate,
Ph.D. Brandeis; H. H. Vaught; Ed.D. Memphis
State; R. R. Wachtler, M.S.S.W. Tennessee;
C. S. Wilks, Ph.D. St. Louis; M. G. Zebock,
M.S.W. Wisconsin.

Assistant Professors:
P. M. Campbell, D.S.W., Alabama; J. Charpin,
Ph.D. Peabody; S. S. Chippungu; Ph.D. Michigan;
J. C. Collier, M.S.W. Tulane; T. C. Faust, M.S.S.W.
Tennessee; A. R. Ford, M.S.W. Atlanta;
V. A. Gates, M.S.S.W. Tennessee; J. Jennings,
Ph.D. Michigan; D. C. Johnston, M.S.W. California
(Berkeley); C. Lowni, M.S.S.W. Tennessee;
N. Lunn, M.S.S.W. Tennessee; F. Stoddard, Ph.D.
Case Western Reserve; M. P. Strong, M.S.W.
Tulane.

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 and a program leading to the Doctor of Philosophy. The Master's curriculum is offered in all three branch locations.

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 dual program in Social Work and Divinity is offered by the UTK School of Social Work, Nashville Branch and the Divinity School of Vanderbilt University.

A special bulletin describing the facilities, admission, fees, and degree requirements is available from The School of Social Work, Henson Hall, Knoxville, Tennessee 37996-3333.

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.

Preference is given to applicants with a B average in undergraduate work and substantial preparation in the social sciences. Applications should be filed no later than March 1 for the year in which admission is desired.

ADVANCED STANDING/ACCELERATED PROGRAM

The University of Tennessee School of Social Work has a special advanced standing/accelerated program which enables eligible candidates to complete the M.S.S.W. degree in four quarters. This advanced standing/accelerated program is approved by the Council on Social Work Education.

Students who qualify for the Accelerated Program must:

1. Have achieved a 3.0 or above grade point average (on a 4.0 scale) in undergraduate work.

2. Have completed an undergraduate major in social work from a program accredited by the Council on Social Work Education, or an undergraduate major in a related area which included a supervised field practice component, or have completed at least two years of full-time employment in social work practice.

3. Pass a qualifying examination administered by the School of Social Work faculty in early spring.

The accelerated programs begin in the 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
accredited program is through the regular admission process. Applications should be filed not later than January 31 for the Nashville program.

PART-TIME PROGRAM

Part-time programs are available in all three branches of the School. Admissions requirements are the same as for full-time study. Course work can be completed over a three- or four-year period.

THE PROFESSIONAL FOUNDATION

The professional foundation is a 30-quarter hour sequence of five basic areas required of all students before entering either of the concentration programs. As the initial phase of the school educational program, the foundation 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, administrators, and planners.

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<th>Credit Hours</th>
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<tr>
<td>Fall Quarter, First Year</td>
<td>5070 Social Work Research I</td>
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<tr>
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<td>5110 Social Welfare Policy and Services I</td>
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<td>5210 Human Behavior and Social Environment I</td>
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<td>5410 Social Work Practice I</td>
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<td>5910 Field Practice</td>
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Winter Quarter, First Year

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<tr>
<td>5120 Social Welfare Policy and Services II</td>
<td>3</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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<td>5920 Field Practice</td>
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<tr>
<td>TOTAL QUARTER HOURS</td>
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THE REQUIRED CONCENTRATION

Upon completion of the foundation curriculum (at the beginning of the third quarter), each student selects a concentration in either social work treatment or social welfare administration and planning and devotes the final four quarters of the program to required concentration courses and electives. Students must take 15 hours in their required concentration. Students may take courses in the other required concentration as electives. Although each branch offers a variety of elective courses, not every elective is offered every year at every branch.

<table>
<thead>
<tr>
<th>Credit Hours</th>
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<tbody>
<tr>
<td>Spring Quarter, First Year</td>
<td>5930 Field Practice</td>
</tr>
<tr>
<td></td>
<td>5125 Social Work With Oppressed Populations</td>
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<tr>
<td></td>
<td>Specialization Courses and Electives</td>
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<td>TOTAL QUARTER HOURS</td>
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Fall Quarter, Second Year

<table>
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<tr>
<td>Specialization Courses and Electives</td>
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<tr>
<td>Winter Quarter, Second Year</td>
<td>5940 Field Practice</td>
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<td>TOTAL QUARTER HOURS</td>
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Spring Quarter, Second Year

<table>
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<th>Credit Hours</th>
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<tr>
<td>5950 Field Practice</td>
<td>8</td>
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<tr>
<td>Electives</td>
<td>3 or 6</td>
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<tr>
<td>TOTAL QUARTER HOURS</td>
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AREAS OF SPECIALIZATION

Social Work Treatment: The social work treatment concentration provides the educational basis for practice with individuals, families, and groups in order to enhance their social functioning, ameliorate problems, and prevent social dysfunction. The special-
5161 Social Welfare Seminar (2-3) Problem area or field of practice as defined by students. Emphasis on understanding and becoming aware of social problems and social welfare policy as they relate to social work practice. Prereq: Completion or consent of instructor.


5444 Social Work Practice with the Poor (2-3) Problems, issues, and dilemmas of practice in social services with poor and disadvantaged populations. Prereq: Completion of foundation or consent of instructor.

5460 Social Work Treatment with Individuals and Families (3) Social work practice, literature, social casework as method of social work practice and as form of interpersonal treatment. Prereq: Completion of foundation or consent of instructor.

5470 Contemporary Treatment Modalities: Individual and Family (2-3) Well-established and developing treatment modalities in terms of essential concepts. Differential facets and theory-based linkages. Prereq: Completion of foundation or consent of instructor.

5500 Thesis (1-15) P/NP only. E

5502 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

5570-80 Social Work Research I, II (3, 2) Research methodology as applied to problems in social welfare. Prereq: Written formulation; research design and methodology; data collection, analysis, and presentation; and research reporting. F, W

5581 Evalilative Research in Social Work (2-3) Advanced research course. Topics include sociopolitical analysis, organizational context of evaluative research, research design and methodology appropriate to evaluative research, and utilization of research findings. Prereq: Completion of foundation or consent of instructor. Sp.

5582 Practicum in Social Work Research (3-9) Supervised practice in application of research methods and tools to social welfare program. May be taken for credit by faculty, students, or social welfare agency or organization. Prereq: 5580-80 and consent of faculty member conducting investigation. S/NC only. Sp.

5583 Directed Readings in Research (2-4) May be repeated with approval of instructor. Maximum 4 hrs. F, W, Sp.

5590 Special Problems in Social Work (2-9) Individual or study on problems of special significance to the student. Permission of major professor. May be repeated. F, W, Sp.

5601 Social Welfare Policy and Services I (3) Interests of social work profession in development of contemporary social state, national, and international levels of organization. Contribution social work professionals can make to formal policy-making. Prereq: Completion of foundation or consent of instructor. F

5602 Social Welfare Policy and Services II (3) Examination of theories of complex organizations applied to social welfare service delivery settings. Prereq: Completion or consent of instructor. W

5611 Social Welfare in Rural Communities (2-3) Theories and models of change such as social work intervention at various system levels. Prereq: Completion or consent of instructor. F

5612 Social Work in Rural Communities (2-3) Charismatic approach, and designs of programs providing short-term treatment services. Specific techniques of assessment and treatment applied to psychosis with individuals in crisis. Prereq: Completion of foundation or consent of instructor.

5616 Human Behavior and Social Environment I and II (3, 2) Emphasis on individual, family, small group, and group in context of functions, structures, roles, and processes. Prereq: Completion of Social Welfare I and II. F

5630 Human Behavior and Social Environment (2-3) Deepens and extends student's knowledge of range of adaptation and maladaptation to social behavior. Prereq: Completion of Social Welfare I and II. F

5631 Imaginative Perspectives on the Human Condition (2-3) Examination of usefulness to social work student in understanding, changing, and healing the human spirit through interaction of persons with one another and with society. Prereq: Completion of foundation or consent of instructor.

5632 Psychopathology and Social Deviance (2-3) Theories and recent research in etiology of psychotic, deviant, and social variance. Prereq: Completion of Social Welfare I and II. F

5633 Deviant Behavior of Children and Youth (2-3) Prereq: Completion of Social Welfare I and II. F

5634 Human Sexual Problems (2-3) Desensitization and desensitization of personal and social attitudes toward sexual behavior. Prereq: Completion of Social Welfare I and II. F

5635 Social Work and Black Families (2-3) Historical and contemporary theories regarding Black families, emphasis on family as a system. Framework to assess and plan for Black families within service delivery systems. Prereq: Completion of foundation or consent of instructor.

5636 Social Work Practice I (3) Basic theory, values and beginning skills development generic to social work intervention at various system levels. Prereq: Completion of Social Welfare I and II. F

5640 Family Therapy in Social Work Practice (2-3) Application of practice theory to assist in assessment of skills in treatment of family as unit. Prereq: Completion of foundation or consent of instructor. W

5642 Short-term Treatment (2-3) Theory and practice of short-term treatment focusing on nature of methods, client characteristics, roles and responses to this approach, and designs of programs providing short-term treatment services. Specific techniques of assessment and treatment applied to psychosis with individuals in crisis. Prereq: Completion of foundation or consent of instructor.

5700 Comparative Methods of Group Treatment (2-3) Prereq: Completion of Social Welfare I and II. F


5702 Organizational Design of Social Welfare Agencies (2-3) Prereq: Completion of Social Welfare I and II. F

5703 Social Planning (2-3) Same as Planning 5760 F

5704 Planning and Management of Change in Social Welfare (2-3) Theories and models of change such as planned change, conflict, and evolutionary change in organization to organizations. Prereq: Completion of Social Welfare I and II. F

5705 Social Work Practice II (3) Emphasis on evaluation of professional work. Prereq: Completion of Social Welfare I and II. F

5706 Social Work Practice III (3) Course Listing/Graduate School of Social Work 173
5741 Supervision in Social Work (2-3) Dual roles of supervisor in various settings are distinguished from consultation and from direct practice. Responsibility and accountability to client system, supervisees, and executive, problems of middle management position of supervisor. Differences and similarities in supervision of varying levels of personnel. Goal, tasks, techniques, and processes in relation to individual and group supervision and field instruction. Prereq: Second-year status or consent of instructor. A

5742 Consultation in Social Work (2-3) Constellation of roles, relationships, and behaviors required of consultant. Consultation as distinguished from supervision, administration, and direct practice. Types of consultation in relation to various levels of responsibility. Processes and practices of consultation and dilemmas and pitfalls of consultant's position. Prereq: Second-year status or consent of instructor.

5743 Management of Human Resources in Social Welfare (2-3) Personnel function in administration of human services programs and agencies. Personnel recruitment, selection, appointment, and supervision; staff development; training and evaluation; salary and benefit systems; employer-employee relations; and fair employment practices. Prereq: Completion of foundation or consent of instructor. W

5744 Education and Training in Social Work (2-3) Philosophies and practices of teaching and learning related to adults in social work and social welfare. Distinctions between teaching, training, and education; unique aspects of adult learning; measurement issues; models and styles of education. Prereq: Completion of foundation or consent of instructor. W

5761 Social Welfare Administration and Planning (3) Topics significant to managerial-planner role such as decision making, budgeting, planning, and programming. Prereq: Completion of foundation or consent of instructor. Sp

5762 Seminar in Social Welfare Administration and Planning (3) To assist students in acquiring specific administrative and planning techniques appropriate for social welfare delivery systems. Prereq: Completion of foundation or consent of instructor.

5771 Information Systems and Decision Making (2-3) Decision-making in human services organizations, utilization of information in policy formulation, delivery of services and evaluation of organizational performance. Information generation, collection, processing, storage, retrieval, and utilization in relation to management control, evaluation and forecasting. Prereq: Completion of foundation or consent of instructor. F

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 foundation or consent of instructor. F

5826 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 foundation or consent of instructor. Sp

5826 Social Work Treatment for Marital Adjustment (2-3) Theories regarding social, cultural values and personality processes which gain expression in marriage, concepts regarding contemporary marriage styles, problem areas in marriages, and appropriate treatment approaches. Prereq: Completion of foundation or consent of instructor. Sp

5830 Law and Social Work (2-3) Basic principles of law as it relates 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) Roles and statuses of women; emphasis on contemporary American scene. Empirical research as well as popular literature. Assessed and achieved facets of women's statuses. A

5900 Graduate Seminar in Public Health (1-2) (Same as Public Health 5900, Nursing 5900, Nutrition and Food Science 5910, and Physical Education 5900.) S/NC only.

5910-20 Field Practice (3, 4) Instruction and supervised practice in methods of social work with individuals, groups and communities. Prereq: Admission to the School; 5410 concurrently or prior to 5910; 5420 concurrently or prior to 5920. Must be taken in sequence. Required course. S/NC only. F; W

5930-40-50-60 Field Practice (4, 4-8, 4-8, 4-8) Special instruction and supervised practice methods of social work treatment, administration, and planning in community health and welfare programs and agencies. Prereq: Admission to the School. Must be taken in sequence. S/NC only. Sp; W; Sp

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

6005 Proseminar in Social Work Research (1) May be repeated. Maximum 6 hrs. S/NC only.


6040 Evaluation Research on Social Work Practice, Programs, and Social Policy (3) Techniques and strategies for analysis of social policy and its impact on individuals and population groups; techniques for evaluating processes and outcomes of social work practices.

6045 Directed Study in Social Work Research (2-3) Advanced individual study, under faculty guidance, of social work practice issues. Prereq: Completion of Ph.D. foundation courses or consent of instructor. May be repeated. Maximum 9 hrs.

6050 Research in Social Service Settings (2-3) Advanced research, under faculty supervision, of practice issues in community agency. Prereq: Completion of Ph.D. foundation courses or consent of instructor. May be repeated. Maximum 9 hrs.

6110 Philosophical and Historical Perspectives of Social Work (5) Social, cultural, economic and political contexts for development of social work profession and modern welfare system.


6140 Seminar on Areas of Practice (3) Comparative analysis of knowledge requirements for service delivery in specific areas of practice.

6200 Issues in Social Work Knowledge Building (2-3) Advanced seminar on theory and model building in direct intervention, administration and planning. Prereq: Completion of Ph.D. foundation courses or consent of instructor. May be repeated. Maximum 9 hrs.

6210 Advanced Seminar in Areas of Practice (3) Impact of social contexts on service delivery in selected area of practice. May be repeated. Maximum 9 hrs.

6220 Seminar/Practicum in Social Work Education (2-3) Curriculum issues and teaching methods; classroom experience in social work teaching.