within no more than two years of entry by attaining a score of 650 on the GRE Advanced Test in Psychology.

C. Completion of a general preliminary examination in scientific methodology within no more than two years of entry. This examination covers the following specific areas: statistics, psychometrics, experimental design

D. Completion of a special preliminary examination in the area of the student’s major research and professional interests. This examination must be attempted no later than nine months following completion of the general preliminary examination. This examination may be repeated once, normally no later than six months after the first attempt, at the discretion of the student’s doctoral committee.

E. Completion of an oral examination following the preparation of a doctoral dissertation. This examination covers the field of the doctoral research and related topics, and must be passed at least two weeks prior to the awarding of the degree.

F. Maintenance of at least a 3.0 grade point average.

M.S. PROGRAM

I. Course Requirements

A. I.M. or Psych. 5170, 5180, 5190
   Proseminar in Industrial and Organizational Psychology

B. Statistics 5050, 60, 70 (Behavioral Statistics) and applied psychometrics, 3 hrs.

C. 18 hours of additional course work to be selected primarily from among the 5000-level course offerings in industrial management and psychology. [e.g., I.M. 5110, 5120, 5230; Psych. 5080 (Current Topics in Applied Psychology)]

D. 9 hours of Psych. or I.M. 5000 (Master's Thesis)

E. Recommended: Psychology Proseminar.

II. Program Requirements

The Ph.D. program requirements described above in sections II A, II B, and II F comprise the major requirements for a Master's degree. An oral examination covering the thesis and related topics must also be completed.

University Studies

(Non-Departmental)

University Studies deal with important contemporary topics which are sufficiently comprehensive to require the study and attention of students and faculty from more than one college. They are open to all qualified members of the university community.

4100 Energy Needs and our Environment (3)
   Not allowed for graduate credit for ecology majors.

Water Resources Development

Floyd C. Larson, Director,
Water Resources Research Center

MAJOR DEGREE
Water Resources Development M.S.

Specific requirements for admission to this program are a Bachelor’s degree in law, engineering, or one of the physical or social sciences from an accredited college or university, and evidence of ability to do work of graduate quality, as ascertained by undergraduate records. Also considered will be work record, if any, and letters of recommendation. The general policies and requirements of the Graduate School apply to this program.

The degree of Master of Science requires 45 quarter hours of graduate studies, including nine hours of thesis work. The exact curriculum of each student is decided in consultation with a faculty committee, depending on the background and field of interest. If during the undergraduate work the student has, in the opinion of the faculty committee, sufficient training and education in one or more of the required courses, the student may substitute other elective courses. Electives will consist of advanced work in the student’s specialty or in a related field.

3410 Principles of Ground Water Geology (3)
   (Same as Geology 3410.)

3565 Introduction to Public Administrative Organization & Management (4)
   (Same as Political Science 3565.)

4110 Managerial Economics (3)
   (Same as Economics 4110.)

4810 Water Law (3)
   (Same as Environmental Engr. 4810.)

5000 Thesis

5130 Planning Research Methods I (3)
   (Same as Planning 5130.)

5160 Planning and Utilities (3)
   (Same as Environmental Engr. 5160 and Planning 5160.)

5200 Water Resources Systems (3)
   (Same as Environmental Engr. 5200.)

5330 Descriptive Hydrology (3)
   (Same as Environmental Engr. 5330.)

5340 Hydrology of Agricultural and Forest Lands (3)
   (Same as Agricultural Engineering 5340.)

5410-20-30 Interdisciplinary Seminars (3, 3, 3)
   Problems relating to comprehensive water resource development including flood management, hydroelectric power, navigation, recreation, alternatives in water resource planning, tomorrow in today’s planning, project formulation and justification, direct and indirect economic consequences, state and local participation, and municipal and industrial uses of water developments.
College of Liberal Arts

Alvin H. Nielsen, Dean
Charles W. Keenan, Associate Dean
Boyd L. Daniels, Assistant Dean for Student Academic Affairs
Charles O. Jackson, Asst. Dean for Curriculum & Instruction

The College of Liberal Arts offers programs leading to eight advanced degrees*. See page 9 for degrees and majors.

Departments of Instruction

Numbers in parentheses following the course titles indicate quarter hours of credit offered.

Anthropology

MAJOR
Anthropology

DEGREE
M.A., Ph.D.

Professors:
W. M. Bass (Head), Ph.D. Pennsylvania;
A. K. Guteh, Ph.D. Michigan; P. W. Parmalee, Ph.D. Texas A. & M.

Associate Professors:
C. H. Faulkner, Ph.D. Indiana; J. E. Harrison, Ph.D. Syracuse; R. L. Jaetz, Ph.D. Kansas;
M. C. R. McCullough, Ph.D. Pennsylvania.

Assistant Professors:
J. M. Bishop, Ph.D. California (Berkeley);
A. M. Henderson, Ph.D. Colorado;
M. H. Logan, Ph.D. Pennsylvania State;
F. H. Smith, Ph.D. Michigan.

MASTER'S PROGRAM

The formal requirements for the Master's degree include:

1. A minimum of three quarters of residence at the University of Minnesota.
2. A minimum of 45 quarter hours for graduate credit, including preparation of thesis. Thirty-six of these 45 hours must be in anthropology, nine hours may be taken in closely related disciplines (at least one-half of the courses must be at the 5000 level).
4. A thesis. In addition to the two (2) copies required by the Graduate School, one bound copy of the thesis is to be presented to the department and one bound copy to the student's thesis advisor.

PH.D. PROGRAM

Although there is no minimum credit hour requirement for the Ph.D. degree, students in this program should plan to devote to its attainment no less than 3 years beyond the B.A. level, and to complete the following requirements:

1. Admission to Ph.D. program through passing the Graduate Evaluation Examination at completion of first year of study, or through departmental acceptance of a previously earned M.A. degree in Anthropology.
2. Formation of an Advisory Committee and establishment in consultation with that Committee of a program of study. Delineation of field(s) of competence by the student and Committee and subsequent presentation to Graduate Advisor.
3. Demonstration of competence in a foreign language as determined by the student's Committee.
4. Successful completion of oral and written comprehensive examinations and admission to candidacy.
5. Successful completion of the dissertation and final oral examination.

3070 Genetics and Society (3) (Same as Botany 3070)
3410 Principles of Cultural Anthropology (3) Basic concepts and objectives in the study of culture. The range of cultural phenomena and approaches to its study. Prereq: Human Culture recommended.
3440 Religion of Primitive Peoples (3) The religions of non-literate peoples. The place of religion in their social and cultural systems. Prereq: Human Culture recommended. (Same as Religious Studies 3440)
3450 Community Studies in Complex Culture (3) Review of cross-cultural comparative urban and village communities and methodologies used in community studies. Prereq: Human Culture recommended.
3510 Peoples and Cultures of Mainland Asia (3) Ethnographic survey of the indigenous cultures of mainland Asia. Cultural diversity and human ecology in areal perspective. Prereq: Human Culture recommended.
3530 Peoples and Cultures of Africa (3) Ethnographic survey of the aboriginal cultures of sub-Saharan Africa. Cultural diversity and human ecology in areal perspective. Prereq: Human Culture recommended.
3540 North American Indian (3) An ethnographic survey of the cultures of the Arctic, Southwest, Plains and Eastern Areas. Emphasis on the cultural differences of peoples occupying these areas during the pre-colonial period. Prereq: Human Culture recommended.
3555 Cherokee Ethno History (3) Survey of socio-political aspects of internal affairs and external relationships from first European contact to present. Emphasis on 16th and 19th centuries.
3610 Archaeology of United States and Canada (3) Survey of prehistoric peoples north of Mexico from initial occupation to European contact. Prereq: Prehistoric Archaeology recommended.
3620 European Prehistory I (3) Cultural developments during the Paleolithic, Mesolithic, and Neolithic. Prereq: Prehistoric Archaeology recommended.
3630 European Prehistory II (3) Cultural developments during the Metal Ages. From the close of the Neolithic through the Iron Age. Prereq: Prehistoric Archaeology recommended. 3620 and 3630 should be taken in sequence.
3649 Ancient Civilization of Mesoamerica (3) Introduction to the archaeology of areas of ad- 
vanced civilization. Focus on Mexico and Central America beginning with the earliest cultures and 
proceeding to contact with Europeans. Prereq: Human Culture recommended.

3500 Prehistory of Tennessee (3) History of anthropological research in Tennessee. Survey 
of prehistoric American Indian cultures identified through this research.

3710 European Folk Cultures (3) Traditional aspects of European life; emphasis on folk- 
tales, beliefs, art, and folklore, under changing historical and socio-economic conditions.

3800 Language and Culture (3) Relationship between linguistic categories and patterns of 
culture. Knowledge of linguistics not required. Prereq: Human Culture recommended.

3811 Introduction to Museology (3) (Same as Art 3811).

3900 Human Osteology (4) Intensive examination 
of the human skeleton. Prereq: Human Origins and consent of instructor, 3 hrs and 1 lab.

3920 Principles of Physical Anthropology (3) Survey of materials and methods in physical 

3930 The Biology of Races of Man (3) Evolution, 
structure; genetics and theories of man; and differential criteria. Prereq: Consent of instructor.

3950 Human Identification (3) Introduction to 
techniques used in identification of human skeletal material in forensic medicine.

4220 Contemporary North American Indian (3) 
Survey of Indian cultures from initial Euro- 
American contact to present; emphasis on cul-
ture change, U.S. Government Indian policy, reservation life; contemporary Southeastern 
Indian social and cultural problems. Prereq: Human Culture or consent of instructor.

4210 Ethnographic Research Techniques (3) 
Methods of collecting, ordering and utilizing data. Prereq: Consent of instructor.

4240 Applied Cultural Anthropology (3) Ap-
plied cultural anthropology; emphasis on methods and findings in programs of community and 
national development, public health, interna-
tional cooperation and development. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs.

4250 Medical Anthropology: Lecture (3) A 
survey of medical anthropology. Emphasis is on Western and non-Western aspects of health, disease, 
treatment, death, and related concepts. Focus is on analyses and descrip-
tions of anthropological fieldwork.

4259 Medical Anthropology: Laboratory (3) Fieldwork in medical anthropology. Emphasis is on cultural aspects of health, disease, and death in industrial societies and the folk medicine systems which co-exist with Western, technical medicine. Prereq or coreq: 4250.

4300 Readings in Anthropology (1-9) Inten-
sive reading, problem oriented. Prereq: Consent of instructor.

4340 Field Work in Archaeology (3-9) Prac-
ticed work, surveying, excavating, processing, and analyzing of data; intensive reading. Prereq: 3 quarters of introductory anthropology and consent of instructor. May be repeated. Minimum 9 hrs.

4350 Field Work in Cultural Anthropology (3-
9) A practiced devotion to fieldwork methods, 
thematic fieldwork reporting, survey and inter-
view techniques and the writing and carrying out of fieldwork projects. Prereq: 3 quarters of introductory anthropology and consent of instructor. May be repeated. Maximum 9 hrs.

4360 Field Work in Physical Anthropology (3-
9) Practicum in the collection and analysis of 
human biological data. May include以外 skeletal system, and the design and carrying out of 
fieldwork projects. Prereq: 3 quarters of introductory anthropology and consent of instructor. May be repeated. Maximum 9 hrs.

4410 Non-Western Education: Anthropological 
Approaches (3) Examination of problems resulting from application of Western educa-
tion in developing societies and in aboriginal communities with industrialized societies (e.g. 
American Indians).

4420 Dynamics of Culture (3) Culture change; 
invention, diffusion and acculturation; cul-
tural continuity and stability. Prereq: Human Culture or consent of instructor.

4430 Personality and Culture (3) Analysis of rela-
tionship between individual and social beha-

vior. Application of psychological techniques in 
cross-cultural studies. Cultural differences 
and their impact on individual behavior. Prereq: Human Culture or consent of instructor.

4440 Urban Anthropology (3) Survey of theo-
retical and methodological issues anthropolo-
gists encounter researching cross-cultural urban settlements. Focus is on anthropological perspective and urban problems and planning. Prereq: 3450 or consent of instructor.

4480 Current Trends in Anthropology (3) An 
analytical integrative review in symposium of the current anthropological theories, 
thories, fieldwork methods, and general assumptions of the four subfields of anthropology: archaeology, physical anthropology, linguistics, and cultural anthropology.

4490 Cross-Cultural Survey of Sex Roles and 
Behavior (3) Examination of sex roles and sex 
behavior from cross-cultural and diachronic 
viewpoints. Draws disparate and scattered 
findings together and attempts to arrive at con-
clusions on questions as how sex roles are 
learned, the parameters of acceptable as-
aspect, and degrees of tolerance for sexual 
deviations in various cultures.

4500 Peoples of China: Chinese Society 
Before 1900 (3) An anthropological survey of 
Chinese society and culture during the pre-
Shang, dynastic and early Western contact 
periods. Prereq: Consent of instructor. Recommended: 3510 or an East Asian course.

4510 Peoples of China II: Chinese Society 
After 1839 (3) An anthropological survey of 
Chinese society and culture during the pre-
Shang, dynastic and early Western contact 
periods. Prereq: Consent of instructor. Recommended: 3510 or an East Asian course.

4550 Indians of the Southeastern United 
States (3) Survey of cultural change, U.S. Government Indian policy, reservation 
life; contemporary Southeastern Indian social and cultural problems. Prereq: Human Culture or consent of instructor.

4560 Cherokees Ethnology (3) Intensive sur-
vey of ideology and material aspects of Chero-
kee culture existing at time of first European contact.

4570 Peoples of Southeast Asia (3) Survey of 
representative ethnic groups and indigenous cultures of mainland and island Southeast Asia. Problems of contemporary culture changes.

4580 Asians in the Americas Since 1800: 
Anthropological Perspectives (3) Character, 
factors, and motivations in Asian immigration to North, Central and South America. Assimi-
lation patterns and enclave communities are major focuses. May be repeated. Maximum 9 hrs.

4590 Peoples of Japan (3) An analysis of the 
cultural diversity and unity of the people of 
Japan. Prereq: Human Culture or consent of instructor, recommended 5510 or an East Asian course.

4600 Method and Theory in American Archae-
ology (3) The historical development of New 
World archaeology with emphasis on theory and 
field techniques. Prereq: Prehistoric Archaeology or consent of instructor.

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: Prehistoric Archaeology or consent of instructor.

4640 Zooarchaeology (3) Basic osteological 
 studies of vertebrate classes; emphasis on 
aboriginal man's utilization of native animals in his subsistence and culture. Identification, 
analysis and interpretation of archaeologically 
derived mouluscan and vertebrate remains.

4650 Archaeology of Southeastern United 
States (9) Intensive study of the prehistoric 
American Indian. Special emphasis on Tennes-
see prehistory. Prereq: 3510 or consent of instructor.

4740 Southern Appalachian Folk Culture (4) 
Research-oriented course dealing with wide 
range of traditional culture in Southern Ap-
palachia. Emphasis on household economics, 
color, cloth, speech, art, song, dance, and oral traditions and customs. Pre-
req: Consent of instructor. May be repeated.

4870 Cherokee Language (3) Linguistic sur-
vey of structure of the Cherokee language.

4930 Physical Growth and Constitution (3) 
Comparative growth patterns throughout the 
life cycle of man, skeletal and dental matura-
tion, sex differences in growth, human con-
istutional types. Prereq: First quarter general 
anthropology. Strongly recommended: Gen-
eral Genetics or consent of instructor.

4950 Primate Studies (3) Survey of field and 
laboratory investigations of comparative beha-

vior and non-human primate behavior. Prereq: 
Human Origins or consent of instructor.

4960 Primate Paleontology (3) Survey of fossil 
primate forms; the origin and evolution of 
primates, the problems of classifying the 
earliest Hominid and related forms. Prereq: 
Human Origins, Recommended: 4380, 4960.

4970 Human Paleontology (3) Survey of the 
major human fossil forms and interpretation of 
human phylogeny. Emphasis on Pleistocene 
and more recent Hominid forms and the fac-
ors which shaped them into modern man. 
Prereq: 3 quarters of introductory anthropology. Recommended: 4960 and 4380.

5000 Thesis

5010 Graduate Research (1-9) Independent 
investigation of special problems in anthro-
pology.

5100 Seminar in Cultural Anthropology (3-9)

5101 Foreign Study (1-12) See page 146.

5102 Off-Campus Study (1-12) See page 146.

5103 Independent Study (1-12) See page 146.

5140 Seminar in Zooarchaeology (3) App-
proaches to the analysis and interpretation of 
archaeological faunas. Intensive reading; eval-
uation and discussion of major faunal studies,
guides to identification, methods of presenting data. May be repeated. Maximum 6 hrs.

5149 Laboratory Studies of the Vertebrate Skeleton (4) Examination and comparison of skeletons of fish, amphibians, reptiles, birds, mammals. Oriented toward the identification of archaeologically derived faunas. Prereq: Consent of instructor. Maximum 8 hrs.

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 faunas. Prereq: 4640. 1 hr and 3 labs.

5160 Seminar in Archaeology (3-9) Theoretical and practical issues central to contemporary archaeology. Prereq: Permission of instructor. May be repeated. Maximum 9 hrs.

5210 Community Anthropology: The Local Community (3) Courses dealing with ethical issues, researcher models and research methods on the local community. Prereq: 4440 or consent of instructor.

5340 Fieldwork in Archaeology (2-9) Practical work surveying, excavating, processing, and analyzing of data; intensive reading. Prereq: Some courses in introductory anthropology and consent of instructor. May be repeated. Maximum 9 hrs.

5400 History of Anthropological Theory (3) Review of theoretical contributions of the more influential anthropologists. Prereq: Consent of instructor.

5440 Peasant Societies (3) Critical analysis of existing literature and theories regarding rural-urban polarities, interactions, and different cultural manifestations of agricultural populations. Prereq: Consent of instructor.

5450 Comparative Social Organization (3) Social structure in non-literate societies. Kinship, age, sex, locality, and other factors in determining relations between individuals and groups. Prereq: At least one area course.

5460 Qualitative Methods in Anthropology (3) Application of qualitative methods in anthropological data. Emphasis on correlation and derivative procedures, distance analysis, discriminant analysis, and implementation of computer routines. Prereq: Statistics and probability or equivalent.

5470 The Healer in Cross-Cultural Perspective (3) A graduate seminar dealing with the socialization, methods of diagnosis, and therapeutic modes of healing in predominantly non-Euro-American milieus. Prereq: 4250.

5510 Seminar in Ethnology of Western North America (3) Native North American culture types west of the Rockies; selected social systems, economics, technologies, and environmental factors. Prereq: 3540 or 4550 or consent of instructor.

5600 Theory in Archaeology (3) Review of development of archaeological theory. Coverage up to and including recent systems approaches.

5610 Problems in North American Archaeology (3) A seminar designed to explore specific research problems in North American archaeology. Research topics on prehistoric ecology and settlement patterns in North America. Prereq: Consent of instructor. May be repeated once.

5620 Problems in Old World Archaeology (3) Selected topics and research problems in European and African archaeology. May be repeated. Prereq: Consent of instructor. May be repeated once. (Same as Classics 5620).

5630 The Maya (3) Intensive survey of Maya culture of Mexico, Central America, and Guatemala from pre-Columbian times to the present. Prereq: 3580.

5640 Archaeological Resource Management (3) Theory and practice—public, conservation, contract, and legal aspects of resource management. Special emphasis on: legislation, contracts, responsibilities, and certification; agencies and plans, project design, administration, and logistics; standards of field work, analysis and publication; archaeology and the public; conservation of human remains as a career. May be repeated. Maximum 6 hrs.

5660 Seminar in Prehistoric Lithic Technology (3) Analysis of techniques employed in production of prehistoric stone tools; raw materials employed; resultant implements; their morphology and function; and typological constructions utilized in archaeological analysis. Prereq: Consent of instructor.

5670 Seminar on Aboriginal Lithic Resources (3) Training and research in stone materials utilized by prehistoric populations—their properties, natural occurrence and geologic context, relative abundance and quality, extraction and distribution, processing and ultimate forms and functions. Emphasis is on theory and implementation of regional resource surveys and on discrete regions in terms of both cultural homogeneity, particularly East and Middle Tennessee. Course work includes input from professional geologists, and field research. Prereq: 5660 recommended.

5700 Theory in Folk Culture Studies (3) Graduate seminar analyzing major theoretical viewpoints of European and American folklore and the study trends from inception to the present.

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, use of the dentition in skeletal aging, and dental testing. Prereq: 3900.

5910 Measurement of Man (3) A survey of the techniques of measuring and describing skeletal material and the human subject with emphasis upon the biological applications to growth, nutrition and human engineering. Prereq: Consent of instructor.

5920 Advanced Physical Anthropology (3) An intensive investigation of the theory and problems in physical anthropology.

5930 The Human Skeleton in Forensic Medicine (3) The application of physical anthropology to problems in human identification. Determination of age, race and sex of the skeleton and preparation of reports for legal medicine. Prereq: 3900.

5940 Skeletal Biology of Early Human Population (3) An intensive treatment of practical and theoretical approaches to analysis of prehistoric human skeletal populations. Demography, vital statistics, pathology, nutrition, endocrynology, and sexual and social relationships will be covered as they relate to the population as an adaptive unit. Prereq: 3900.

5945 Comparative Primate Anatomy (4) A laboratory-oriented course dealing with the functional anatomy of the primates. Particular emphasis will be placed on the musculature of the skeletal system, and the evolution of various primate adaptive patterns. Prereq: Osteology and one dissection course in zoology.

5950 Paleopathology (4) Identification and description of human pathological conditions affecting the human skeleton. Roentgenological, histological and gross visual examination of skeletal material. Lecture and laboratory. Prereq: 3900 and/or consent of instructor.

5960 Dermatoglyphics (3) Methods of dermatoglyphic analysis; genetics and population variation of various dermatoglyphic elements; forensic applications; relationships to various genetic and chromosomal abnormalities. Prereq: Consent of instructor.

5970 Emergence and Early Evolution of Man (3) A detailed study of the ancestry and evolutionary significance of the Australopithecines. Prereq: 4970 or consent of instructor.

5980 Neanderthal Man and Human Evolution (3) An in-depth consideration of the morphology, distribution and evolutionary relationships of the Neanderthals. Prereq: 4970 or consent of instructor.

5990 Human Variation (3) Nature of human biological variation with emphasis on micro-evolutionary processes responsible for establishing and maintaining variation and relationship of variation to population structure. Prereq: 3930 or consent of instructor.

6000 Doctoral Research and Dissertation

6140-20-30 Seminar in Cultural Anthropology (3, 3, 3) This seminar is offered each quarter primarily for doctoral candidates.

6480 Seminar in Social Structure (3) This seminar examines the existing literature on kinship systems and especially focuses upon synthesis of those data.

6510 Selected Topics in Archaeology (3) May be repeated. Maximum 9 hrs.

6910 Selected Topics in Physical Anthropology (3) May be repeated. Maximum 9 hrs.

6970 Seminar in Human Paleontology (3) Prereq: 4970 and consent of instructor.

Archaeology—Greek and Roman

See Classics

Art

MAJOR

DEGREES

Art

M.A., M.F.A.

Professors:

R. A. Clarke, M.S., Wisconsin;
D. G. Cleaver (Art), Ph.D. Chicago; W. F. Loy, M.F.A. Wichita;
B. G. McKenney, M.F.A. Tulane;
P. G. Nichols, M.A., Yale;

Associate Professors:

W. C. Kennedy, M.F.A. Wisconsin;
P. A. Livingston, M.F.A. Wisconsin;
D. Peacock, M.F.A. Iowa; F. G. Stewart, M.F.A. Claremont;
R. P. Young, M.A. Columbia.

Assistant Professors:

R. LeFevre, M.F.A. Rochester Institute of Tech; W. E. Loyd, M.F.A. Tennessee;
F. Martinson, Ph.D. Chicago; F. Moffat, Ph.D. Chicago; E. Smythe, Ph.D. North Carolina;
R. Steinmetz, M.A. Yale;
L. D. Wiesener, M.F.A. Florida State.

Instructors:

E. Evans; T. J. Riesing, M.F.A. Nebraska.

The Art department offers two graduate degrees: Master of Arts and Master of Fine Arts. In order to become a candidate for either of these degrees, the applicant must first be admitted to the Graduate School. Th_
FRENCH, GERMAN, OR ITALIAN, UNLESS WAIVED BY THE ART HISTORY FACULTY.

CLASSIFICATION OF ART COURSES

A. Studio Art: 3516, 3517, 4015, 4115, 4215, 4315, 4415, 4515, 4525, 4534, 4545, 4615, 4616, 4617.


3516 Typography (4) Theories and techniques of typography and printing as a fine art medium. May be repeated. Maximum 12 hrs.

3517 Airbrush (4) Techniques and creative applications. May be repeated. Maximum 8 hrs.


3705 Northern European Painting: 1350-1600 (4) Painting and printmaking of the Low Countries, France, Germany, and England. Includes International Gothic, van Eyck, Bosch, Dürrer, Holbein, and Bruegel.

3715 Early Italian Renaissance Art: 1300-1500 (4) Painting, sculpture, and architecture. Includes Giotto, Masaccio, Donatello, Brunelleschi, Alberti, Botticelli, and Leonardo.


3725 Art of Southern Europe and New World in Seventeenth and Eighteenth Centuries (4) Emphasis on El Greco, Caravaggio, Zurbaran, Velazquez, Bernini, Tiepolo, Goya, and artistic relations between Iberia and Latin America, and the urban development of Rome.

3726 Art of Northern Europe in Seventeenth and Eighteenth Centuries (4) Emphasis on Rembrandt, Vermeer, Hals, Rubens, Poussin, Calico, Georges de la Tour, Watteau, David, urban development of Paris and London, and pilgrimage churches of Southern Germany.

3735 History of Nineteenth-Century Painting in Europe and America (4) Emphasis on French Neo-Classicism, Romanticism, Friedrich, Constable, Turner, Goya and Barbizon landscapists, Hudson River Group, Pre-Raphaelite Brotherhood, Manet, Courbet, Impressionism, Eskins, Homer, Seurat through Cézanne.

3736 History of Twentieth-Century Painting in Europe and America (4) Fauvism, Die Brücke, 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.


3746 History of Modern Sculpture in Europe and America (4) From 1860 to 1990: Neo-Classicism to Rodin. From 1900 to present: emphasis on Cubism, Constructivism, Expressionism, Assemblage, Pop, Primary Forms, Environments, and Earthworks.

3755-56-57 Studies in Art History (4, 4, 4) Concentration in selected areas. Prereq: 9 hours of art history or consent of instructor.

3756 History of North American Art (4) Survey of landmarks in painting, architecture, sculpture, and design from prehistory to 1900.

3766 History of Twentieth-Century American Art (4) Analysis of developments in television, painting, sculpture, and design from 1900.

3775 Art of Indian Asia (4) History of Indian art with consideration of art of Central Asia and Southeast Asia.

3776 Chinese Art (4)

3777 Japanese Art (4)

3811 Introduction to Museology (3) Concepts, practices and historical development of museums of art, archaeology, anthropology and science. (Same as Anthropology 3811).

4015 Individual Problems (4) May be repeated. Maximum 12 hrs. Prereq: Consent of instructor.


4215 Painting IV (4) May be repeated. Maximum 12 hrs. Prereq: Consent of instructor.

4315 Watercolor IV (4) Advanced composition in transparent and opaque watercolors. May be repeated. Maximum 12 hrs. Prereq: Consent of instructor.

4415 Sculpture IV (4) May be repeated. Maximum 12 hrs.

4515 Visual Communication IV (4) Corporate design introduction.


4545 Visual Communications Seminar (2) Political, social, economic and moral problems of contemporary designer. Prereq: 4515.

4615 Intaglio IV (4) Color problems with intaglio lithography. May be repeated. Maximum 12 hrs.

4616 Lithography IV (4) Color problems in lithography. May be repeated. Maximum 12 hrs.

4617 Advanced Screen Printing (4) May be repeated. Maximum 12 hrs.

4855-56-57 Reading and Research in Art History (2, 2, 2) Prereq: 16 hrs of art history and consent of instructor.

4875-76-77 Studies in Oriental Art History (4, 4, 4) Concentration in selected areas.

5002 Non-Thesis Graduation Completion (3) 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.

5011-21-31 Exhibition in Lieu of Thesis (3, 3, 3)

5101 Foreign Study (1-12) See page 146.

5102 Off-Campus Study (1-12) See page 146.

5103 Independent Study (1-12) See page 146.

5110-20-30-40-50-60 Drawing and Composition (3, 3, 3, 3, 3, 3)

5115 Off-Campus Study (1-12) See page 146.

5210-20-30-40-50-60 Oil Painting (3, 3, 3, 3, 3, 3)


5310-20-30-40-50-60 Watercolor Painting (3, 3, 3, 3, 3, 3)

5315 Advanced Watercolor (4) May be repeated. Maximum 12 hrs. Prereq: 12 hrs of 5310.

5410-20-30-40-50-60 Printmaking (3, 3, 3, 3, 3, 3)


5510-20-30-40-50-60 Communication Design (3, 3, 3, 3, 3, 3)

5775, 5776, 5777 Seminar in Art History (4, 4, 4) Concentration in selected areas. Prereq: 9 hours of art history or consent of instructor.
course work in speech pathology, audiology, psychology, and related fields, the student may be required to make up such deficiencies.

Specific programs or study will be determined by the student in consultation with his faculty committee. In addition to the general Graduate School requirements, specific requirements for the degree of Doctor of Philosophy in speech and hearing sciences will include:

1. Successful completion of course work in the study of one or more research tools, or other specific scientific methodological tools pertinent to the research interests of the student may be required. The choice of research tool(s) is subject to departmental approval.

2. A minimum of nine quarter hours of graduate credit obtained in course work in a cognate field outside the Department of Audiology and Speech Pathology in 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 bases of audiology, speech and language pathology, and speech and hearing science; advanced knowledge of the specifics of the area of specialization.

5. Research and dissertation to give at least 36 hours of graduate credit (6000 level).

6. A final oral examination.

4040 Appraisal of Speech and Language Disorders (4) Diagnostic procedures for children and adults with speech and language problems including observation and practice with diagnosis. Prereq: Phonetics. (Same as Special Education 4040.)

4060 Speech Science II (3) Speech production; clinical applications of speech science research. 2 lectures and 1 2-hour lab per week. Prereq: Speech Science I.

4190-200 Speech Development of the Hearing Impaired (3, 3) (Same as Special Education 4190-200.)

4210-20 Language Development of the Hearing Impaired (3, 3) (Same as Special Education 4210-20.)

4250 Introduction to the Education and Psychology of the Deaf (3) (Same as Special Education 4250.)

4310 Slurring (4) Nature and treatment. Review and integration of various theories. (Same as Special Education 4310.)

4320-30-40 Clinical Practice in Speech Pathology (1-6, 1-6, 1-6) Prereq: Intro. to Speech Pathology, Phonetics, Articulation Disorders, 4040, and consent of instructor. 4340 may be repeated. S/NC only. (Same as Special Education 4320-30-40.)

4400 Voice Disorders (4) Etiology, diagnosis and treatment of organic and functional voice disorders. Prereq: Speech Science II. (Same as Special Education 4400.)

4450-50-70 Clinical Practice in Audiology (1-6, 1-6, 1-6) Prereq: 4720, 4930, or 4940. S/NC only. (Same as Special Education 4450-50-70.)

4520 Speech Pathology (3) Independent study of special problems in speech pathology. Prereq: Consent of instructor.

4550 Problems in Speech Pathology (1-6) Prereq: Consent of instructor.

4550 Problems in Audiology (1-6) Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.


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...
5119 Instrumentation in Speech and Hearing Science (3) An instrumentation course involving the spectrum of laboratory equipment available in speech science. Upon completion, the student should be able to select proper instrumentation for measuring the parameters of speech and hearing.

5200 Seminar on Slurring (3) Current significant research relevant to the problem of slurring. Prereq: 4310 or consent of instructor.

5201 Aphasia (3) A historical review of aphasia literature including theories of brain function, classification and terminology, tests and rationale for testing, etiology, therapy considerations and prognosis for recovery. Prereq: 4300 or equivalent or consent of instructor.

5230-54-60 Advanced Clinical Practice in Speech Disorders (1-6, 1-6, 1-6) Prereq: Consent of instructor. 5340 may be repeated. Maximum 9 hrs. S/NC only.

5340-60-70 Advanced Clinical Practice in Speech Diagnosis (1-8, 1-6, 1-6) Prereq: 4400. 4340 or equivalent. 5370 may be repeated. Maximum 9 hrs. S/NC only.

5380 Cerebral Palsy (3) Study of cerebral palsy with special emphasis on neuroservo mechanisms and speech and language training. Prereq: Articulation Disorders. (Same as Special Education 5380.)

5390 Cleft Palate (3) Etiology, diagnosis and clinical management of cleft palate speakers with emphasis on speech. Prereq: Articulation Disorders. (Same as Special Education 5390.)

5440 Hearing Aid Evaluation (3) Study of the procedures involved in assessing the benefits of amplification of sound for the acoustically handicapped. The pertinent research in the areas of evaluation methods, binaural vs. monaural, prescription fitting, etc., will be reviewed. Prereq: 4720.

5450 Sound Measurement and Analysis in Hearing Conservation (3) Study of noise measuring systems and techniques; a survey of factors in military and industrial audiology, and study of the role of the audiologist in industry. Prereq: 4710 or consent of instructor.

5460 Differential Diagnosis of Auditory Disorders (3) Theoretical and practical considerations relevant to the emergence of impaired hearing in the areas of evaluation methods, binaural vs. monaural, prescription fitting, etc., will be reviewed. Prereq: 4720.

5470 Impedance Impedance Measurement in Audiology (3) Theoretical considerations behind the clinical examination of the ear and the ear as an analytic mechanism. Prereq: 4710, 4720, Speech Science II, or approval of the instructor.

5500 Seminar in Audiology (3) Study of significant research relevant to the problem of impaired hearing. Prereq: Consent of instructor. May be repeated. Maximum 12 hrs.

5503 Seminar in Advanced Audiological Procedures (3) Theoretical and practical considerations of audiological procedures used for differentiating between cochlear versus retrocochlear auditory lesions, identifying central auditory lesions, and for identifying nonorganic hearing loss. Prereq: 4710, 4720, 3960 or consent of instructor.

5500 Seminar in Language Pathology (3) Nature, etiology and treatment of retarded language development in children. Prereq: Articulation Disorders. (Same as Special Education 5540.)

5550 Special Problems in Speech Pathology (1-3) Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.

5560 Independent Study in Speech Pathology (1-3) Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.

5570 Independent Study in Audiology (1-3) Special study of significant research relevant to the field of audiology. May be repeated. Maximum 6 hrs.

5580 Practicum: Language Pathology in Children (1-6) A controlled study of research relating to practice in the field of language pathology, under supervision of department. May be repeated. Maximum 6 hrs.

5590 Practicum: Language Pathology in Children (1-6) A controlled study of research relating to practice in the field of language pathology, under supervision of department. May be repeated. Maximum 6 hrs.

5600 Doctoral Research and Dissertation

6010 Experimental Phonetics (3) Principles involved in acoustical and physiological analyses of speech production and perception. Prereq: 5110 or consent of instructor.


6050 Applied Anatomy and Physiology of Speech Mechanism (3) Dissection and related readings. Prereq: 5060 or equivalent.

6070 Experimental Techniques in Cochlear Physiology and Neurophysiology (3) Prereq: 5070 or equivalent.

6080 Seminar in Speech Science (3) Advanced study of experimental design and experimental variables in speech physiology, acoustical analysis, recognition, perception and intelligibility of speech, communication theory, and psycholinguistic measurement of speech and language. Topics vary from quarter to quarter. Prereq: 6010 or consent of instructor. May be repeated. Maximum 9 hrs.

6090 Seminar in Hearing Science (3) Advanced study of various topics of the perception of the non-speech acoustic signal; detectability, pitch, loudness, differential threshold, adaptation, and fatigue. Prereq: 5060 or consent of instructor. May be repeated. Maximum 9 hrs.

6110 Experimental Design in Speech and Hearing (3) Analysis of experimental design in theses and related journals. Psychophysical methods for data acquisition. Generation of experimental designs based on parametric and non-parametric statistics. Prereq: 5110 or equivalent and consent of instructor.

6117 Theories of Hearing (3) The theoretical processes intrinsic to hearing as related to sensitivity, loudness, pitch, and discrimination of acoustic stimuli. Prereq: 5070 or consent of instructor.

6500 Special Problems in Speech Pathology (3) Prereq: Consent of instructor. May be repeated.
6520 Advanced Seminar in Speech and Language (2-6) Topics vary from quarter to quarter but include advanced study of specific topics related to aberrations of voice, articulation, speaking time and rhythm, language development or use, and language symbolization. Prereq: Consent of instructor. May be repeated.

6560 Directed Research (1-6) Participation in on-going or non-dissertational research. Prereq: Consent of instructor. May be repeated. Maximum 12 hrs.

6570 Directed Study in Speech Pathology (1-3) May be repeated. Maximum 9 hrs.

6580 Directed Study in Audiology (1-3) May be repeated. Maximum 9 hrs.

6590 Directed Study in Speech Science (1-3) May be repeated. Maximum 9 hrs.

6600 Directed Study in Hearing Science (1-3) May be repeated. Maximum 9 hrs.

Biochemistry

MAJOR DEGREES

Biochemistry M.S., Ph.D.

Professors: J. W. Greenawalt (Head), Ph.D. Purdue; J. E. Churchich, Ph.D. Sheffield (England); R. H. Feinberg, Ph.D. California (Berkeley); T. P. Sato, Ph.D. Michigan; J. R. Totter, Ph.D. Iowa State.

Associate Professor: J. G. Joshi, Ph.D. Poona (India).

Assistant Professors: R. Bryant, Ph.D. Illinois; R. H. Feinberg, Ph.D. California (Berkeley); S. W. Hanson, Ph.D. Chicago; L. Huang, Ph.D. Michigan State.

THE MASTER'S PROGRAM

Candidates usually should offer an undergraduate major in either biology or chemistry. Departmental requirements consist of the satisfactory completion of 45 credit hours of graduate work and the mastery of the subject matter of the following courses:

1. Introductory Organic Chemistry with laboratory (at least one year), Inorganic Quantitative Analysis* (e.g., at least 1 quarter of analytical chemistry), Organic Qualitative Analysis* (e.g., Chemistry 4510), Introductory Physics*, Differential and Integral Calculus*; at least 3 quarters of approved graduate courses in chemistry or physics, for example: Organic Reaction Mechanisms (e.g., Chemistry 5110-20-30-35), Quantum Chemistry (e.g., Chemistry 5540), Advanced Physics (Physics 6210-20-30), Infrared and Raman Spectroscopy (Physics 5440), Radiation Chemistry (Physics/Chemistry 5460), Advanced Thermodynamics and Statistical Mechanics (Physics 5110-20-30); plus minimum of 3 quarters of approved physical chemistry (e.g., Biochemistry 4210-20-30, Chemistry 3410-20-30) and at least 18 hours of biology beyond the introductory level.


3. Participation in Biochemistry 6410-20-30 and in the advanced biochemistry seminars during the entire period of residence.

4. Preliminary examinations are administered prior to the beginning of the fall quarter of the student's third year and are designed to test in comprehensive fashion the mastery of the required formal course work listed in 1 and 2.

5. A dissertation reporting the results of original and significant research carried out during the term of candidacy.

6. A final examination which will be concerned primarily with the student's dissertation.

Petitioning for Master's Degree: Students who have passed the preliminary examination in the Ph.D. program may petition the department for award of a Master's degree. The additional requirements for such a degree shall be:

(a) the completion of at least 45 hours of approved course work for graduate credit, at least half of which must be at or above the 5000 level;
(b) the preparation of a research manuscript suitable for submission for publication in a major scientific journal;
(c) the oral defense of that manuscript before an examining committee of three faculty members appointed by the head of the department, at least two of whom shall be members of the department.

4110-20 Cellular and Comparative Biochemistry (4, 4) Electrolyte behavior; the chemistry and structure of proteins; enzyme behavior and biological function; catalysis and energy capture; synthetic metabolism; nucleic acids and genetic information; proteins and nucleic acids; genetics; the regulation of biological processes. Must be taken in sequence. Prereq: Organic Chemistry. 6ict introductory course in biology. 3 lectures and 1 discussion.

4119 Cellular and Comparative Biochemistry Laboratory (5) Basic biochemical procedures of general application in biochemistry and molecular biology. 1 quarter of analytical chemistry. Prereq or coreq: 4110.

4210-20 Introduction to Physical Biochemistry (3, 3) 4210—Introduction to thermodynamics; phase stability and phase change; chemical potential; osmotic pressure; activity and the Debye-Hückel model; electrochemistry; membrane permeability; 4220—Elements of statistical mechanics, diffusion, collision theory; chemical kinetics and transition state theory; higher order kinetics; the specialized kinetics of enzymatic processes; some bio-polymer considerations. Prereq: Single Variable Calculus, Organic Chemistry, and an introductory course in biology.

4230 Introduction to Physical Biochemistry (3) Physical characterization of macromolecules, polarized light, absorption and fluorescence, sedimentation and transport, bio-dynamics, electrophoretic mobility, light scattering, and structural X-ray crystallography of proteins and nucleic acids. Prereq: Biochemistry 4220 or Chemistry 3430, or equivalent.

5000 Thesis

5101 Biochemical Techniques (2) Theory and laboratory practice in sedimentation, chromatographic and electrophoretic techniques in the isolation and characterization of macromolecules of importance in biochemistry and molecular biology. Prereq: 4119 or equivalent. Open to undergraduates with consent of the department.


5120 Membranes, Compartmentation, and the Regulation of Energy Metabolism (3) Examination of the metabolic pathways for electron transport, oxidative phosphorylation, and lipid synthesis, storage and degradation, and of the intracellular and inter-organ compartmentalization of energy and the mechanisms of transport which make possible the biological control of these pathways. Prereq: 4110-20.

5130 Protein Structure and Enzyme Function (3) Physico-chemical properties of proteins; primary, secondary, tertiary and quaternary structure; denaturation, renaturation and other conformational changes; structural-function correlations; coenzyme-specific models of catalysis; steady-state, transient, relaxation, and allosteric kinetics of catalysis. Prereq: 4110 and either 4220 or Chemistry 3430.

5220 Structures and Functions of the Nucleic Acids (3) Chemistry of the nucleic acids; hydrogen bonding and double-stranded structures; replication, transcription, and other higher order structural considerations; the biosynthesis of DNA's and RNA's; repair mechanisms; degradation mechanisms; mechanisms of genetic information storage and retrieval. Prereq: 4110-20 or equivalent.

5230 Protein's Synthesis and its Role in Metabolic Regulation (3) Mechanism of assembly of polypeptide chains; ribosome structure and function; deciphering and genetic code; regulation of transcription and translation (RNA induction, repression, etc.) Prereq: 4110-20.

5300 Graduate Research Participation (3-9) May be repeated. Maximum 12 hrs.

5310-20 Experimental Techniques (2, 2, 2) A tutorial laboratory course in modern experi-
ment methodology and instrumentation. Intended primarily for departmental majors.

5450 Special Topics (1-3) Registration only by prior arrangement with department. May be repeated.

6000 Doctoral Research and Dissertation

ADVANCED BIOCHEMISTRY SEMINARS

Special subjects not covered in detail in the formal lecture courses of the department will be presented by students and staff. These will be supplemented with lectures by invited guest speakers who are recognized as leading authorities in the particular topic being discussed. One series (e.g., 6110-20-30) will generally be presented each year in the particular topic being discussed. It may be repeated with the consent of the department. Satisfactory/No Credit.

6110 Enzyme Kinetics and Mechanisms of Enzyme Action (1) S/NC only.
6120 Functions of the Vitamins (1) S/NC only.
6130 Functions of the Trace Elements (1) S/NC only.
6210 Structure and Function of Macromolecules (1) S/NC only.
6220 Biochemical Genetics (1) S/NC only.
6230 Metabolic Regulation (1) S/NC only.
6310 Biological Energy Transformations (1) S/NC only.
6320 Antigen-Antibody Interactions (1) S/NC only.
6330 Biochemistry of Specialized Physiological Processes (1) S/NC only.
6410-20-30 Current Topics in Biochemistry (2, 2, 2) Seminars and lectures dealing with current advances in the field of chemical biology. May be repeated with the consent of the department. S/NC only.

Biology

MAJOR

Biology

DEGREE

M.A.C.T.

The Master of Arts in College Teaching program is administered by an interdepartmental committee composed of one representative from each of the following departments: biochemistry, botany, microbiology and zoology. Inquiries regarding the program should be addressed to the Chairman of the Committee.

The admission requirements are:

1. Bachelor's degree with satisfactory record.
2. Nine quarter hours of college mathematics.
3. Twelve quarter hours of physical sciences.
4. Twelve quarter hours of general biology, general botany, or general zoology.
5. Eighteen quarter hours of advanced biology courses.

Requirements for the degree:

All candidates for the M.A.C.T. degree in Biology will meet a minimum distribution of graduate and undergraduate courses as follows:

- A. Eight quarter hours in each of the following:
  1. Taxonomy and/or Ecology.
  2. Morphology, Developmental Biology and/or Anatomy.
  3. Physiology and/or Biochemistry.
  4. Genetics, Cytology and/or Cyogenetics.

- B. Eighteen quarter hours of graduate credit in each of the following four fields: biochemistry, botany, microbiology, zoology or 36 quarter hours of graduate credit among the four fields as specified by the interdepartmental committee administrating the M.A.C.T. program in Biology.

- C. At least 21 quarter hours of course work in requirement B (not including special projects and thesis) numbered at the 5000 or 6000 level.

- D. At least nine quarter hours of Master's research and an acceptable thesis.

- E. Total graduate credit in the biological sciences (or appropriate supporting fields) of 57 quarter hours (including that in A, B, C and D).

- F. A three quarter one-hour seminar (or seminar series) on the problems and techniques of college teaching.

- G. Six quarters of part-time, supervised college teacher-internship training.

- H. A final comprehensive examination, oral, covering the thesis endeavor and the subject matter of the course requirements.

Botany

MAJOR

Botany

DEGREE

M.S., Ph.D.

Professors:

- R. W. Holton (Head), Ph.D. Michigan

Associate Professors:

- C. C. Amundsen, Ph.D. Colorado; S. L. Bell, Ph.D. Chicago; M. W. Bierm, Ph.D. Texas; J. D. Caponelli, Ph.D. Harvard; A. M. Evans, Ph.D. Michigan; A. S. Heilman, Ph.D. Ohio State; H. H. Shugart, Ph.D. Georgia.

Assistant Professors:

- K. W. Hughes, Ph.D. Utah; D. J. Schwarz, Ph.D. North Carolina State; D. K. Smith, Ph.D. Tennessee.

Requirements for admission: In addition to the general Graduate School requirements (see page 11) the botany department also strongly recommends submitting aptitude and advanced scores from the Graduate Record Examinations, at least three letters of recommendation from academic or professional persons, a short statement describing probable areas of interest in botany, and the following specific courses: (1) general botany or biology, 12 quarter hours; (2) advanced botany or closely allied biological sciences, 18 quarter hours; (3) physical sciences; general inorganic chemistry, 12 quarter hours, organic chemistry and physics highly recommended; (4) college mathematics, nine quarter hours.

Deborah}

General degree requirements are given on page 17, and special departmental requirements include successful completion of:


1. Satisfactory preparation of a written formulation and an oral defense to the student's committee of a research proposal suitable for a thesis problem. Must be completed before enrollment in Botany 5000.

2. Satisfactory performance on an examination in one modern foreign language or an A or B in French 3030 or German 3030 (can also be applied to the doctoral program).

3. Satisfactory completion of two credit hours at the 6000 level.


5. Presentation of a 30-minute departmental seminar.

6. Educational service is required of each graduate degree candidate and such service will include teaching and/or ancillary services performed in the department related to the instruction of courses.


1. Satisfactory presentation of a written formulation and oral defense to the student's committee of a research proposal suitable for a dissertation problem. Must be completed before enrollment in Botany 6000.

2. Satisfactory performance on a written comprehensive preliminary examination.

3. Presentation of one or more cogitate areas outside of the department totaling nine 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 nine credit hours at the 6000 level (excluding dissertation).


7. Presentation of a one-hour departmental seminar near the end of the doctoral program.

8. Educational service is required of each graduate degree candidate and such service will include teaching and/or ancillary services performed in the department related to the instruction of courses.

*Note: Graduate School requirements are denoted by an asterisk. These requirements should be interpreted as
minimal requirements and specific stipulations or requirements such as additional foreign languages, additional oral preliminary examinations, etc., 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.

**3030 Field Botany (4) Study of plants in natural environments including plant identification, collection, preservation and basic ecological concepts. Prereq: 5 hrs in biological sciences.

3031-32 Field Botany (4, 4) Emphasis on fall and winter flora, respectively. Prereq: 3030.

Need not be taken in sequence.

**3050 Socio-Economic Impact of Plants (3) Significance of plants in the origin and development of human cultures, evolution of cultivated plants, and the role of plants in present civilizations. Occasional field trips.

**3070 Genetics and Society (3) An introduction to genetics, anthropology and evolution with emphasis on their implications for human society. (Same as Anthropology 3070.)

**3090 Biology and Human Affairs (3) Basic biological principles involved in deterioration and preservation of an environment in which man and his cultures may survive.

3130 Introductory Plant Pathology (4) (Same as Agric. Biology 3130.)

**3310 Introductory Plant Physiology (4) Mineral nutrition, water relations, translocation, respiration, photosynthesis, growth phenomena. Prereq: General Chemistry, 3 hrs and 1 lab.

4020 Mechanisms of Plant Speciation (4) Processes of plant speciation emphasizing population genetics, isolation, drift, hybridization, variation in populations, establishment of population barriers and other aspects of plant speciation. Prereq: 3010-20 and General Genetics.

4120 Plant Anatomy (4) Comparative structure of vascular plants. 1 hr and 3 labs. Prereq: Fundamentals of Botany.

4240 Paleobotany (4) (Same as Geology 4240.)

4310 Plant Ecology (4) Interactions between individuals, species, communities and their environments. Circulation of energy and matter in communities. Weekly field trips or laboratory periods, and at least two weekend field trips. Prereq: 3030 or equivalent.

5000 Thesis

5011 Mycology (4) An intensive survey of the fungi, including all major classes, utilizing lecture, laboratory and field information. Occasional field trips. Prereq: 3010. 3 hrs and 1 lab.

5012 Morphology and Evolution of the Phycocyanes (4) Similar to 5090, but dealing with the Phycocyanes fungus. Prereq: 5011 or consent of instructor.

5017 Field Mycology (4) An intensive summer course on the field characteristics and morphology of higher fungi. Frequent field trips. Prereq: Consent of instructor. May be repeated.

5021 Bryology (4) Taxonomy, phylogeny, ecology, physiology, and developmental morphology of bryophytes with an emphasis on field studies and current research. Prereq: 3020. 1 hr and 3 labs.

** Not for graduate credit for botany majors.

**5022 Lichenology (4) Taxonomy, phylogeny, ecology, economy and symbiosis of lichens with an emphasis on field studies and current research. Prereq: 5017 or 5011, and 5017 recommended. 1 hr and 3 labs.

5031 Vascular Plant Taxonomy (4) Family characteristics of vascular plants, including principles of phylogeny and classification, based primarily on plants of the local flora. Prereq: 3030 or equivalent. 2 hrs and 2 labs.

5061 Phycology (4) An intensive, comparative study of the major divisions of algae, both freshwater and marine, including both unicellular and multicellular species, and their relationships. Frequent field trips or laboratory periods, and at least two weekend field trips. Prereq: 3011 or consent of instructor. 2 hrs and 2 labs.

5070 Principles of Biological Illustration (3) Principles and application of photography, including photomicrography and photomacrography, drawing graphics, and other methods to the recording and presentation for research and publication of data in pictorial or graphic form. 1 hr and 2 labs.

5080 Pteridology (4) Evolutionary study of the lower vascular plants, including morphology, anatomy, cytology, ecology, life cycles and classification. Biosystematic studies and recognition of local species. Prereq: 3010 or equivalent. 2 hrs and 2 labs.

5090 Ecology of Vascular Plants (4) Evolutionary study of plant populations, their interactions with each other and their environment. Prereq: 3020. 1 hr and 3 labs.

5100 Plant Cardiovascular Physiology (3) Study of the cardiovascular system of plants in relation to energy, nutrients, and water. Prereq: 3020-30 and 5011. 3 hrs and 1 lab.

5150 Advanced Morphology of Flowering Plants (4) A consideration of vegetative and reproductive organography including regulatory physiology, floral development, pollination mechanics, embryology and its deviations, seed and fruit development. Prereq: 3020-30 or 4120; 3210 or consent of instructor.

5160 Biosystematics (4) A study of the major experimental methods being used today in systematic studies. Specific types of systematic problems. Cytotaxonomy, numerical taxonomy and chemotaxonomy will be emphasized. Prereq: 3010 or equivalent.


5220 Advanced Plant Physiology II (3) Growth and differentiation of plants at the molecular, cellular, and organismic levels. Chemical regulation of development; macro-molecular interpretation of differentiation; photoperiodism and endogenous rhythms; dormancy; germination; flowering and senescence. Prereq: 5210 or consent of instructor 4120 and a plant or cell physiology course.

5290 Quaternary Problems (4) (Same as Geology 5290.)

5310-20-30-40 Special Problems in Botany (1-6, 1-6, 1-6, 1-6)

5340 Plant Geography (4) Distribution of eco- systems and habitats with emphasis on American types. Vegetation, climatic and historical aspects are emphasized. Prereq: 4310. 2 hrs and 2 labs.

5350 Analysis of Plant Communities (4) Plants as species and ecosystems components considered from the standpoint of genealogy, ordination, and ecosystem function. Prereq: 4310. 2 hrs and 2 periods (field trips).

5410-20-30 Seminar in the Teaching of College Botany (1, 1, 1) Objectives in the teaching of general botany, problems of teaching in the general course; seminars in techniques, testing, concepts, and materials. Required of teaching assistants. Prereq: Consent of instructor. S/NC only.


5780 Plant Cytology (4) An intensive consideration of cell, chromosome, genetic and protein function, with emphasis on the correlation where possible, of ultrastructure, biochemistry and function of subcellular organelles, and on principles and application of various analytical and electron microscopic techniques; cell fractionation and analysis of organelles and subcellular components; differentiation and analytical centrifugation; photomicrography and microscopy. Topics will vary to include developments in the biological sciences. 2 hrs and 2 labs.

5810 Cytogenetics (4) Changes in chromosomes and genes with relation to mutations, hybridization, speciation, and phylogeny. Prereq: General Genetics; 5780, or Zoology 4310. 2 hrs and 2 labs.

5820-21-22-23-24 Methods and Instrumentation in Laboratory Investigations (1, 1, 1, 1, 1) A laboratory course providing project experience and theoretical background in various currently used research methods. Topics may include ion-exchange resins, adsorption spectrometry, disc electrophoresis, polargraphy, zonal and ultra-centrifugation, gas chromatography, automatic analyzers, microscopy, culture methods, use and detection of radioisotopes, and others. Prereq or Coreq: General Genetics or equivalent. 5820 in plant biochemistry or equivalent. Elements of Physics or equivalent. S/NC only.

5830 Field Methods in Plant Ecology (4) Analysis of plant communities through the use of field measurements, including field experience. Prereq: 4310, 5340, 5350. 2 hrs and 2 periods (field trips).

5840 Microbes in Ecosystems (3) Microbial communities, their metabolic activity, mineral relationships, and interactions with other biotic and abiotic factors in natural environments and microcosm systems. Prereq: 4310 and Microbiology 3000 or consent of instructor.

5850-51-52-53-54 Methods and Instrumentation in Field Investigations (1, 1, 1, 1, 1) A laboratory course providing project experience and theoretical background in various currently used research methods. Topics will vary according to the field project. May be repeated with consent of instructor. S/NC only.

5870 Advanced Plant Genetics (4) Genetics of plants stressing molecular aspects and including mechanisms of gene action, controlling electron transport, photosynthesis, and inheritance, and adaptation. 3 hrs and 1 lab. Prereq: General Genetics and Chemistry 3231.

5910-20 Developmental Plant Morphology (3, 1) Developmental morphology of plants from the aspect of the genetic basis and includes study of morpho-
FOR ENSUREMENT IN ENVIRONMENT OR ENERGY CONSIST OF THE SATISFACTORY COMPLETION OF:

1. Research and a thesis to give nine to 18 hours of graduate credit (5000).

2. Chemistry 4160-70, 5531, 5140-50, Polymer Engineering 4910.

3. Sufficient additional graduate course work in chemistry and/or related fields to make an overall total of 45 hours.

4. Participation in Chemistry Seminar (5911-21-31) and the Polymer Seminar Program during the entire period of graduate study.

5. A final oral examination.

The requirements for the M.S. degree in chemistry with specialization in environment or energy consist of the satisfactory completion of:

1. Research and a thesis on an environment or energy-related problem to give nine to 18 hours of graduate credit.

2. Chemistry 4160-70 and two of the following: 5511, 5521, 5531.

3. Sufficient additional graduate course work in chemistry and/or related fields to give a total of 45 hours. For emphasis in environment, these additional courses must include Chemistry 5290-50-50-69-70-79, Ecology 5310, and Environmental Engineering 5000. For emphasis in energy, these additional courses must include Chemistry 5410, a chemistry sequence (Chemistry 5110-20-30-35 or 5290-60-70 or 5410-30 or 5710-20-30, 5810), Geology 5810, and Mechanical Engineering 4140. All course selections must be approved by the appropriate departmental committees.

4. Participation in seminar (5911-21-31) during the entire period of graduate study. (No more than three credit hours of seminar may be applied to the above requirements.)

5. A final oral examination.

MASTER OF ARTS IN COLLEGE TEACHING

The requirements for the M.A.C.T. degree in chemistry consist of the satisfactory completion of:

1. Chemistry 4160-70 and two of the following: 5511, 5521, 5531.

2. Research and a thesis to give nine hours of graduate credit, 5000.

3. Sufficient additional graduate course work in chemistry and/or a related field to make an overall total of 80 hours. The additional hours must include two of the following sequences: 5110-20-29-30, 5250-50-60-69-70-79, 5340-50, 5410-20-30, 5710-20-30.

4. Participation in seminar (5911-21-31) during the entire period of graduate study. No more than nine credit hours of seminar may be applied to the above requirements.

5. A final oral examination.

DOCTOR OF PHILOSOPHY PROGRAM

The department offers specialization in nine areas for the Ph.D. degree: analytical chemistry, chemical physics, environmental chemistry, energy, inorganic chemistry, organic chemistry, physical chemistry, polymer science, and theoretical chemistry. For the Ph.D. degree in chemistry with specialization in analytical, inorganic,
organic, physical, or theoretical chemistry, the satisfactory completion of the following is required:

1. Research and a dissertation to give at least 36 hours of graduate credit (6000).
2. Chemistry 4160-70 and two of the following: 5511, 5521, 5531.
3. Participation in seminar (5911-21-31) during the entire period of graduate study.
4. Thirty-nine hours of additional graduate course work including at least six hours at the 6000 level and at least nine hours from the following groups: (a) for analytical, 5250-59-69-70-79; (b) for inorganic, 5420-5710-20-30; (c) for organic, 5110-29-30-35 and at least nine hours from the following courses: 5260-60-70, 5350-50-60, 5410-20-30-50, 5710-20-30; (d) for physical, 5340-50, 5420-30-50; (e) for theoretical, 5340-50-60, 5410-20-30-50, Physics 5210. Graduate course work in related fields may be used for undesignated course work in this requirement upon approval of the student's faculty committee.
5. A comprehensive advanced examination in the field of specialization.
6. Demonstration of a reading knowledge of one of the following languages: French, German, Russian, or an approved alternate.
7. A final oral examination.

The requirements for the Ph.D. degree in chemistry with specialization in environment or energy consist of the satisfactory completion of:
1. Research and a dissertation on an environment- or energy-related problem to give at least 36 hours of graduate credit.
2. Chemistry 4160-70 and two of the following: 5511, 5521, 5531.
3. Participation in seminar (5911-21-31) during the entire period of graduate study and a six-month Internship in a governmental or industrial laboratory.
4. Thirty-nine hours of additional graduate course work including six hours at the 6000 level. For emphasis in environment, these additional courses must include Chemistry 5250-59-69-69-70-79, Ecology 5310, Environmental Engineering 3000, plus selected courses from other areas of chemistry, environmental engineering, meteorology, microbiology, health physics, ecology, computer science, statistics, and industrial health. For emphasis in energy, these additional courses must include Chemistry 5410, a chemistry sequence (Chemistry 5110-20-30-35 or 5250-60-70 or 5420-30 or 5710-20-30, 5810), Geology 5810, Mechanical Engineering 4140, plus other course selections from areas such as catalysis, heterogeneous equilibria, kinetics, thermal science, combustion and propulsion engines, resource economics, nuclear engineering, and electrical engineering. All course selections must be approved by the appropriate departmental committees.
5. A comprehensive advanced examination.
6. Demonstration of a reading knowledge of one of the following languages: French, German, Russian, or an approved alternate.
of bonding and reaction mechanisms. Prereq: 1 year of organic chemistry.

4610-20 Advanced Chemical Experimentation (2, 2) A laboratory course in the application of modern experimental techniques to solution of chemical problems. Synthesis and characterization of inorganic and organic compounds with emphasis on independent study using advanced techniques. Prereq: 5231-39 or 5351-39, 3420. Coreq: 4610 not open to students who have completed 4510.

4640 Electronics for Chemists (4) Electronics in design and construction of chemical instrumentation. Prereq: 1 year of physics.

4910-20-30 Biophysical Chemistry (3, 3, 3) Physical chemical principles with application to biological systems. Must be taken in sequence. Not open to students having 3410-20-30, 4910—Gas laws; first, second and third laws of thermodynamics; equilibrium. 4920—Solution chemistry; electrochemistry; kinetics; nuclear chemistry. 4930—Elementary quantum chemistry; optical and magnetic spectroscopy; light scattering; macromolecular properties. Prereq: General chemistry, or equivalent; 1 year of mathematics.

5000 Thesis


5129 Advanced Organic Chemistry Laboratory (3) Laboratory work on inorganic compounds illustrating modern techniques. Prereq: 1 year of organic chemistry.

5140 Introductory Polymer Chemistry (3) Fundamental principles, stressing the role of chemistry in the interdisciplinary field of polymer science; relation of molecular structure to bulk properties of polymers. Prereq: 1 year each of undergraduate organic and physical chemistry.

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 or equivalent.

5160 Organic Chemistry of Polymers (3) Synthesis of monomers; mechanism, stereochemistry, and sequence distribution of polymerization; formation of block, graft, and network polymers. Reactions and kinetic methods including degradation. Prereq: 5140 and 5531.

5170 Physical Chemistry of Polymers (3) Rubber elasticity; solution properties of macromolecules; viscoelasticity; conformational, and conformational statistics of polymers. Prereq: 5150.

5240 Electronics for Chemists (4) Includes the material of Chemistry 4640 plus a special project. Prereq: Consent of instructor.

5250-60-70 Advanced Analytical Chemistry (3, 3, 3) 5250—Absorption and emission spectrophotometry, structure elucidation by IR, NMR, UV, and mass spectra; 5260—Chemical separation methods: solvent extraction, chromatography, electrophoresis, radiochemical methods; fluorescence; x-ray methods; 5270—Electroanalytical and thermal analytical methods; on-stream and automatic analysis. Prereq: 1 year of physical chemistry.

5250-69-79 Advanced Analytical Chemistry Laboratory (1, 1, 1) Experiments in the use of chemical separation methods and instrumental methods covered in the concurrent lecture course. Prereq: 1 year of physical chemistry. Coreq: 5250 for 5259; 5260 for 5269; 5270 for 5279.

5280-90 Clinical Chemistry (3, 2) Introduction to clinical chemistry, significance of physiological parameters, electrolytic balance, metabolic dysfunctions, analytical methodology, data processing, and special problem areas. Prereq: Biochemistry 4110; 1 year of instrumental and separation methods of analysis. Coreq: Biochemistry 4120 or equivalent.

5299 Clinical Chemistry Laboratory (1) Techniques of handling physiologic samples, analytical methods and special problem areas. Prereq or coreq: Biochemistry 4110-20 or equivalent.

5310-20-30 Research in Chemistry (3, 3, 3) Special reading, consultation and laboratory (not applicable to formal course requirements.)

5340 Quantum Chemistry (3) Postulate approach to the fundamental principles of quantized mechanics; solution of the Schrödinger equation; approximate (ab initio and semi-empirical) molecular orbital methods; calculation of molecular properties.

5350 Quantum Chemistry (3) Electronic excited state introduction to group theory; perturbation theory; reactivity of organic molecules. Prereq: 5340.

5410-20-30 Advanced Physical Chemistry (3, 3, 3) 5410—Classical thermodynamics. 5420—Molecular structure. 5430—Chemical kinetics. Prereq: 4110 or 4160-70.

5440 Experimental Methods of Infrared and Raman Spectroscopy (3) (Same as Physics 5440.)


5460 Radiation Chemistry (3) Interaction of high-energy radiation with matter with emphasis on the medium. Some primitive theories: radiation chemical units; stopping phenomena; loss spectra; secondary processes and transient intermediate and diffusion models in the radiation chemistry of water and aqueous solutions; gas-phase radiolysis; liquid organic compounds; solid state studies. Prereq: 5430 or Physics 4610, 4720-30. (Same as Physics 5460.)

5511 Survey of Inorganic Chemistry (3) Atomic structure, the wave mechanical atoms, ionic and covalent bonding, periodic relationships of the elements, inorganic stoichiometry, coordination chemistry, and the descriptive chemistry of the elements. Prereq: 5520.

5521 Survey of Analytical Chemistry (3) Volmetric and gravimetric analysis; acid-base, oxidation-reduction, complexation and precipitation equilibria; spectrophotometric, electroanalytical, and separation methods.

5531 Survey of Organic Chemistry (3) Bonding in organic molecules, chemistry of hydrocarbons, alicyclic compounds and conformational analysis, monofunctional oxygenated derivatives, carboxyl compounds, stereochemistry, aromatics, and spectral analysis of organic molecules by infrared, ultraviolet, nuclear magnetic resonance and mass spectral techniques.

5710-20-30 Theoretical Inorganic Chemistry (3, 3, 3) 5710—The nature of chemical bonding; ionic, covalent, metallic, molecular. 5720—Coordination complexes; 5730—Theoretical investigational methods of structural inorganic chemistry. Prereq: 1 year of physical chemistry.

5810 Nuclear Chemistry (3) Nuclear properties, radioactivity, radioisotope decay processes, nuclear structure and models, nuclear reactions, radiation and matter, radiation detection. Prereq: 1 year of physical chemistry.

5911-21-31 Chemistry Seminar (1, 1, 1) Discussion of current and recent research literature and general chemistry. May be repeated. Registration required each quarter except summer for resident graduate students. S/NC only.

6000 Doctoral Research and Dissertation

6111 Selected Topics in Organic Chemistry (3) Subject matter varies among important topics of current significance. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs.

6130 Natural Product Chemistry (3) The structure, chemistry, and synthesis of naturally occurring substances of biological or environmental significance. May vary with each offering and will reflect areas of current chemical interest. Prereq: Two of 5110-20-30-35.

6150 Theoretical Organic Chemistry (3) The application of quantum mechanics to organic chemical problems. Molecular structure of ground and excited states of synthetic and naturally-occuring compounds like benzene and carbene, transition states, aromatic compounds, methods for understanding the stereo- and regiospecificity of organic reactions. Prereq: Two of 5110-20-30-35.


6165 Orbital Symmetry Control (3) The application of Woodward-Hoffman rules and other theories to the mechanistic interpretation of concerted organic reactions. Prereq: Two of 5110-20-30-35.


6210 Advanced Analytical Spectroscopy (3) Newer methods of spectroscopic analysis, including: transform methods, lasers in spectroscopy, fiber optics, introductory non-linear optics, and spectroscopic techniques for remote sensing. Prereq: 5250.

6211 Selected Topics in Analytical Chemistry (3) Subject matter varies among important topics of current significance. Recent topics: environmental chemistry, spectrotelechemistry, modern liquid chromatography, new electroanalytical methods, bioanalytical methods, and microcomputer and microprocessor applications in chemical instrumentation. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs.

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.

6320 Natural Polymers (3) Structure, modification, and non-biochemical utilization of natural polymers and polymers derived from naturally-occurring monomers. Prereq: 5140 and two of 5110-20-30-35.

6411 Selected Topics in Physical and Theoretical Chemistry (3) Subject matter varies among important topics of current significance. Prereq: Any two of 5410-20-30-50, 5340-50. May be repeated.

6420 Nuclear Magnetic Resonance (3) Theory of nuclear magnetic resonance spectroscopy with emphasis on high-resolution methods. Applications to problems in molecular structure and dynamic. Prereq: Any two of 5110-20-30-35.

6430 Photochemistry and Radiation Chemistry (3) Fundamental physical and chemical processes and devices for the production of electrons, photons, and other active species. Prereq: Consent of instructor. May be repeated.
as studied by opto-acoustic spectroscopy; chemical reactivity of excited states; ion-molecule and free radical reactions; electron capture and electron-transfer processes. Prereq: 5430.

6450 Electrochemistry (3) Electrical double layer; electrode kinetics; transport properties of electrolytes; electroanalytical methods. Prereq: 5430 or 5270.

6475 Electronic Structure of Radicals (3) Applications of electron spin resonance to the study of molecular conformation, structure, and bonding in organic and inorganic radicals; comparison of experimental results with theoretical predicitons based on the Walsh rules and on INDO molecular orbital calculations. Prereq: 5340-50 and 6520.

6480 Statistical Thermodynamics (3) Application of statistical mechanical methods to study of equilibrium and rate processes, phase equilibria, condensation phenomena, etc. Prereq: 5410, 5450.

6495 Advanced Chemical Kinetics (3) Mechanistic and laboratory chemical reactions at the molecular level involving such topics as dynamics of molecular collisions, potential-energy surfaces, reactions cross-sections, "direct" vs. "complex" modes of reaction, photofragmentation, energy partitioning and transport, chemical lasers. Prereq: 5430.

6510 Thermodynamics of Solutions (3) The theory of regular solutions and of electrolyte solutions; measurement of activity coefficients and other thermodynamic properties; selected topics from the literature. Prereq: 5410.

6520 Magnetic Resonance (3) Principles of magnetic resonance spectroscopy underlying nuclear magnetic resonance and electron spin resonance. Chemical applications to solid and liquid systems. Prereq: 5340.

6711 Selected Topics in Inorganic Chemistry (3) Subject matter varies among important topics of current significance. Recent topics: photoelectron spectroscopy, transuranium chemistry, organometallic compounds, inorganic solution kinetics and mechanisms, crystal chemistry, non-aqueous chemistry, chemistry of halogens and complexes. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs. Prereq: 5430.


6750 Molten Salt Chemistry (3) Structure, spectroscopic properties, solution thermodynamics, electrochemistry and phase equilibria of molten metal-melt systems. Prereq: 4110 and 4510 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. Recent topics: nuclear decay schemes, nuclear models, nuclear reaction theory, nuclear detection techniques, activation analyses; Prereq: Consent of instructor. May be repeated. Maximum 9 hrs. Prereq: 5340-50.

6820 Molecular Vibration-Rotation Theory (3) (Same as Physics 6820.)

Classics

Professors: H. C. Rutledge (Head), Ph.D. Ohio State; A. Rapp (Emeritus), Ph.D. Illinois.

Associate Professors: M. L. Henbest, M.A. Arkansas; J. E. Shelton, Ph.D. Vanderbilt.


The graduate courses in the Classics include the wider reading of Greek or Latin authors in a selected field, a more detailed study of one of the great departments of classical literature, and the development of background for the appreciation of Greek or Roman life and literature.

Greek

3010 Plato (3)

3020 Herodotus (3)

3030 Euripides (2)

4020 Aeschylus; Sophocles (3)

4030 Lysias (3)

4040 Aristophanes (3)

4050-60-70 Directed Readings in Greek (3, 3, 3)

5110-20-30 The Greek Epic, Homer (3, 3, 3)

5210-20-30 Greek Drama (3, 3, 3) Aeschylus, Sophocles, Euripides, Aristophanes.

Latin

3440 Livy (3)

3450 Pliny and Martial (3)

3460 Elegiac Poets (3)

4120 Horace, Satires and Epistles (3)

4310 Readings from Medieval Latin (3)

4320-30 Selected Readings from Latin Literature (3, 3) Latin 4110-20-30 will alternate with Latin 4110-20-30. May be repeated.

4340 Horace, Odes (3)

4350 Tacitus (3)

4360 Lucretius (3)

4370 Readings in Medieval Latin (3)

5310 Seminar in Caesar (3) Reading in the writings of Caesar, including the Gallic Wars. Recommended for teachers. Summer.

5410-20-30 Latin Epic: Lucretius, Vergil, Lucan (3, 3, 3)

5510-20-30 Roman Comedy: Plautus, Terence (3, 3, 3)

GENERAL COURSES

3210 Early Greek Mythology (3) Comprehensive study of Greek myths through readings, lectures, and discussion with emphasis on significance for Greek thought and religion. Slides and tapes illustrate influence of Greek myths on art, music, and literature of ancient Greece and later cultures. (Same as Religious Studies 3210.)

3220 Greek Mythology in the Classical Period (3) A study of use of myth in literature, history, religion, philosophy, and art of Classical Age of Greece, and change of attitude toward myth from earlier periods. Familiarity with basic Greek myths is assumed. Readings, lectures, slides, and discussion. (Same as Religious Studies 3220.)

3230 Roman Mythology (3) Study of myths created by Romans, as well as those the Romans borrowed from Greeks, with reference to Roman attitude toward history, religion, and society. Readings, lectures, slides, and discussion. (Same as Religious Studies 3230.)

3310 Art and Archaeology of the Aegean Bronze Age and Early Iron Age, the Cyclades islands, Greek mainland, and Crete. Emphasis on palaces of Crete and Mycenae, Tiryns, and Pylos, their fall, the following Dark Age, and rebirth of Greek civilization. Illustrated lectures.

3320 Art and Archaeology of Archalic and Classical Greece (3) Survey of development of Greek architecture, sculpture, and painting from 650 B.C. to death of Alexander. Illustrated lectures.

3330 Art and Archaeology of Hellenistic Greece and Rome (3) Hellenistic Greek, Etruscan, and Roman sculpture, painting, and architecture with attention to city planning. Illustrated lectures.

3340 Cities of the Greek and Roman World (4) 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 (4) Survey course with emphasis on archaeological remains such as Olympia, Epidaurus, Paestum, Cumae, Praene, and Baalbek.

4010 Greek Drama in English Translation (3) Survey of dramatic masterpieces of Greek.

4210 The Teaching of Latin (3) Carries no credit. Purposes, techniques, materials, and evaluation; directed observation in public schools; preparation of teaching plans and materials.

4220 Seminar in Classical Studies (3) Special problems in the literature and the other arts of Greece and Rome. May be repeated with consent of department.

4230 Classical Mythology and Its Uses (3) An intensive review and survey of Greek and Roman mythology. Emphasis on the uses of classical mythology in literature, music, and the plastic arts, especially of modern times.

4510 Selected Readings in Latin Literature in Translation (3) Content varies; may be repeated with consent of department.

5523 Problems in Old World Archaeology (3) (Same as Anthropology 5620.)

Comparative Literature

H. C. Rutledge, Chairman

4012-22-32 Special Topics in Comparative Literature (3, 3, 3) Content varies; may be repeated.

4050-60-70 Dante and Medieval Culture (3, 3, 3) Readings and lectures in English for students majoring or minoring in other departments. (Same as Italian 4050-60-70.)

5012 Comparative Theories of Literature (3) Croce, Richards, Frye, Welles, and others. Prereq: Completion of three literature courses in a foreign language above 3000, or the equivalent.

5022 Approaches in Comparative Literature (3) The French and American schools; "comparative literature" vs. "general literature"; Van Thingham, Baldensperger, Welles. Prereq: 5012; completion of three literature courses in a foreign language above 3000, or the equivalent.

5032 Studies in Comparative Literature (3) Independent research projects. Prereq: 5012 and 5022.
2. Pass written and oral comprehensive examinations.

Under either plan, courses which are taken from a department other than computer science must have the approval of the Computer Science department.

3030 Introduction to Structured Programming (4) Intermediate computer programming. Use of general purpose language such as PL/I. Concept of structured programming. Prereq: 3 hrs in programming or consent of instructor.


3155 Introduction to Numerical Algorithms (3) Roots of equations, systems of linear equations, least-squares data fitting, numerical integration, numerical methods for ordinary differential equations. 3150 and 3155 may not both be taken for credit. Prereq: Introduction to Computer Science or consent of instructor. Prereq or coreq: Multivariable Calculus and Matrix Algebra.

4010 Discrete Structures and Logical Foundations of Computer Science (3) Sets, relations, orderings, Boolean algebra, propositional logic, functions and computable functions; graph theory and its applications to computer systems; sets theoretical characterizations of computing machines and computing languages. Prereq: 3150 or consent of instructor.

4020 Introduction to Algorithms, Languages, and Automation (3) Introduction to finite automata; "effective procedures" and algorithms; Turing machines; formal languages and grammars. Prereq: 4010 or 4035-45.

4035-45 Introduction to Numerical Linear Algebra (3) Floating-point numbers and arithmetic on modern digital computers; numerical algorithms for solving systems of linear equations; linear least-squares methods and eigenvalue computations. Prereq: 3150 or 3155. (Same as Math 4035-49.)

4225-35 Introduction to Numerical Analysis (3, 3) (Same as Mathematics 4225-35). Use of digital computer in standard statistical analysis, such as frequency tabulations, percentiles and data reduction, correlation and regression. Use of statistical package programs. Not intended for persons who have credit for a computer science course. Not for credit for computer science majors. Prereq: Probability and statistics or equivalent.

4320 File Maintenance and Data Processing (3) (Not for credit for computer science majors) Applied computer programming. Error analysis of FORTRAN programs, overlay structures, maintenance of tape and direct access information storage files, use of utility programs, and applications to computer systems. Prereq: 1 course in FORTRAN programming.

4330 Special Projects in Applied Programming (3) Applied programming in area of student's primary interest, using the digital computer. To be directed by computer science faculty, perhaps jointly with student's faculty adviser. Oral and written reports; credit for programming experience 1-3 hours. May be repeated. Maximum 9 hrs.

4510 Data Structures and Nonnumeric Programming (3) A study of data structures and algorithms for manipulation of various data structures; stacks, queues, rings, orthogonal lists; stacks, queues, rings, doubly-linked lists, trees, dynamic storage allocation; organization of files; programming languages for information structures. Prereq: Computer Organization and Programming II or consent of instructor.


4620 Operating Systems—Case Studies (3) Alternatives in operating system design; dynamic relocation, paging, segmentation, time sharing, protection, concurrency, real time systems. Examples from different operating systems analyzed as appropriate. Prereq: 4610 or equivalent or consent of instructor.

4820 Introduction to Pattern Recognition (3) (Same as Electrical Engineering 4820.)

4830 Digital Image Processing (3) (Same as Electrical Engineering 4830.)

4850 Small Computer Systems (3) (Same as Electrical Engineering 4850.)

4910 Analysis and Management of Computer Installations (3) Analysis and design of computer systems, implementation, justification, personnel in systems: perspective on systems. Prereq: Computer Organization and Programming II or equivalent.

4990-90 Special Studies in Computer Science (1-4, 1-4) Credit determined at registration. Prereq: Recommendation of computer science staff. May be repeated with consent of department. Maximum 9 hrs.

5000 Thesis

5002 Non-Thesis Graduation Completion (3) 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.

5010 Computer Assisted Instruction (3) Study of the history and development of CAI systems. Emphasis on studying success and failure of major projects as well as investigating future role it will play in MAI research. Research projects involve use of a CAI programming language to implement a CAI course. Prereq: Computer Organization and Programming I or consent of instructor.

5050 Computer Modeling and Simulation of Physical Systems (3) Techniques for computer modeling and simulation of dynamic systems. Emphasis on the use of computers for modeling and simulation. Prereq: 4510 or consent of instructor. (Same as Electrical Engineering 5050.)

5210 Artificial Intelligence (3) Study of the simulation of intelligent processes by computers. Techniques of representation, search, and manipulation for various areas: problem solving, game playing, pattern perception, theorem proving, and natural language processing. Computer simulation of AI problems. Prereq: 4510 or consent of instructor. (Same as Electrical Engineering 5210.)

5250 Medical Computing (3) A study of the achievements and problems associated with the application of computer technology to the field of health care. Various areas of medical computing will be covered, including laboratory data systems, patient monitoring systems, diagnostic assistance, patient records, automatic history taking, and hospital administration systems. Prereq: 4510.

5430 Compiler Design (3) Traces development of major components of a compiler using the
constructs provided by formal language theory. Recognizers, symbol tables, semantic routines, algorithms of storage, code optimization. Prereq: 4510, Computer Organization and Programming III, and 5750.

5455 Finite Difference Methods for Partial Differential Equations (3) (Same as Math 5455.)

5456 Mathematical Aspects of the Finite Element Method (3) (Same as Math 5465.)

5655-65-75 Numerical Mathematics (3, 3, 3)

5670-80 Advanced Operating Systems (3, 3, 3) Theory and analysis of operating systems. Synchro-

nization and deadlock effects. Analysis of operat-

ing systems using mathematical models, simu-

lation, and hardware and software monitors. Com-

parison of good heuristic scheduling algo-

rithms with best possible schedules; schedul-

ing anomalies. Case studies of virtual memory systems. Analysis of page swapping and place-

ment strategies. Prereq: 4610 or equivalent or con-

sent of instructor.

5710 Finite Automata Theory (3) Finite-state sequential machines. Minimization, experiments, decomposition. Regular sets and regular ex-

pressions. Non-deterministic, incompletely spec-

ified and linear automata. Prereq: Formal Lang-

uages and Automata.

5730 Computability and Computational Comple-

xity (3) Computability and decidability. Turing machines and the halting problem. Register ma-

chines. Recursive and recursively enumerable sets: partial and total recursive functions. Time and space bounded computa-


5750 Theory of Formal Languages (3) Phrase-

structure languages, their generators and proc-

essors. Type 0, 1, 2, and 3 languages: opera-

tions on languages and grammars; deterministic context-free languages. Theory of transduction. Prereq: Formal Languages and Automata.

5810 Information Organization and Retrieval (3) A study of the organization, storage, search-

ing and retrieval of information. Development of IR systems from off-line to modern on-line operations. Information analysis and dictionary construction and operations. Search and match-

ing procedures; retrieval process. Information dissemination systems. Data base retrieval sys-

tems. Prereq: 4510 or Computer Organization and Programming III.

5840-50 Pattern Recognition (2, 3) Formulation of the pattern recognition problem. Role of pattern recognition within the framework of artificial intelligence. Vector representation of signals. Introduction to the feature extraction problems. Deterministic and statistical pattern classification algorithms. Syntactic pattern rec-

ognition. Examples of practical applications. Computer solution of simplified pattern recog-

nition problems. Prereq: 3150, Stat. 3450 and Math 4050 or equivalent. (Same as Elec. Engr. 5860-70.)

5910-20-30 Special Topics in Computer Science (1-3, 1-3, 1-3) May be repeated. Maximum 9 hrs.

5940-50 Advanced Small Computer Systems (3, 3) (Same as Elec. Engr. 5940-50.)

5970-90 Seminar (1-3, 1-3, 1-3) May be repeated. Maximum 9 hrs.
minimum of three academic years of resident graduate study. This includes a balanced preparation in upper-division courses (or their equivalent) in English: 12 courses at the 6000 level; six additional courses at the 5000-6000 level; and six courses for graduate credit at any level, including the 3000-4999 level. In addition, three courses must be taken for graduate credit in a subject other than English. Upon recommendation of the department, doctoral candidates may include M.A. thesis credits as part of the required course hours.

After the course work and the two language examinations are completed, the doctoral candidate will take four preliminary comprehensive examinations from six areas divided as the department directs. Successful completion of these examinations will be followed by the writing of the dissertation and an oral examination.

*1211 Written and Oral English for Foreign Students (6) Rapid review of English grammar structures and vocabulary with intensive oral, aural, and written drill. Required during the first quarter of residence of all foreign students (graduates, undergraduates and transfer students) who are not excused from it on the basis of the English Proficiency Examination required of every new foreign student.

*1221 Written and Oral English for Foreign Students (6) Emphasis on the more advanced structures of English grammar and on paragraph writing. Required during the first quarter of residence of foreign students who on the English Proficiency Examination demonstrate need for work in English structure, but not at the intensive level of English 1211. Required also of foreign students who complete 1211.

3070 Modern British Poetry (3) From Housman to Thomas and more recent poets.

3080 Modern American Poetry (3) From Robinson to Crane and more recent poets.


3150 Melville (3)

3210-20 Victorian Prose (3, 3) 3210—Carlyle, Macaulay, Froude, Newman, Mill, Thackeray. 3220—Ruskin, Arnold, Huxley, Morris, Pater, Stenhouse, Boole. 3411-12-20-30 Modern Drama (3, 3, 3, 3) 3411—Continental to 1930. 3412—Continental since 1930. 3420—British. 3430—American. (Graduate credit normally limited to students in Speech and Theatre.)

3510 Sixteenth-Century Prose and Poetry: More and Wyatt to Spenser (3)

3520-30 Elizabethan and Jacobean Drama (3, 3) 3610 Restoration and Eighteenth-Century Poetry (3) Emphasis upon Dryden and Pope.

3620 Restoration and Eighteenth-Century Drama (3) Dryden through Sheridan.

3630 Restoration and Eighteenth-Century Prose (3) Defoe, Addison, Steele, Swift, and others.

3670 The Age of Johnson (3)

3710 Literature of the English Bible (3) Types of Old Testament literature, excluding Wisdom literature.

3910-20-30 Comparative Literature (3, 3, 3) 3910—Ancient and Medieval Literature. 3930—Modern.

3940 The Novel of the Contemporary Western World (3) Proust, Joyce, Mann, and others.

4010-20 Shakespeare (3, 3) 4010—Early plays, c. 1590-1601, including 1 Henry IV, Twelfth Night, and Late plays, 1601-1613, with emphasis upon tragedies and dramatic romances.

4050-60-70 American Novel (3, 3, 3) 4050—From earliest sentimental novels through Brown, Cooper, and Kennedy, and major figures to 1875. 4060—Henry James and Mark Twain through early works of Faulkner and Hemingway. 4070—Early twenties to present.

4140-50 Technical Writing (3, 3) 4140—For students planning careers in the physical, life and health sciences, engineering, agriculture, and forestry. The writing of proposals, laboratory and progress reports, abstracts and journal articles. 4150—The writing of scientific feature articles in which data are marshalled and analyzed for their human interest.

4210-20-30 Victorian Poetry (3, 3, 3) 4210—Tennyson and the Pre-Raphaelites. 4220—Browning. 4230—Arnold, Clough, Fitzgerald, and others.

4310-30-40 The British Novel (3, 3, 3) 4310—Defoe to Jane Austen. 4320—Scott to Thackeray. 4330—George Eliot to Galsworthy. 4340—James Joyce to the present.

4430 Modern English Grammar (3) New approaches with emphasis on the generative- transformational approach.

4440 Language in Society (3) Methodology and significant discoveries of sociolinguistics in America.

4450 Dialectology (3) Theories and methodology of folk speech and language analysis. Prereq. Varieties of English or consent of instructor.

4460 Special Topics in English Linguistics (3) May be repeated with consent of department.

4471-81 English as a Second or Foreign Language (3, 3) 4471—Applied linguistics in teaching and learning of English as a second or foreign language. 4472—Linguistics and methodology of present-day English. 4473—Methodology and learning of English as a second or foreign language. 4474—Phonological and grammatical structure of present-day English. Analysis of differences (phonological, grammatical, and lexical) between English and another language. 4475—Critical examination of the aims of English language teaching, with emphasis on preparation of materials and structured teaching situations. Theory of language teaching and learning, and of methods of language teaching, with experience of member of staff. Prereq. 4472. (Same as Linguistics 4471-81.)

4510 Introduction to Literary Criticism (3)

4610-20-30 Black Literature (3, 3, 3) Trends and developments.

4651 Southern Literature from 1858 to 1880 (3) The beginning of writing in the South, especially in its relations to the formation of a regional or southern tradition in literature.

4652 Southern Literature from 1860 to 1970 (3) Humorists, local colorists, and realism of the later nineteenth century and of the New South; emphasis upon the southern flowering of 1920-1950; recent trends.

4680 Emerson and Thoreau (3) Selected writings of American Transcendentalism.

4680 American Humor through Mark Twain (3)

4720 Introduction to Folklore (3)

4730 The Popular Ballad (3)

4850 Milton (3) Emphasis on major poems.

4860 Seventeenth-Century Prose and Poetry: Bacon and Donne to Marvell (3)

4910 Chaucer—Early Poems and Troilus and Criseyde (3)

4920 Chaucer—The Canterbury Tales (3)

4950 Approaches to Literature (3) Basic knowledge and techniques necessary to understand and evaluate various kinds of imaginative literature.

5000 Thesis

5002 Non-Thesis Graduation Completion (3) 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.

5101 Foreign Study (1-12) See page 146.

5102 Off-Campus Study (1-12) See page 146.

5103 Independent Study (1-12) See page 146.

5110-20-30 Tutorial in English (1, 1, 1) Observation of courses in freshman and sophomore English, grading of papers, supervised teaching, weekly conferences or seminars on the teaching of college English. Prereq: Consent of instructor. Required of M.A.C.T. candidates. S/NC only.

5150 Old English Prose (3)

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.

5210-20-30 Readings in American Literature from the Colonial Period to the Present (3, 3, 3)

5310 Rhetoric and Composition: Theory and Practice (3) Concentration on stylistics and types of expository writing.

5410-20-30 Readings in Middle English Literature (3, 3, 3)

5510-20 Readings in Literary Criticism from Plato and Aristotle to the Present Day (3, 3)

5510-20-30 Readings in English Literature of the Nineteenth Century (3, 3, 3)

5710-20-30 Readings in English Literature of the Eighteenth Century (3, 3, 3)

5810-20-30 Readings in English Literature of the Renaissance (3, 3, 3)

5860 Introduction to Literary Research (3) Critical examination of the aims of English studies, the profession of the English teacher, theory of literature, and methods of research, including collecting of information, evaluation of material, and transmitting of the results of scholarship.

5910-20-30 Readings in English and American Literature of the Twentieth Century (3, 3, 3)

6000 Doctoral Research and Dissertation

6110-20-30 Studies in Elizabethan Literature (3, 3, 3)

6150 Old English Poetry (3) Prereq: 5150.

6160 Beowulf (3) Prereq: 5150, 6150.

6170 Studies in Middle English (3)

6181-82-83 Studies in the English Language (3, 3, 3)

6210-20-30 Studies in American Literature (3, 3, 3)

6241-42 Studies in Colonial American Literature (3, 3) 6241—From Thomas Hariot through Increase and Cotton Mather. 6242—From Jona-
than Edwards to the adoption of the Constitution.

6270-80 Studies in American Fiction (3, 3)

6310-20-30 Studies in Victorian Literature (3, 3)

6410-20-30 Studies in Chaucer (3, 3, 3)

6510-20-30 Studies in Spencer and Milton (3, 3, 3)

6610-20-30 Studies in English Romanticism (3, 3, 3)

6710-20-30 Studies in Eighteenth-Century Literature (3, 3, 3)

6810-20-30 Studies in Drama and Theatre (3, 3, 3)

6910-20-30 Studies in Twentieth-Century Literature (3, 3, 3)

French

See Romance Languages

Geography

MAJOR

Geography

DEGREES

M.S., Ph.D.

Professors:

E. H. Hammond (Head), Ph.D. California (Berkeley); B. E. Johnston, Ph.D. Tennessee; R. G. Long, Ph.D. Northwestern; T. H. Schmudder, Ph.D. Wisconsin.

Associate Professors:

C. S. Allen, Ph.D. Georgia; T. L. Bell, Ph.D. Iowa; L. W. Brinkman, Jr., Ph.D. Wisconsin; J. B. Rehder, Ph.D. Louisiana State.

Assistant Professors:

J. R. Carter, Ph.D. Georgia; W. M. Cherry, M.S. Tennessee; B. Ralston, Ph.D. Northwestern.

MASTER’S PROGRAM

The department requires a minimum of 45 quarter hours beyond completion of a sound undergraduate major program. Of these, half must be in courses numbered above 5000, in addition to thesis, and must include Geography 5150-60. Thesis and comprehensive examination required.

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. Specific course requirements will be determined by the student’s committee in accordance with interests and needs. A normal program contains 75 hours in courses for graduate credit and includes a minimum of 15 hours in the 6000 series. A minimum of 15 hours of graduate credit must be earned in related fields outside the department. Registration in any course in the 6000 series may be repeated for credit with the permission of the department. Competence in one foreign language and pertinent quantitative techniques are required. The language will be French or German unless otherwise approved by the student’s faculty committee. Written and oral qualifying examinations are required.

3410 Intermediate Economic Geography (4)

Concepts, theories, and practices in location planning. Locational patterns in agriculture, manufacturing, and service activities.

3430 Urban Geography (4)

Concepts and theories concerning development and significance of systems of cities and internal morphology of cities.

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.

3490 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.

3520 The Atmospheric System and Man (4)

Overview of general circulation system leading to world pattern of climates. Role of climate in agriculture, architecture, human comfort and economic activity.

3530 The Land-Surface System and Man (4)

Nature and regional variations in relationships among surface form, water, vegetation, and surface materials. Man as evaluator and agent of change.

3510 Political Geography (4)

Importance of geographic factors in understanding political relationships within and between nations; spatial implications of political decision-making process; geography of administrative units.

3650 Cultural Geography (4)

Basic concepts of culture; methods and background of cultural geography; world patterns of cultural phenomena.

3790 Geography of Middle America (4)

Covers Mexico, Central America, and the West Indies.

3800 Geography of South America (4)

3870 Geography of Asia (4)

A survey of the physical, cultural and economic characteristics of the countries of Asia, excluding the Soviet Union.

3910 Regional Geography of United States and Canada (4)

Major physical, economic, and social distributions as they interrelate to give distinctive character to regions of United States and Canada.

3920 Geography of the American South (4)

3940 Geography of Appalachia (4)

Interrelational of physical, economic, and social patterns to give distinctive character to the region and its parts, especially Southern Appalachia. Appalachia in perspective in the current American scene.

4100 Quantitative Methods in Geography (4)

Geographic applications of statistical techniques, point pattern analysis and analysis of areal units. Prereq: Elementary Quantitative Methods or consent of instructor.

4210 Problems in Geographic Method (4)

Examples of problem approach in geographic analysis and synthesis. Emphasis on character of geographic data, areal sampling, generalization, classification, regionalization, and questions of scale.

4240 Historical Geography of the United States (4)

Survey of changing human geography of United States during four centuries of settlement and development. Emphasis upon changing population patterns, development of agricultural regions and patterns of urban development.

4510 Principles of Geomorphology (4)

Same as Geology 4510.

4550 Geography of Soils (4)

Soils as physical systems and their relationship to environments. Investigation of specific cases of the role of soil in the management of environmental systems.

4510 Industrial Geography (4)

Factors affecting location of industrial activities, with emphasis on the United States. Prereq: 3410 or consent of instructor.

4530 Geography of Agriculture (4)

4710 Cartography (4)

Map construction, reproduction, and practice in map drawing.

4720 Data Mapping (4)

Methods for representing spatial distributions by maps and graphs. Mapable data may include phenomena as diverse as birth rates, voting patterns, and air pollution levels. Prereq: Consent of instructor.

4740 Remote Sensing: Types and Applications (4)

Basic principles and uses of aerial photography and other remote sensing techniques. Emphasis upon value of various types of imagery for geographic interpretation and simple mapping. Prereq: Consent of instructor.

5000 Thesis

5101 Foreign Study (1-12)

See page 146.

5102 Off-Campus Study (1-12)

See page 146.

5150 Introduction to Geographical Research (3)

The aims of geographical research; survey of printed source materials; practice in effective presentation of research findings.

5160 Research Design and Field Problems (4-6)

Development of research design, including collection of appropriate study designs, and practical field application. Normally offered as a 4-week summer course for 6 hours credit. Students may not take other courses or have due assignments during this 4-week period.

5170 Geographic Concept and Method (3)

Traditional and modern thought regarding the nature, scope, problems, and methods of geography.

5200 Special Problems in Geography (2-4)

Reading and research on problems or topics of interest to individual students. Student must define topic and receive instructor’s approval of study plan before registering for course. May be repeated with consent of instructor.

5250 Advanced Historical Geography (3)

Approaches, principles and techniques of research in historical geography. Critical review of work of major historical geographers, with emphasis on current literature and ideas. Prereq: 4240 or permission of instructor. May be repeated with consent of instructor.

5260 Advanced Cultural Geography (3)

Geographic analysis of rural settlement in the 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.

5310 Advanced Regional Geography of the United States (3)

Intensive work in the delineation, analysis and synthesis of one or more selected regions of the United States. The regions involved will change from offering to offering. May be repeated with consent of instructor.

5330 Advanced Regional Geography of the South (3)

5410-20 Advanced Economic Geography (3, 3)

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.

5550 Topics in Geography of Land-Surface System (3)

Examination of trends, problems,
and methods in geography of land-surface system. May be repeated for credit with permission of instructor. Prereq: 3530 or consent of instructor.

5610 Topics in Climatology (3) Examination of trends, problems, and methods in modern climatology. May be repeated for credit with permission of instructor. Prereq: 3520 or consent of instructor.

5710 Seminar in Geography (3)

5720 Topics in Quantitative Geography (3) Multivariate analysis applied to problems in geography; research problems utilizing appropriate packaged computer programs, usefulness to geographic research of techniques developed by other disciplines. Prereq: 4100 or consent of instructor.

5740 Advanced Topics in Remote Sensing (3) Applied research using remote sensing and aerial photographic imagery for the interpretation and mapping of geographic data. Prereq: 4740 or consent of instructor.

5915 Regional Geomorphology (4) (Same as Geology 5915.)

6000 Doctoral Research and Dissertation

5110-20 Seminar in Economic Geography (3, 3)

6220-50 Seminar in Urban Geography (3, 3)

6240-50 Seminar in Historical Geography (3, 3)

6260-70 Seminar in Cultural Geography (3, 3)

6310-20 Seminar in Rural Geography (3, 3)

6410-20 Seminar in Regional Geography of the United States (3, 3)

6510-20 Seminar in Regional Geography of Latin America (3, 3)

6710-20 Seminar in Physical Geography (3, 3)

Geological Sciences

MAJOR

DEGREES

Geology

M.S., Ph.D.

Professors:

G. Bragg (Head), Ph.D. Wisconsin; H. W. Kiepfer, Ph.D. Ohio State; J. C. Kopp, Ph.D. Columbia; J. R. McLaughlin, Ph.D. Tennessee; D. H. Wooster, Ph.D. Georgia (Germany); K. R. Walker, Ph.D. Yale; J. G. Walls, Ph.D. North Carolina.

Associate Professors:

G. M. Clark, Ph.D. Pennsylvania State; L. A. Taylor, Ph.D. Lehigh.

Assistant Professors:

D. W. Byerly, Ph.D. Tennessee; F. B. Keller, M.Phil. Yale; C. C. Misra, Ph.D. Western Ontario; W. P. Straub, Ph.D. Iowa State.

THE MASTER'S PROGRAM

The department requires a minimum of 45 quarter hours including at least 18 hours in courses (other than thesis) numbered above 5000. A minimum of 24 hours in geology courses, in addition to thesis, is required. Students who enter without having had an acceptable field sampling or laboratory course or to take Geology 4440, or an equivalent course elsewhere, as part of the above department requirements. One year of general physics is required, if not taken as an undergraduate. Orientation examinations will be given to determine course program, which must be approved by the student's committee.

DOCTORAL PROGRAM

Specific course program and thesis topic determined by candidate's faculty committee.

1. Program to be determined by faculty committee. Requirements include a minimum of 54 quarter hours in courses for graduate credit, in addition to dissertation. These courses must include a minimum of 45 hours in the 5000- or 6000-series, of which at least 15 hours must be in the 6000-series. Three of the required hours may be taken in related fields. A Master's degree is recommended. Registration in any course in the 6000 series may be repeated for credit with the permission of the department.

2. Preliminary examination will be both written and oral.

3. Each Ph.D. student must satisfy a research tool requirement which will be determined by his/her faculty committee and which will consist of one of the following:

A. Demonstration by examination of a reading knowledge in one modern foreign language in which there is a significant body of geological literature.

B. Completion of course 3030 in an appropriate foreign language with a B or better.

C. Courses (minimum of 6 hours) at 3000 level or higher taken for undergraduate credit and completed with a B average in appropriate mathematics, statistics, or computer science courses. The courses must be taken during a student's graduate program and must be approved by the student's entire committee.

In no case will option C above be available unless the student has had reading training as a college undergraduate in an appropriate foreign language.

*3160 Introduction to Earth Materials (4) An introduction to the study of minerals, rocks and soils. Laboratory includes hand specimen and analytical methods of identification of important rock-forming and economic minerals and major rock and soil types. Prereq: Geoscience 1 or Introductory Geology, 2 hours and 2 labs.

3180 Mineralogy (4) Classification and identification of silicate and non-silicate minerals. Minerals as phases in natural systems. Laboratory includes hand specimen, chemical and x-ray methods of identification. Prereq: 3160; General Chemistry or equivalent. 2 hours and 2 labs.

*3210-20 Invertebrate Paleontology (4, 4) Systematic review of important invertebrate fossil groups. 3210—Protista to Brachiopoda, including sponges, coelenterates and bryozoa. 3220—Phoronida to Hemichordata, including annelids, molluscs, arthropods and echinoderms. May be taken separately or in any order. Prereq: Paleobiology, General Biology, or consent of instructor. 3 hours and 1 lab or field period.

3250 Micropaleontology (4) Micropaleontology of animals and plants with special emphasis on stratigraphically important groups. Prereq: 3210 or consent of instructor. 3 hours and 1 lab or field period.

*3260 Paleobiology (4) An introduction to the principles and materials of paleontology as applied to the interpretation of earth history. Prereq: Geoscience II or Introductory Geology. 9 hours and 1 lab or field period.

3270 Geological History of Land Organisms (4) The geological, paleontological and ecologic history of the terrestrial biota and ecosystem with special emphasis on the fossil record of land plants and animals. Prereq: 3260 or consent of instructor, 3 lectures and 1 lab or field period.

3290 Physical and Biological Quaternary Environment of Humans (4) Interdisciplinary interactions of the physical and biological Quaternary environment with humanity, stressing important affects on landscapes and biota that influence humans today. 2 lectures and 2 labs or field periods.

3310 Lithology (4) Classification and properties of igneous, metamorphic and sedimentary rocks. Laboratory includes both hand specimen and microscopic study of important rock types. Prereq: 3160. Strongly recommended: 3160. 2 lectures and 2 labs.

3330 Geology of East Tennessee (4) Lectures and field excursions. Prereq: 12 hrs of geology and consent of instructor.

*3360 Stratigraphy-Sedimentation (4) An introductory study of stratigraphic principles and practices and of sedimentary processes and the interpretation of depositional environments. Prereq: Geoscience II or Introductory Geology and 3160. 3 hours and 1 lab or field period.

*3370 Structural Geology (4) Introductory discussion of structures such as folds, faults, joints, cleavage and primary structures. Laboratory work includes depth and thickness problems, structural sections, structural contour maps, etc. Prereq: Geoscience II or Introductory Geology and Single Variable Calculus or equivalent. 3 hours and 1 lab.

3410 Principles of Ground Water Geology (3) Geologic materials and processes affecting the occurrence and behavior of water. 2 lectures and 1 lab. (Same as Water Resources Development 3410.)

3510 Introductory Environmental Geology (4) Geologic problems involving earth environment and resources, and geologic parameters associated with their control and misuse. Prereq: Geoscience II or Introductory Geology or consent of instructor. 2 hours and 2 labs or field periods.

*3520 Our Changing Landscapes (4) A basic introduction to the study of landscape-forming processes and their interactions with earth materials to produce landscapes. Laboratory experience includes slope and stream channel experiments and field experience. 2 hours and 2 labs or field periods.

3610 Quaternary Geology for Engineers (3) Erosional and depositional processes, landforms, ground-water. 2 lectures and 1 lab or field period. Prereq: Introductory Geology for Engineers or equivalent.

3710 Origin and Evolution of the Continents and Ocean Basins (4) An introductory study of the origins of and changes that have occurred in the earth's crust with emphasis on modern concepts of continental drift and plate tectonics. Prereq: Geoscience II or Introductory Geology.

4110 Principles of Economic Geology (4) Formation of mineral deposits. Prereq: 3160, 3370, or equivalent.

4115 Elementary Applied Geophysics (4) Basic principles of electrical, seismic, gravity and magnetic surveying. Prereq: Geoscience II and elementary physics. Differentiable and integral calculus desirable. 3 lectures and 1 lab.

* Not available for graduate credit for geology majors.
4130 Sedimentology (3) Prereq: 3160. 2 hrs and 2 labs.
4210 Biostratigraphy (4) Fossil faunas and florals and their use in geochronology, stratigraphic correlation, and paleoecology. Prereq: 3260. 3 hrs and 1 lab.
4230 Paleocology (4) Principles of environmental analysis applied to fossil assemblages and related geological problems. Prereq: 3260 or consent of instructor. 3 hrs and 1 lab.
4240 Paleobotany (4) Survey of fossil record of plants with particular emphasis on comparative morphology and evolutionary trends in major plant groups and chronological successions and geographic distribution of past floras on earth. Prereq: Geoscience II or Introductory Geology or History of Life on Earth; Plants in Evolution or consent of instructor, 3 hrs and 1 lab. (Same as Botany 4240.)
4310 Geologic Mapping (4) Interpretation and methods. Prereq: 12 hrs of geology. 3 hrs and 1 lab or field period.
4370 Tectonic Styles (4) Elements, habitats, and geotectonic causes of basic styles of tectonic deformation are presented on maps, sections, and by physical and geological phenomena directly or indirectly influenced by Pleistocene glaciation. Prereq: Elements of Geology (3 quarters) or consent of instructor. (Same as Botany 5290 and Zoology 5290.)
4390 Special Problems in Geology (1-4) May be repeated for credit with consent of department. (Same as Botany 5290 and Zoology 5290.)
4510 Principles of Geomorphology (4) A study of the glacial processes acting on the earth's surface and the landforms produced. Prereq: Geoscience I or Introductory Geology or consent of instructor, 3 hrs and 1 lab. (Same as Geography 4510.)
4610 Principles of Geochemistry (4) Application of chemical principles to geologic problems. Emphasizes applications on crystal chemistry and relation between basic atomic structure and behavior of elements in the earth's crust. Prereq: General Chemistry or equivalent required. Recommended: Introduction to earth materials.
4650 Mineral Phase Equilibria (3) Principles of phase equilibria and application of phase equilibria studies in rock-forming mineral systems as aid to understanding conditions of formation and modification of rocks. Prereq: 3310 or consent of instructor.
4660 Electron Microprobe Analysis: Theory and Application (3) Techniques and applicability of electron probe in chemical analysis; emphasis on applications in the earth sciences. Prereq: 3310 or consent of instructor. 2 lectures and 1 lab.
4760 Global Tectonics (3) The earth's gravitational field, internal heat diffusion and geoelectrical conductivity of the mantle. 3 lectures per week. Prereq: 4115 or consent of instructor.
4810 Special Problems in Geology (1-4) May be repeated for credit with consent of department. (Media 4 quarters)
5000 Thesis
5050 Geochemistry of Ore Mineral Deposits (3) Study of ore deposits based on experimental, empirical, and theoretical geochemical considerations. Prereq: 4950 or 4110 or consent of instructor.
5060 Experimental Geochemistry (3) Study of various experimental techniques for investigating mineral reactions, the role of temperature and pressure on the generated forms, and a study of the geologic applicability of the derived data. Prereq: 5050 or consent of instructor.
5069 Experimental Geochemistry Laboratory (1-3) Includes special problems in geochemistry using lab techniques in 5060. Prereq: 5060 or consent of instructor.
5120 Geophysics—Gravity and Magnetic Methods (4) Potential methods discussed in depth, introduction to geodesy and paleomagnetism. Prereq: 4115, Differential and Integral Calculus or consent of instructor. Advanced engineering mathematics desirable, 3 lectures and 1 lab.
5130 Geophysics—Seismic Exploration Methods (4) Seismic reflection and refraction methods discussed in depth. Introduction to earthquake seismology and the earth's interior. Prereq: 4115 or consent of instructor. 3 lectures and 1 lab.
5210-20-30 Special Problems in Geology (1-4, 1-4) May be repeated with consent of department. (Same as Botany 5290 and Zoology 5290.)
5310 Principles of Stratigraphy (4) Prereq: 4130.
5320-30 Advanced Historical Geology (3, 3) 5300—Geologic history of the Paleozoic; 5330—Mesozoic and Cenozoic. Prereq: 5310.
5340 Seminar in Local Stratigraphy (1) Stratigraphy of the Knoxville area.
5350 Selected Topics in Geology (1) Presentation of graduate research works, topics from current literature and subjects of general interest. Registration required each quarter except summer for resident full-time graduate students. S/NC only.
5360 Selected Topics in Geology (1) May be repeated for credit with consent of department.
5370 Mesoscopic Analysis (4) Introduction to techniques of gathering, processing, and interpretation of microscopic fabric data. 3 lectures and 1 lab or field meeting. Prereq: 3370.
5460 Photogeologic Interpretation (4) Advanced photogrammetric techniques used to obtain geological measurements from aerial photographs. Practice in photo interpretation of imagery covering selected geologic features. Prereq: 5450 or equivalent or consent of instructor.
5470 Plate Tectonics and Orogeny (4) Geomorphology and kinematics of plate motion are used to devise models of geosynclines, fold belts, metamorphic and plutonic belts, with recent and ancient examples. 3 lectures and 1 seminar or lab. Prereq: 3370.
5510 Optical Mineralogy (4) Identification of nonopaque and opaque minerals by reflected light microscopy. Prereq: 5460 or equivalent, or consent of instructor.
5520 Igneous Petrology (4) Description, classification, and origin of igneous rocks. Laboratory emphasizes thin section study. Prereq: Lithology and 5510, 3 lectures and 1 lab.
5530 Metamorphic Petrology (4) A study of the physical and chemical characteristics of the metamorphic environment; its gradational relationship with igneous activity on the other, Laboratory will consist of study of both hand specimens and thin sections and a field trip in the Blue Ridge province. Prereq: Mineralogy and 5510, 3 lectures and 1 lab.
5540 Non-carbonate Sedimentary Petrology and Basin Analysis (4) A study of clastic deposition environments, e.g., deep-water trough, abyssal plain, continental shelf, intracontinental basin, and shoreline facies. 3 hrs and 2 labs. Laboratory will consist of the section studies and field trips to representative ancient deposits. Prereq: 5510 or consent of instructor.
5550 Carbonate Sedimentary Petrology (4) Emphasis on environments of deposition of modern and ancient carbonates. Prereq: 4130 or consent of instructor; recommended: 5510. 3 lectures and 1 lab.
5630 X-Ray Diffraction and Spectroscopy (4) Production and use of x-rays in identifying crystalline substances; identification of chemical elements by their x-ray spectra. Prereq: 3160 or consent of instructor. 2 lectures and 2 labs.
5640 Clay Mineralogy (4) Origin of the clay minerals; their structures and properties; application of mineralogical techniques in clay mineral studies. Prereq: Mineralogy and 5630 or equivalent. 2 lectures and 2 labs. To be offered on alternate-year basis.
5650 Thermodynamics for Geologists (3) Principles of thermodynamics as related to geologic processes. Prereq: General Chemistry and Analytic Geometry and Calculus of a Single Variable or equivalents.
5660 Chemical Geochemistry (3) Chemical approach to selected geologic problems. Topical study includes oxide-reduction, phase equilibrium, chemical mineralogy. Prereq: 4130.
5670 Geochemical Prospecting (3) Theory and practice of geochemical prospecting for metallic ore deposits, i.e., the use of chemical analyses of rock, soil, plants, water, and stream sediments for locating ore. Prereq: 4110 and General Chemistry or equivalents.
5710 Advanced Paleontology (4) Fossil invertebrates.
5810 Geology of Fuels (4) Origin, occurrence, and uses of fossil fuels.
5820 Metallic Mineral Deposits (4) Origin, occurrence, and uses of metallic minerals.
5830 Nonmetallic Mineral Deposits (4) Origin, occurrence, and uses of nonmetallic minerals. 3 hrs and 1 lab or field period.
5840 Ore Microscopy (4) The study of ores and ore minerals by reflected light microscopy. Prereq: 4130, 5510, and consent of instructor. 2 hrs and 2 labs.
5850 Regional Studies in Economic Geology (3) Literature study and lectures during winter quarter. Followed by field trip between winter and spring quarters to mining operations and other places of geological interest. Prereq: 4110 and consent of instructor. 2 hours plus field trip. May be repeated with consent of department.
5915 Regional Geomorphology (4) Study of the geomorphology of geologically-related areas, which have common elements such as history or development, related processes which have produced genetically similar assemblages of landforms. May be repeated with consent of department. (Same as Geography 5915.)
6000 Doctoral Research and Dissertation
*6110 Seminar in Stratigraphic Geology (3)
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 pro-seminar (6200) and the literary or philosophical seminars (6210-20-30, 6310-20-30). At least nine hours must be taken in a cognate field. Students are encouraged to take additional work in allied fields. A minor in an allied field must consist of at least 18 hours of 5000 or 6000 courses. Students must show a fluent command of German, both oral and written, and a knowledge of two other foreign languages, French and another language, such as Italian, Latin or Russian, appropriate to his field of research. A preliminary comprehensive examination, both written and oral, on German Language and Literature and the minor field or fields, must be passed before the student may be admitted to candidacy. The student will be examined on an extensive reading list which covers the whole range of German literature, and will be expected to show familiarity with major works of world literature. The candidate will be required to defend the dissertation in an oral examination, which will cover also the general area of the dissertation. Central emphasis is put on the doctoral dissertation as a final test of the candidate's scholarly qualifications. The field of study is divided into (1) German literature and (2) German (or Germanic) philology or linguistics. A student may concentrate on one or the other. Dissertation and seminar research topics will be chosen in accordance with the varying preferences and specific interests of the faculty. Detailed programs will be established in each case by the student's faculty committee.

German

3010-20-30 Elements of German for Upper Division and Graduate Students (3, 3, 3) For graduate students preparing for language examinations. No graduate credit allowed.

3210-20-30 German Literature in English Translation (3, 3, 3) No foreign language credit.

3240 Old Norse Literature in English Translation (3, 3) No foreign language credit.

3250 Modern Scandinavian Literature in English Translation (3) Introduction to modern literature of Sweden, Norway, Denmark, and Iceland. Representative readings by such writers as Ibsen, Strindberg, Lagerlöf, Hamsun, Veesas, Lagerkvist, Bang, Nexø, Laxness. No foreign language credit.

4050 The Faust Legend (3) Survey of development of legend from Faust chappoek to present, excluding Goethe's Faust. No foreign language credit.

4110-20-30 Studies in Classical and Modern Writers (3, 3, 3) Prereq: 9 hrs of 3000 courses (exclusive of 3010-20-30) or equivalent.

4140-50 Selected Topics in German Literature from 1760 to the Present (3, 3) Prereq: 9 hrs of 3000 courses (exclusive of 3010-20-30) or equivalent.

4160 Studies in German Authors (3) Study of the life and works of a single outstanding German literary figure. Content varies. May be repeated for credit. Prereq: 9 hrs of 3000 courses (exclusive of 3010-20-30).

4170 Theatrical German (1-3) Performance in one or more German plays. May be repeated for credit with consent of department. Prereq: Intermediate German or equivalent or consent of instructor.


4250 Introduction to Descriptive Linguistics (3) (Same as French 4250).

4260 Introduction to Historical and Comparative Linguistics (3) Linguistic change, phonological and morphological change. Cultural, historical, sociological influences upon the development of language. Semiotic change. Lexicography. All these topics copiously illustrated by selected examples from Indo-European languages. Prereq: 9 hrs of upper division English or 9 hrs of upper division courses in a modern or ancient language (exclusive of German and French 3010-20-30), courses in literature in translation, and general courses in Latin and Greek requiring knowledge of these languages, or consent of department. (Same as French, Russian, and Spanish 4260.)

4270 Introduction to Germanic Linguistics (3) The phonetics and phonemics of German. German grammar and the German vocabulary from a descriptive point of view. The dialects of German. An introduction to the study of the other Germanic languages.

4310-20 History of the German Language (3, 3)

4610-20-30 German Civilization (3, 3, 3) Prereq: Intermediate German or equivalent.

4910-30 Advanced Conversation and Composition (3, 3, 3) Prereq: 3810-20-30 or equivalent or consent of department.

5000 Thesis

5101 Foreign Study (1-12) See page 146.

5102 Off-Campus Study (1-12) See page 146.

5103 Independent Study (1-12) See page 146.

5140 Old Saxon (3) The phonology, morphological and syntactic development.

5200 Proseminar (3) Bibliography: methods; illustrative problems; preparation of papers.

5210-30 College Teaching of German (1, 1) Required of all M.A., M.A.C.T., or Ph.D. candidates, except those whose previous teaching experience warrants excuse from this requirement or who wish to pursue vocations other than teaching.

5410-20-30 Medieval German Language and Literature (3, 3, 3) 5410—Introduction to Middle High German. 5420-30—Readings in Mediæval German Literature.

5500 Studies in German Literature (3) Content varies. May be repeated. Maximum 9 hrs.

5510 German Humanism and the Reformation (3)

5520 German Baroque Literature (3)

5530 The Enlightenment and the Rococo (3)

5540 German Classicism (3)

5550 Goethe's Faust (3)

5560 German Romanticism (3)

5570 German Realism and Naturalism (3)

5580 Modern German Literature (1889-1945) (3)
College of Liberal Arts

5590 Modern German Literature (1945-Present) (3)

5600 German Literary Theory and Criticism (3)

5610-20-30-40-50-60 Directed Readings in German Language and Literature (3, 3, 3, 3, 3, 3)

5710 Introduction to Old Norse (3) Phonology, morphology, and syntax of Old Norse. Representative readings in Old Norse.

5720 Readings in Old Norse Prose (3) Intensive readings of Old Norse prose works. The study of the Icelandic saga as a literary genre.

5730 Readings in Old Norse Poetry (3) Intensive readings of the Eddic poems. Study of these poems as a literary genre and as a repository of ancient Germanic customs, legends, and mythology.

6000 Doctoral Research and Dissertation

6100 Greek (3) Phonology, morphology, and syntax of the Greek language. Its relationship to Indo-European languages and other Germanic languages. Readings from the Greek Bible.

6120-30 Old High German (3, 3) 6120-Introduction to phonology, morphology, and syntax of the Old High German of the 6th and 9th centuries. Dialects. Representational prose readings. 6310-Literature and Linguistics; intensive study of the prose and poetry of the period from a linguistic and literary point of view.

6140 Old Saxon (3) The phonology, morphology, and syntax of Old Saxon. Representative readings.

6210-20-30-40-50-60 Seminar in German Literature (3, 3, 3, 3, 3, 3) May be repeated.

6310-30 Seminar in German and Germanic Philology (3, 3, 3) May be repeated.

Russian

3010-30-30 Elements of Russian for Graduate Students and Seniors (3, 3, 3) For graduate students preparing for language examinations and seniors desiring reading knowledge of a second foreign language. Prereq: 2 years of some foreign language in college or consent of department. Undergraduate credit only. No credit for students having completed 1 year of Elementary Russian.


3240 The Russian Drama in English Translation (3-4) Selections from works of Fontovin, Gribboev, Pushkin, Gogol, Ostrovsky, Turgenev, Chekhov, and others.

3250 The Works of Ivan Turgenev and Anton Chekhov in English Translation (3-4)

3260 Russian Folklore in English Translation (3-4)

3270 Russian Philosophical and Theological Thought (4) (Same as Religious Studies 3270)

4010 Selected Topics in Russian and East European Studies (3) An interdisciplinary seminar on a selected topic using a comparative approach.

4110-20-30 Studies in Major Russian Writers (3, 3, 3) Content varies. Pushkin, Lermontov, Gogol, Turgenev, Tolstoy, Dostoevsky, Chekhov and others. Prerequisite: 3000 courses (exclusive of 3010-20-30), Russian Literature in English Translation, Russian Scientific and Technical Literature) or equivalent. May be repeated.

4210-20-30 Studies in Russian Literary Periods (3, 3, 3) 4210-Russian Romanticism. 4220-Russian Realism. 4230-Russian Modernism. Prereq: 9 hours of exclusive of 3010-20-30, Russian Literature in English Translation, Russian Scientific and Technical Literature) or equivalent.

4230 Introduction to Descriptive Linguistics (3) (Same as French 4230)

4260 Introduction to Historical and Comparative Linguistics (3) (Same as German 4260)

4270 Introduction to Slavic Linguistics (3)

4310-20-30 Advanced Studies in Russian Language (3, 3, 3) Intended primarily for students majoring or minorng in Russian who are interested in language and linguistics. Includes problems in morphology and syntax, stylistics and translation techniques, and history of Russian language as well as other special problems for advanced students of Russian.

4410-20-30 Directed Readings (3, 3, 3)

Greek

See Classics

History

MAJOR DEGREES

History

M.A., M.A.C.T., Ph.D.

Professors:

L. P. Graf (Head), Ph.D. Harvard; G. Brooker, Ph.D. Minnesota, V. C. Mair (Emeritus), Ph.D. Harvard; H. S. Fink (Emeritus), Ph.D. Princeton; A. G. Hass, Ph.D. Chicago; Y. P. Hao, Ph.D. Harvard; W. W. Masinski, Ph.D. California (Berkeley); J. W. Hoffman (Emeritus), Ph.D. Chicago; C. J. Jackson, Ph.D. Emory; M. K. Klein, Ph.D. Columbia; R. C. Marius, Ph.D. Yale.

Associate Professors:

P. H. Bergeron, Ph.D. Vanderbilt; J. D. Bing, Ph.D. Indiana; J. C. Daniel, Ph.D. Maryland; E. R. Duncan, Ph.D. California (Berkeley); J. R. Fink, Ph.D. Washington; C. W. Johnson, Ph.D. Michigan; P. A. Marr, Ph.D. Harvard; M. C. McDonald, Ph.D. Pennsylvania; J. Multoway, Ph.D. Yale; P. J. Pinckney, Ph.D. Vanderbilt; E. H. Trainer, Ph.D. Emory; W. B. Wheeler, Ph.D. Virginia.

Assistant Professors:


MASTER'S PROGRAM

Master of Arts—Plan I: Course requirements include History 5240, and either 5250 or 5260; one M.A. reading course; at least 6 additional hours 5300 or above. Total hours, including thesis—45. Plan II: History 5240, and either 5250 or 5260; two M.A. reading courses; 12 additional hours 5300 or above, at least 2 of which must be 6300 or above. Total hours—45. Plan I and Plan II require evidence of proficiency in one foreign language before the M.A. degree is granted.

Master of Arts in College Teaching—Course requirements include History 5240-50-60, 5271-72-73, and Cont. and High. Ed. 5110. Students must spend 1 year as a graduate assistant and 1 year as a teaching assistant. Total hours, including thesis—60. Students seeking the M.A.C.T. degree may substitute 9 quarter hours of courses numbered 6300 or above for the Master's thesis.

DOCTORAL PROGRAM

1. Admission: (a) Acceptable scores on the Graduate Record Examination (General Aptitude and Subject) are required.

(b) Students successfully completing the M.A. degree at The University of Tennessee must be recommended by the Department of History.

(c) Students from other institutions should have an M.A. degree and must be reviewed and approved by the Graduate Awards and Review Committee after their first year of work at The University of Tennessee.

2. Residence and Course Work: Beyond the Bachelor's degree a minimum of 75 credit hours in course work is required, of which not less than 45 must be in courses that are numbered over 5000. Not less than 6 quarters of the required 9 quarters of residence work shall be under the supervision of the staff of The University of Tennessee.

3. Language Requirements: Candidates shall be required to possess a reading knowledge of 1 language and such additional language or languages as may be determined by the student's graduate committee. Under normal circumstances students specializing in European history will need 2 languages. The committee may also specify any other research tools, such as statistics, which it regards as essential for the student's preparation.

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 an advisor. The appropriate forms and the time of the examination may be obtained from the Graduate School.

(b) By course work. Upon consultation with the advisor, a student may elect to complete an appropriate 3010-20-30 sequence in a language department (or an intermediate language sequence in which no 3010-20-30 sequence is available). Satisfactory completion requires that a student must have at least a B in the final quarter.

4. Preliminary Examinations and Committee: Incoming students will be advised by the department head.

The preliminary examinations must be taken after all course work is completed, language requirements fulfilled, and at least 9 months before the degree is expected. These exams should normally be taken before beginning the ninth quarter of work toward the doctorate. The candidate must present 4 fields, distributed as follows: 1 major field (history); 2 minor fields (history); and 1 minor field which may be either in history or outside the department. In any case, the student is required to have 9 hours of graduate work outside the History department. Three of the 4 areas listed below must be represented by a major or a minor field, or both.
5650 Topics in Negro History (3)  
5670 Topics in American Colonial History (3)  
5675 Topics in the Early National Period of American History (3)  
5680 Topics in 19th-Century American History (3)  
5690 Topics in 20th-Century American History (3)  
5710 History of the Crusades (3) The Crusades from 1095 to the 15th century.  
5720 Topics in Medieval History (3)  
5740 Topics in European Urban History (3)  
5750 Topics in Ancient History (3)  
5780 Topics in German National Socialism (3)  
5810 Topics in American Colonial History (3)  
5820 Topics in Mexican History (3)  
5850 Topics in Chinese History (3)  
5860 Topics in Japanese History (3)  
5910-20 Topics in Southern History (3, 3) 5910 — The Old South. 5920 — The New South.  
6000 Doctoral Research and Dissertation  
6210-20-30-40 Directed Readings (3, 3, 3, 3) Individual readings directed toward preparation for preliminary examination fields. Open only to candidates for the Ph.D. degree who are in residence and who have been in residence at least two quarters. Only one course may be taken in preparation for each of the four fields. Depending on the field in which he/she is reading, the student will be assigned to an appropriate member of the department. S/NC only.  
6300 Seminar in Special Studies (3)  
6310 Seminar in Tennessee History (3)  
6350 Seminar in American Diplomatic History (3)  
6410-20 Seminar in Western Europe (3, 3)  
6444 Seminar in French History (3)  
6480 Seminar in Russian History (3)  
6510 Seminar in English History (3)  
6610 Seminar in American Colonial History (3)  
6620 Seminar in the Era of the American Revolution (3)  
6630 Seminar in Early National Period of American History (3)  
6635 Seminar in Jacksonian Period (3)  
6640 Seminar in Social and Cultural History of the United States (3)  
6650 Seminar in the American Westward Movement (3)  
6710 Seminar in Medieval Institutions (3)  
6740 Seminar in the Crusades (3)  
6770 Seminar in Central European History (3)  
6810 Seminar in Latin American History (3)  
6910 Seminar in the Civil War Era (3)  
6930 Seminar in Twentieth-Century America (3)  
6940 Seminar in the History of the South (3)  

Registration in topics and seminar courses may be repeated for credit with the permission of the department.

Latin  
See Classics

Mathematics

MAJOR

DEGREES

Mathematics  
M.A., M.S., M.M., Ph.D.

Professors:

- R. M. Barrett (Head), Ph.D., Pennsylvania; G. E. Albert (Emeritus), Ph.D., Wisconsin; J. S. Bradley, Ph.D., Iowa; W. G. Brady, Ph.D., Pittsburgh; J. H. Carruth, Ph.D., Louisiana State; E. E. Giles, Ph.D., Purdue; A. J. Davenport, Ph.D., Wisconsin; D. J. Dessert, Ph.D., Maryland; E. D. Eaves (Emeritus), Ph.D., Texas; H. Franzen, Ph.D., Illinois; D. A. Gardner, Ph.D., North Carolina State; R. T. Gregory, Ph.D., Illinois; D. W. Hinton, Ph.D., Tennessee; A. S. Householder (Emeritus), Ph.D., Chicago; L. H. Husch, Ph.D., Florida State; R. M. Mcconnell, Ph.D., Duke; H. T. Mathews, Ph.D., Tulane; D. D. Miller, Ph.D., Michigan; R. J. Piumpoom, Ph.D., Auburn; K. G. Reddy, Ph.D., Indian Institute of Technology (India); B. D. Sieeman, D.Sc, Dundee; F. W. Stallmann, Ph.D., Giessen (Germany).

Associate Professors:

- C. E. Clark, Ph.D., Pennsylvania State; D. E. Dobbs, Ph.D., Cornell; M. D. Gunzburg, Ph.D., New York; W. E. Haver, Ph.D., New York (Binghamton); G. S. Jordon, Ph.D., Wisconsin; K. R. Kimble, Ph.D., Ohio State; G. A. Klassen, Ph.D., Nebraska; Y. Kuo, Ph.D., Cincinnati; H. L. Lee (Emeritus), Ph.D., Duke; J. W. Lee, Jr., Ph.D., Louisiana State; B. S. Rainey, Ph.D., Illinois; P. W. Schaefer, Ph.D., Maryland; J. Smith, Ph.D., California (Berkeley); K. S.C. Goni, Ph.D., Oregon State; L. Turner, Ph.D., Purdue; W. R. Wade, Ph.D., California (Riverside); C. G. Wagner, Ph.D., Purdue.

Assistant Professors:

- D. F. Anderson, Ph.D., Chicago; W. Brandal, Ph.D., Northwestern; J. D. Chandra, Jr., Ph.D., Virginia; V. A. Doughty, Ph.D., Harvard; E. L. Evans, Ph.D., Houston; W. F. Keigher, Ph.D., Illinois at Urbana-Champaign; J. E. Leech, Ph.D., California (Los Angeles); R. Loewy, Ph.D., Calif. Inst. Tech.; W. H. Row, Ph.D., Calif.; Wisconsin; R. J. Bowld, Ph.D., Virginia; S. M. Serbin, Ph.D., Cornell; R. O. Shelton, Ph.D., Rice; K. R. Stephenson, Ph.D., Wisconsin; C. C. Travis, Ph.D., Calif. (Davis); A. T. M. Wang, Ph.D., Minnesota; R. D. Weidner, Ph.D., California (Berkeley).

Math 3050, 3060, 3090, 3100, 3110, 3120, 3130, 3230, 3240, 3310, 3510-20-30, 3720, and 3910 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 "0" may be offered as an honors version. In this case, the last digit will appear as an "8" and the title will be preceded by the word "Honors" both in the timetable and on the student's transcript. Honors versions of courses listed in the Graduate Catalog are acceptable for graduate credit. Such courses may be offered upon the initiative of interested faculty, students, or the department head (though in all cases subject to the approval of the department head).

MASTER OF MATHEMATICS PROGRAM

The Master of Mathematics degree is intended primarily for teachers of high school mathematics.
Before admission to this program, the applicant must have either (a) certification for teaching secondary mathematics in at least 1 of the states of the United States, or (b) a baccalaureate degree in successful elementary or secondary school teaching experience. Evidence of the requirement being met must be supplied by the student.

Applicants for admission to this program must take the Graduate Record Examination (aptitude portion), and have had at least one year of college mathematics including analytic geometry. The following requirements must be met:

(1) Completion of 45 hours of course work. A minimum of 30 hours must be taken in residence.
(2) A minimum of 36 hours must be selected from the mathematics courses 3050, 3060, 3090, 3100, 3120, 3130, 3150, 3155, 3230, 3240, 3310, 3510, 3520, 3530, 3710, 3720, 3810, 3910, or other mathematics courses numbered above 4000.
(3) Passing a comprehensive examination on completion of all course work.
(4) A minimum of 9 hours of courses numbered above 5000 subject to the approval of the mathematics department and the department in which the courses are taken.

MASTER'S PROGRAM

The Master of Arts degree and the Master of Science degree are designed primarily for prospective high school or college teachers and also for people interested in applied mathematics.

The departmental requirement for either of these degrees is a thesis, for which 9 credit hours must be earned, and 36 additional hours of acceptable course work numbered above 4000. Of the above 36 hours, 9 hours may be in a minor outside the department and 18 hours (exclusive of thesis) must be completed from courses in mathematics numbered above 5000.

It is strongly recommended that a candidate for the Master's degree with a major in mathematics develop a reading knowledge of French, German, or Russian. A student offering mathematics as a minor for the M.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.

DOCTORAL PROGRAM

The preliminary examination for the Ph.D. degree in mathematics will include 4 of the following subjects (including at least 2 from Group A) to the extent indicated by the accompanying course numbers, and such other subjects as the graduate faculty may prescribe.

(A) Algebra 5510-20-30
Functions of a Complex Variable 5110-20-30
Functions of a Real Variable 5210-20-30
Topology 5910-20-30
(B) Linear Analysis 5240-50-60
Mathematical Statistics 5750-60-70

Numerical Analysis 5650-60
Partial Differential Equations 5450-60-70

Note: A student selecting 2 subjects from Group B above is required to take a 1 year graduate level (numbered 5000 or above) course in mathematics that is extensively used, outside of the Mathematics department. This course must be approved by the Mathematics department head.

It is expected that the candidate will participate in courses and seminars in mathematics and related fields beyond those required to qualify for the preliminary examination. The amount and nature of this work will be determined by the student and his committee.

Two foreign languages are required. German or French 3030 with a grade of A or B may be substituted for the corresponding language examination.

Study in a cognate field is not required by the Mathematics department.

Registration in any course in the 6000 series may be repeated for credit with the permission of the department.

*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. Prereq: Introductory Calculus, General Mathematics or equivalent.
3060 Elementary Statistical Analysis (3) Elementary probability distributions used in statistics: binomial, Poisson, and normal and their properties; sampling theory; confidence intervals and statistical tests of hypotheses; least squares and linear regression. Prereq: 3050 or consent of instructor.
3090 Polynomials and Rings (3) Elementary introduction to modern abstract algebra. Axiomatic approach is used to study divisibility and factorization in rings of integers and of polynomials with coefficients from various fields. Prereq: Multivariable Calculus and Matrix Algebra or consent of instructor.
	*3100 Logic and Sets (3) Elements of mathematical logic; truth sets and open sentences; diagrams for truth in modern algebra of sets with operations of union and intersection. Prereq: 1 year of college math. Primarily for students in the College of Education.
3110 The Real Number System (3) Laws of arithmetic; rational and irrational numbers; fields. Prereq: 1 year of college math. Primarily for students in the College of Education.
3150 Introduction to Numerical Algorithms and Programming (3) (Same as Computer Science 3150)
3155 Introduction to Numerical Algorithms (3) (Same as Computer Science 3155)
3220 History of Mathematics (3) Survey of development of various branches of mathematics, from ancient to modern times. Prereq: Single Variable Calculus or Calculus or equivalent.
3310 Advanced Euclidean Geometry (3) Triangles and circles, constructions, modern concepts. Prereq: 1 year of college math.

* These courses are sometimes offered in special summer institutes for an 8-week period with 4 hours credit. Such special courses are designated 3091, 3092, etc.

3320 Non-Euclidean Geometry (3) Foundations of geometry. Elliptic and hyperbolic plane geometry. Prereq: 1 year of college math.
3330 Transformational Geometry (3) Fundamental transformations and projection geometry. Classification of isometries and similarities; symmetries of a polygon; inversions. Prereq: 1 year of college math.
3510 Intermediate Analysis (3) Primarily for students in secondary mathematics education. Course covers elementary calculus from advanced viewpoint with emphasis on proofs of basic theorems. Topics covered include limits of sequences and functions, continuous functions, derivatives, definite integral, and fundamental theorem of integral calculus. Prereq: Calculus of Algebraic Functions, Linear Algebra and Calculus or Single Variable Calculus.
3780-90 Introduction to Combinatorial Theory (1, 3) Introduction to problems of arrangement and selection within discrete systems. Enumeration by recurrence relations and generating functions, graph theory, finite fields, partitions, block designs. Prereq: Multivariable Calculus and Matrix Algebra or consent of instructor.
3810 How to Prove It (3) Course is designed to improve undergraduate students' understanding and methods of mathematical proof by means of practice and participation in seminar setting. Variables include students in the College of Liberal Arts.
3920-30 Topology of Euclidean Spaces (4, 4) Topics will include topology of line and plane, separation properties, compactness, connectedness, completeness, continuous functions, homeomorphisms, continua, and topological invariants. Must be taken in sequence. Prereq: Multivariable Calculus and Matrix Algebra and 3810, or Honors: Multivariable Calculus and Linear Algebra.
3990 Studies in Mathematics (1-4) Credit determined at registration. Prereq: Consent of instructor. May be repeated for credit with consent of department. Maximum 9 hrs.
4010-45 Introduction to Numerical Linear Algebra (3, 3) (Same as Computer Science 4035-45).
4050 Matrix Algebra and Applications (3) Matrices, elementary operations, systems of linear equations, vector spaces, determinants, eigenvalues and eigenvectors. Prereq: Multivariable Calculus and Matrix Algebra or Calculus or consent of instructor.
4060-70 Matrix Algebra and Applications (3, 3) Eigenvalues and eigenvectors, singular values and singular vectors, unitary and similar transformations, quadratic forms, vector and matrix norms, Jordan canonical form, and related topics. Prereq: Multivariable Calculus and Matrix Algebra.
4120 Linear Algebra (3) Abstraction, vector spaces, linear transformations, and their matrices, systems of linear equations and determinants, inner products, and diagonalization of symmetric matrices. Prereq: Multivariable Calculus and Matrix Algebra or 4050.
4150-60 Abstract Algebra (3, 3) Equivalence relations and partitions, properties of integers, elementary theory of groups of rings, polynomial rings, fields, domains, divisibility,
4225-35 Introduction to Numerical Analysis (3, 3) Interpolation and approximation, numerical differentiation and integration, roots of equations, systems of linear and nonlinear equations. Prereq: Stat 3155. (Same as Computer Science 4225-35.)


4250 Elementary Complex Variables (3) Complex numbers, Cauchy's theorem and formula, Taylor and Laurent series, residues and their applications. Prereq: Multivariable Calculus and Matrix Algebra; one 4000-level mathematics course recommended.

4510-20-30 Introduction to Analysis (3, 3, 3) Real number system, functions, sequences, limits, continuity, uniform continuity, differentiation, integration. Functions of several variables, implicit function theorem, multiple integrals, infinite series, sequences of functions, uniform convergence. Taylor series. Should be taken in sequence. Prereq: Multivariable Calculus and Matrix Algebra.

4540 Infinite Series and Functions of Several Variables (3) General theory, power series and Taylor's formula, uniform convergence. Partial differentiation and maxima and minima for functions of several variables. Larson-Grange multipliers. Prereq: Multivariable Calculus and Matrix Algebra.

4550 Partial Differential Equations (3) Fourier series, Fourier integrals, orthogonal functions; the vibrating string; solution by series; heat flow, Bessel functions. Prereq: Multivariable Calculus and Matrix Algebra. Recommended: 4610 or 4710.


4740-50-60 The Numerical Treatment of Differential Equations (3, 3, 3) The mathematical principles underlying such methods as those of Gauss, Newton, Bensoussan, Graefe, and others for obtaining numerical solutions; theorems of Budan and Fourier, Sturm's theorem, stability, singular perturbations, and asymptotic methods. Prereq: Introduction to Analysis or consent of instructor.

4770 Foundations of Analysis (3) The mathematical principles underlying such methods as those of Gauss, Newton, Bensoussan, Graefe, and others for obtaining numerical solutions; theorems of Budan and Fourier, Sturm's theorem, stability, singular perturbations, and asymptotic methods. Prereq: Introduction to Analysis or consent of instructor.

4810 Elementary Number Theory (3) Divisibility; congruences; theorems of Fermat and Wilson; primitive roots; indices; quadratic reciprocity, Farey sequences, Pell's equation, and Cryptography. Prereq: Multivariable Calculus and Matrix Algebra or consent of instructor.

4890 Readings in Mathematics (1-3) Open to superior students with permission of department head. Independent study with faculty guidance. May be repeated. Maximum 9 hrs.

4990 Studies in Mathematics (1-4) Credit determined at registration. May be repeated. Maximum 9 hrs. Prereq: Recommendation of Mathematics Department faculty member and consent of department.

4992 Non-Thesis Graduation Completion (3) Required for the non-thesis student not otherwise registered during any quarter when a student uses the facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. 6/NC only.

5011 Elementary Functions from an Advanced Standpoint (3) Order and completeness axioms of the real numbers: limits of sequences, derivatives of functions and definitions and derivatives of the exponential, logarithmic and trigonometric functions; infinite series; convergence; Taylor's and Maclaurin's series; applications to construction of logarithmic and trigonometric tables. Prereq: Intermediate Analysis or 3110 or consent of instructor.

5012 Differential Geometry for Teachers (3-4) Advanced techniques applied to graphing functions. Curves, surfaces, parametrizations, singular points, tangent lines and tangent planes, osculating planes, arc length of curves in the plane and curves on a surface, curvature, torsion, asymptotes, local coordinates. Prereq: Each fall as a junior or senior. Recommended: 3120 or consent of instructor.

5013 Geometry for Teachers (3-4) Primarily for high school teachers of geometry. Historical and modern presentations of topics en- countered in Euclidean plane geometry; theorems, proofs, axioms, synthetic and metric; models; betweenness; congruence of segments and triangles; parallel postulates; similarity; area, ruler and compass constructions; Klein's Erlangen Program. Prereq: Consent of instructor.

5014 Analysis for Teachers (3-4) A study of functions of several variables, vectors, limits and continuity, partial derivatives, directional derivatives and gradient, implicit function theorem, maxima and minima, transformation, differentiation of functions of several variables. Prereq: Intermediate Analysis or consent of instructor.

5015 Probability and Statistical Inference for Teachers (3-4) Probability distributions including the binomial, hypergeometric, and Poisson; moment generating functions; expectation of continuous random variables; moment generating distribution of the uniform and normal distributions. Sampling including the Chi-square, F, and t distributions; interval estimation; confidence limits and variances; simple hypothesis testing. Prereq: 1 yr of calculus and 3050 or consent of instructor.

5050-60-70 Mathematical Logic (3, 3, 3) Truth functions, the symbolic and semantic definitions of some propositional theories, Gentzen's sequence-calculus and systems of natural deduction; algebraic logic, the semantic semantics of first order theories; elementary model and recursion theory; consistency, completeness, decidability.

5110-20-30 Theory of Functions of a Complex Variable (3, 3, 3) Complex numbers; infinite series; analytic functions; conformal mapping; analytic continuation; special functions. Prereq: Mathematics 4150-20 for 5110; 4530 for 5120. Must be taken in sequence.


5240-50-60 Linear Algebra (3, 3, 3) Metric spaces, finite and infinite dimensional Banach and Hilbert spaces, linear operators, vector and operator norms, spectral theory. Examples to be chosen from relevant applied areas. Prereq: 4150-20-50.


5310-20-30 Introduction to Higher Geometry (3, 3, 3) Projective spaces; coordinates and transformations; conics and quadrics. Elliptic and hyperbolic geometry from the viewpoint of projective geometry. Prereq: 4150-50. Must be taken in sequence.

5340-50-60 The Numerical Treatment of Algebraic and Transcendental Equations (3, 3, 3) The mathematical principles underlying such methods as those of Gauss, Newton, Bensoussan, Graefe, and others for obtaining numerical solutions; theorems of Budan and Fourier, Sturm's theorem, stability, and Hurwitz and other tests for localization of roots.

conditions for a weak extremum. Fields, Hilbert spaces, the Matrix Eigenvalue function, sufficient conditions for a strong extremum. Prereq: 4510-20-30 and 4610.

5450-50-70 Introduction to Partial Differential Equations (3, 3, 3) Linear second-order equations in two variables; properties of elliptic, hyperbolic and parabolic equations, separation of variables, and Fourier series; non-homogeneous problems, problems in higher dimensions, multiple Fourier series, Fourier and Laplace transforms. Prereq: 4510-20-30 and 4610 or consent of instructor.

5455 Finite Difference Methods for Partial Differential Equations. Finite difference techniques for the solution of parabolic, elliptic, and hyperbolic equations. Computer implementation, stability, consistency and convergence; nonlinear problems; curved boundaries; solution of linear systems. Prereq: 3150 or 3155 and 4550. (Same as Computer Science 5455.)

5465 Mathematical Aspects of the Finite Element Method (3) Implementation of the Ritz-Galerkin methods for the solution of ordinary and partial differential equations. Local bases, approximation theory, rate of convergence, eigenvalues and eigenvalue problems, singularities, hybrid elements. Prereq: 3150 or 3155 and 4550. (Same as Computer Science 5465.)


5540 Galois Theory (3) Fields and their extensions, separable and normal extensions, algebraic closure, groups of automorphisms, fundamental theorem, solvability of equations by radicals. Prereq or coreq: 5520. 5550-70-90 Theory of Matrices in Numerical Analysis (3, 3, 3) 5550—Fundamental matrix identities and inequalities; Factorization theorems, generalized reciprocals, Hadamard inequalities, Lanczos reductions. 5570—Vector and matrix norms, convergence, domains of inclusion and exclusion of roots of matrices; the field of values; orthomax and minimax they arem for Hamiltonian matrices; Kantorovich inequalities. 5580—Computational methods for inverting matrices, direct and by successive approximation; methods of reduction to normal form; successive approximations to the roots of matrices; measures of error. Prereq: Consent of instructor.

5590 Theory of Rings (3) Direct and subdirect products of rings, prime and maximal ideals; modules and ring isomorphism; Wedderburn-Artin structure theorem. Prereq: 5520.

5610-20-30 Mathematical Methods in Physics (3, 3, 3) (Same as Physics 5610-20-30.)

5640 Numerical Methods in Physics (3) (Same as Physics 5640.)

5655-65-75 Numerical Mathematics (3, 3, 3) The numerical linear algebra of linear algebraic equations, systems of non-linear equations and the algebraic eigenvalue-algebraic problem. Prereq: 4045 or 4295. (Same as Computer Science 5655-65-75.)

5710-20-30 Tensor Analysis (3, 3, 3) The absolute differential calculus in three-dimensional Euclidean space; differential geometry of curves and surfaces; tensors and their extension to n-dimensional space. Prereq: Major in mathematics or physics. Must be taken in sequence.


5810-20-30 Number Theory (3, 3, 3) Arithmetic functions, distribution of primes, Diophantine equations, approximation theory. Shin- irman density and Mann's theorems on quadratic forms, Dirichlet's theorem, prime number theorem. Prereq or coreq: 5510 for 5810; 5520 for 5820.


5990 Graduate Reading in Mathematics (1-3) Open to graduate students with permission of the department head. Independent study with faculty guidance. May be repeated. Maximum 9 hrs. 5991 Seminar Analysis (1-3)

5992 Seminar Topology (1-3)

5993 Seminar Algebra (1-3)

5994 Seminar Foundations (1-3)

5995 Seminar Applied Mathematics (1-3)

6000 Doctoral Research and Dissertation

6210-20-30 Linear Analysis (3, 3, 3) Algebraic and topological properties of linear spaces, emphasis on normed spaces; linear functionals and dual spaces; linear transformations; special topics (approximation theory, ergodic theory, semi-groups of transformations); applications to problems in analysis. Prereq: 4510-60 and 5210-20-30. Must be taken in sequence.

6450-60-70 Partial Differential Equations (3, 3, 3) Advanced topics in classical and modern theoretical partial differential equations. Prereq or coreq: 5110-20-30 and 5210-20-30 or consent of instructor.

6510-20-30 Modern Algebra (3, 3, 3) Intensive study of some major branch of algebraic theory. Subject matter will vary according to interests and preparation of students. Prereq: 5510-20-30.

6540-50-60 Theory of Semigroups (3, 3, 3) Congruences and homomorphisms; ideal theory; representations, decompositions, and extensions; free, regular, inverse, simple, and completely simple semigroups. Prereq: 5520.

6570 Theory of Groups (3) Structure of groups, free groups, nilpotence and solvability, extensions and free products of permutation groups, abelian groups. Prereq: 5520.

6610-20-30 Advanced Ordinary Differential Equations (3, 3, 3) Theory of ordinary differential equations from an advanced viewpoint. Topics from the current literature. Subject matter varies according to interests and preparation of students. Prereq or coreq: Intro. to Differential equations or 4610, 4510-60, and 5110-20-30 or 5210-20-30 or consent of instructor.


6810-20-30 Topological Algebra (3, 3, 3) Topics chosen from topological semigroups, topological groups, Lie groups; transformation groups; topological lattices; relations in topological spaces; topological rings, fields, algebraic geometry. Prereq or coreq: 5910-20-30.

6910-20-30 Modern Topology (3, 3, 3) This course provides technical background to read and contribute to current literature in topology. Topics vary from year to year.

6940-50-60 Introduction to Algebraic Topology (3, 3, 3) Introduction to algebraic topology and homotopy theories. Typical topics discussed will be homology and cohomology groups, the Eilenberg-Steenrod axioms, cup and cap products, duality theorems, homology equivalence, higher homology groups, fiber spaces, spectral sequences. Prereq: 4150 and 5920.

6991 Seminar Analysis (1-3)

6992 Seminar Topology (1-3)

6993 Seminar Algebra (1-3)

6994 Seminar Foundations (1-3)

6995 Seminar Applied Mathematics (1-3)

Registration for seminars may be repeated with consent of department.

Microbiology

MAJOR

DEGREES

Microbiology

M.S., Ph.D.


Associate Professors: J. M. Becker, Ph.D. Cincinnati; T. J. Mower, Ph.D. Maryland; W. S. Riggsby, Ph.D. Yale.

Assistant Professors: D. A. Bryan, Ph.D., D.V.M. Michigan State; R. V. Miller, Ph.D. Illinois; G. S. Sayler, Ph.D. Idaho.

Lecturers: H. I. Adler, Ph.D. Cornell; B. B. Bellomy, M.D. Georgetown; W. Farkas, Ph.D. Duke; B. B. Lozio, M.D. Buenos Aires; C. J. Wust, Ph.D. Baylor; R. W. Tennant, Ph.D. Georgetown.

Students planning to major in microbiology are expected to present, as undergraduate prerequisites, a minimum of 1 year of biology, 1 year of mathematics including calculus, 2 years of chemistry and 1 year of physics.

The student's dissertation committee determines whether a foreign language is required for the Doctor's degree.

3000 Introduction to Microbiology (3) Eucaryotic and prokaryotic protists, viruses, microbial growth, bacterial structure, bacterial and viral genetics, pathogenesis, immunity and applied microbiology. Prereq or coreq: General Genetics.

3009 Introductory Microbiology Laboratory (2) Laboratory exercises designed to accompany Microbiology 3000.

3061 Pathogenic Microbiology (3) The disease producing microorganisms including bacteria, rickettsia, chlamydia, and fungi.

3069 Pathology Microbiology Laboratory (2) Techniques for the isolation, cultivation, and identification of pathogenic microorganisms.

3071 Immunology (3) Concepts of antigens and antibodies; molecular aspects of immuno-
globulins; theories on immunoglobulin synthesis, the molecular and cellular levels; Reticuloendothelial System; complement; immediate type hypersensitivity and cell-mediated immunity; T and B cell interactions; immunodeficiency diseases; immune injury; blood group substances, autoimmunity; and transplantation.

3079 Immunology Laboratory (2) Laboratory procedures involving several species of animals, and techniques used in immunology research. Prereq. or coreq. 3071.


3820 Yeast and Molds (4) Morphology, taxonomy, and physiology of yeasts, actinomycetes, and fungi of industrial importance. Prereq. Microbiology and Elements of Organic Chemistry or Organic Chemistry or consent of instructor.

4111 Physiology of Bacteria (3) Cell chemistry and structure; growth, nutrition, and metabolism of microorganisms. Prereq. 3000, 3009, and an acceptable grade in Organic Chemistry.

4112 Bacteriological Laboratory (2) Prereq. or coreq. 4111.

4130 Taxonomy of Bacteria (3) Bacterial classification. Prereq. 3000, 3009.

4521 Virology (3) The spectrum of bacterial, animal and plant viruses is presented with special emphasis on a comparison of the infectious cycles and the molecular concepts of replication. Prereq. 3000, 3009. Biochemistry 4110-20 or consent of instructor.

4529 Virology Laboratory (2) Laboratory procedures for the isolation, handling and culturing of both animal and bacterial viruses. Methodology for the conduct of molecular studies of virus replication is presented. Prereq. or coreq. 4521.


4819 Bacterial and Viral Genetics Laboratory (3) Special laboratory exercises designed to accompany 4811. Coreq. 4811, or prereq. General Genetics.

4820 Medical Mycology (2) Disease-causing fungi; cytology; physiology, pathogenesis and immunity; epidemiology; methodology of isolation and identification. Prereq. 3000, 3009, and 3820 or consent of instructor.

4829 Medical Mycology Laboratory (2) Prereq. or coreq. 4820.


5000 Thesis

5002 Non-Thesis Graduation Completion (3) 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.

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 effort. May be repeated. S/NC only.

5130 Topics in Taxonomy (3) Isolation, cultivation and taxonomic relationships of schizomyces, with emphasis upon the less frequently encountered orders. Prereq. 4130. 3 labs.

5310 Selected Topics in Microbiological Research (3) Literature surveys and laboratory methods for the development and interpretation of microbiological research. May be repeated.

5360 Topics in Immunology and Immunochimistry (4) Molecular and genetic aspects of immunoglobulin synthesis. Theoretical and practical exercise in immunochimistry. Prereq. 3071, 3072, Biochemistry 4110-20 or equivalent.

5400 Seminar in Microbial Physiology (1) Readings and discussions based on the current literature. May be repeated. S/NC only.

5410 Seminar in Immunology (1) Readings and discussions based on the current literature. May be repeated. S/NC only.

5441-43-44-45-46 Clinical Microbiology (6, 6, 6, 6, 6) Six quarters, six quarter hours each consisting of lectures and clinical laboratory experience. Enrollment by permission of the department head.

5510-20-30 Research Problems (3, 3, 3) 5720 Microbiological Physiology (3) Lectures and seminars dealing with current advances in bacterial physiology including growth and cell structure. Prereq. 4111; Biochemistry 4110-20.

5730 Pathogenesis of Infectious Disease (3) Host response to infection. Derangement of host-metabolism stimulated by microbial invasins, exotoxins, endotoxins and other factors related to virulence. Alteration of genetic and hormonal controls resulting from progressive infection. Prereq. 3071.

5750 The Oncogenic Viruses (3) Lectures and special laboratory exercises dealing with known tumor-inducing viruses. Prereq. 4521 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 will be supplemented by readings from the literature. Prereq. 4521; Biochemistry 4110-20.

5819 Molecular Genetics Laboratory (3) Principles and methods of research in molecular genetics. Fundamental genetics concepts (mutation, complementation, recombination) at the molecular level. Emphasis on studies of the lactose operon of Escherichia coli. Prereq. 4811 and Biochemistry 4110-20 or consent of instructor.

5820 Microbiology of Foods (3) Lectures and seminars dealing with current advances and selected topics in food microbiology with emphasis on analytical methods, safety and preservation. Prereq. 3810; Biochemistry 4110-20. Recommended: Food Technology 4920.

5829 Experimental Microbial Ecology (3) Survey of techniques for the assessment of microbial forms, functions, activities, and interactions in a variety of habitats. Prereq. 3005; Coreq. 4950 or consent of instructor. 1 hr and 2 labs.

5830 Seminar in Microbial Pathogenesis (1) Readings and discussions based on the current literature. May be repeated. S/NC only.

5850 Seminar in History of Microbiology (1) Studies concerned with microbiologists and their achievements from Pasteur to the present. S/NC only.

5940 Seminar in Microbial Genetics (1) Readings and discussions based on the current literature. May be repeated. S/NC only.

5970 Seminar in Virology (1) Readings and discussions of current literature. May be repeated with consent of department. S/NC only.

6000 Doctoral Research and Dissertation

6410 Concepts of Immunity (3) Discussions; readings, and laboratory in the most recent advances of resistance to infectious disease. 3 three-hr labs.

6720 Advanced Topics in Microbial Physiology (3) Prereq. 5630 or 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. 4521. May be repeated with consent of department.

6750 Advanced Topics in Microbial Genetics (3) Prereq. 5840. 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.A., M.M.


The Department of Music offers the degrees of Master of Music with concentrations in performance, composition, theory, choral conducting, Suzuki string techniques, and piano literature and the Master of Arts with a major in music with concentrations in theory and musicology. Applicants for these degree programs must have completed an undergraduate degree approximately equivalent in music requirements to those required in degrees conferred by the University of Tennessee at Knoxville, appropriate to the prospective area of concentration on the Master's level.

Applicants who plan to pursue the degree in performance (applied music) are required to audition before the appropriate area committee. Applicants for admission to the program in composition
must submit scores and tape recordings of representative works. All applicants are required to take the Diagnostic Examination in music theory and music history and literature.

General requirements for the Master's degree begin on page 17 of this catalog.

MASTER OF MUSIC DEGREE CURRICULA

Voice: 45 hours distributed as follows: (a) 12 hours in applied music, (b) 6 hours in area literature, (c) 3 hours in music research, (d) 6 hours in ensemble, (e) 3 hours in theory, (f) 3 hours in recital, and (g) 12 hours in music electives.

Piano: 45 hours distributed as follows: (a) 12 hours in applied music, (b) 9 hours in piano literature and/or pedagogy, (c) 3 hours in music research, (d) 6 hours in music theory, (e) 3 hours in ensemble or accompanying, (f) 6 hours in music history/literature, (g) 3 hours in recital, and (h) 3 hours in music electives.

Organ: 45 hours distributed as follows: (a) 12 hours in applied music, (b) 6 hours in organ literature and/or pedagogy, (c) 3 hours in music research, (d) 9 hours in music theory, (e) 3 hours in recital, (f) 6 hours in music history/literature, and (g) 6 hours in music electives.

Strings: 45 hours distributed as follows: (a) 12 hours in applied music, (b) 6 hours in area literature and/or pedagogy, (c) 3 hours in research techniques, (d) 6 hours in ensemble, (e) 3 hours in theory, (f) 3 hours in recital, and (g) 12 hours in music electives.

Wind and Percussion Instruments: 45 hours distributed as follows: (a) 12 hours in applied music, (b) 6 hours in area literature, (c) 3 hours in music research, (d) 3 hours in advanced conducting, (e) 3 hours in music theory, (f) 3-6 hours in ensemble, (g) 3 hours in recital, and (h) 9-12 hours in music electives.

Composition: 45 hours distributed as follows: (a) 9 hours in applied composition, (b) 3 hours in music research, (c) 15 hours in music theory, (d) 6 hours in music history/literature, (e) 9 hours in theory, and (f) 3 hours in electives.

Music Theory: 45 hours distributed as follows: (a) 18 hours in music theory, (b) 3 hours in music research, (c) 6 hours in music history/literature, (d) 9 hours in thesis, and (e) 3 hours in electives.

Choral Conducting: 45 hours distributed as follows: (a) 6 hours in conducting, (b) 6 hours in choral literature/techniques, (c) 3 hours in music research, (d) 9 hours in theory, (e) 6 hours in ensemble, (f) 3 hours in choral conducting performance or document, and (g) 12 hours in electives.

Suzuki String Techniques: 45 hours distributed as follows: (a) 12 hours in applied music, (b) 6 hours in Suzuki literature/techniques, (c) 3 hours in music research, (d) 3 hours in music theory, (e) 3 hours in recital, (f) 6 hours in ensemble, and (g) 12 hours in electives.

MASTER OF ARTS CURRICULA

Music Theory: 45 hours distributed as follows: (a) 18 hours in theory, (b) 3 hours in music research, (c) 9 hours in music history/literature, (d) 9 hours in thesis, and (e) 8 hours in electives.

Musical Composition: 45 hours distributed as follows: (a) 21 hours in music history/literature, (b) 3 hours in music research, (c) 6 hours in theory, (d) 9 hours in thesis, and (e) 6 hours in electives.

A reading knowledge of French or German must be demonstrated by candidates for the Master of Arts degree.

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.

3041 Keyboard Harmony (2) Melody harmonization, figured bass realization, and improvisation. Prerequisite: Harmony I, slight singing and ear training, and keyboard proficiency at the 2000 level.

3051 Organ Improvisation (2) Prerequisite and organ proficiency at the 2000 level.

3114-24 Choral Arranging (3, 3) Analysis of scores and writing of choral arrangements for choirs. 3114—male and female chorus; 3124—mixed chorus. Prerequisite: Instrumentation or consent of instructor.

3122 Orchestration (3) Advanced techniques in instrumental writing with emphasis on scoring for the concert orchestra. Prerequisite: Instrumentation or consent of instructor.

3230 The Concerto (3) Survey of orchestral literature from the eighteenth century to the present.

3240 The Symphony (3) Survey of symphonic literature from precursors of the classical symphony to the present.

3260 Chamber Music (3) Survey of chamber music from 1750 to the present.

3271-81 History of Opera (3, 3) A general history of opera, covering the earliest settings of the Ordinary through the Baroque period.

3340 Oratorio (3) Choral works other than those appropriate for use in church.

4001 Organ Design (3) Historical, tonal and mechanical principles of organ design.

4041 Styles in Opera Acting (3) Study and practice of styles in opera acting based on historical and national characteristics. Prerequisite: Fundamentals of Opera Acting or consent of instructor.

4045 Projects in Opera Theatre (1-3) May be repeated for credit. Prerequisite: Consent of instructor.

4050 Advanced Instrumental Conducting (3) Development of knowledge and skills in instrumental conducting; study of various periods and composers and relationship of different styles to the conductor's art; musical analysis and practical directing. Prerequisite: Instrumental Conducting or equivalent.

4060 Advanced Choral Conducting (3) Development of knowledge and skills in choral conducting; study of various periods and composers and relationship of different styles to the conductor's art; musical analysis and practice in conducting. Prerequisite: Choral Conducting or equivalent.

4111-21-31-41 Analysis of Music Literature (3, 3, 3, 3) Detailed examination of music compositions by historical period with emphasis on harmony, thematic material, form and structure. Prerequisites: 4111-1600-1750; 4121-1750-1825; 4131-1825-1900. 4141-1890 to present. Prerequisites: Analysis II.

4112 Twentieth-Century Compositional Techniques (3) Stylized techniques of composition from Debussy to Stravinsky. Prerequisite: Harmony II or equivalent.

4113 Pedagogy of Music Theory (3) Techniques most frequently employed in college-level theory programs. Prerequisite: Consent of instructor.

4114 Stage Band Arranging (3) Analysis of scores and scoring for the stage band. Prerequisite: Instrumentation and consent of instructor.

4115 Variation (3) Study and application of variation procedures. Prerequisites: Analysis II or equivalent.

4116 Set Structure and Musical Composition (3) Theory of sets and its application to analysis of music. Prerequisite: Consent of instructor.

4124 Band Arranging (3) Study and application of techniques employed in scoring for the marching and concert bands. Prerequisites: Instrumentation or equivalent.

4134 Band Transcription (3) Technique and application of transcription from keyboard literature and orchestra music for concert band; editing and recomposing. Prerequisite: Instrumentation or equivalent.

4210 Music in the Romantic Period (3) Survey of music from the mid-nineteenth century to the post-Romantic instrumental and vocal styles.

4230 Contemporary Music: 1945 to Present (3) Survey of new and avant-garde music in Europe and America since World War II.

4241 American Music (3) American music from colonial times to the present. Emphasis on twentieth-century music. Includes both folk and cultivated traditions.

4260 Introduction to Ethnomusicology (3) Basic attitudes and techniques of ethnomusicology. Survey of music cultures of the Pacific, Near East, Asia and Africa.


4290 Gregorian Chant (3) Chants of Latin rite. Masses and Office examined as functional music as well as by type.

4310 History of Art Song (3) Survey of art song within the art song song from the nineteenth century to the present.

4315 Wind Chamber Music (3) Study of wind chamber music from the eighteenth through the twentieth century. Emphasis placed on style interpretation, rehearsal techniques, programming and musical significance, both historical and theoretical.

4348-50 Works of Bach (3, 3, 3) Detailed examination of representative works. All applicants are required to take the Diagnostic Examination in music theory and music history and literature.

College of Liberal Arts 129
**5000 Thesis**


5002 Non-Thesis Graduation Completion (3) 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. B/NC only.

**5010 Organ Literature Seminar (3)** Topics vary. Prereq: Organ Literature.


**5030 Choral Literature Seminar (3)** Topics vary.

**5040 Vocal Literature Seminar (3)** Topics vary. Prereq: Consent of instructor.

5050 Graduate Recital (3)

5051 Opera Performance (3)

5052 Vocal Chamber Music Performance (3)

5053 Choral Conducting Performance (3)

5056 Seminar in Choral Performance (3) The laboratory periods are designed to provide opportunities for the students to perform in a well-organized and directed manner. Prereq: Consent of instructor.

5058 Seminar in Choral Music (3) The study of rehearsal and performance problems and techniques as allied to score reading and preparation. Particular attention will be afforded to individual problems. Prereq: 4060 or equivalent.

**5070 Opera Production (1-3)** Prereq: Consent of instructor.

**5090 Special Topics in Performance (1-3)** Prereq: Consent of department head.

**5100 Independent Study in Music Theory (1-3)** Prereq: Consent of department head.

5111 Advanced Harmony (3) An analytic survey of tonal harmony from compositions from 1700 to present. Exercises in writing and interpreting melodic and harmonic material. Prereq: Consent of instructor.

**5112 Proseminar in Music Theory (1)** Discourse, analysis, research writing in theoretical topics. Prereq: Consent of instructor.

5114 History of Music Theory (3) A survey of the work and contributions of theorists from ancient Greece to present. Emphasis on the development of academic instruction in music theory. Prereq: Consent of instructor.

5115 Theory of Computers and Music Research (3) Theory of computer applications in music, emphasizing techniques of analysis and indexing. Prereq: Consent of instructor.

5116 Musical Styles (3) The elements of design and their role in the definition of musical styles. Exercises in aural and visual identification. Prereq: Consent of instructor.


5121 Analytical Techniques (3) A survey of analytical techniques with emphasis on contemporary approaches. Tonal and neotonal music. Prereq: Consent of instructor.

**5125 Practicum in Computers and Music Research (3)** Programming languages, design, and implementation of projects in musical analysis, composition, and indexing. Prereq: 5115 or consent of instructor.

**5150 Seminar in Music Theory (3)** Topics vary. Prereq: Consent of instructor.

**5200 Independent Study in Music History and Literature (1-3)** Prereq: Consent of department head.

5210 Introduction to Music Research (3)

5220 Proseminar (3) Research techniques in music emphasizing bibliography, writing of research papers and presentation of oral reports. Prereq: Consent of instructor.

**5270 Seminar in Musicology (3)** Topics vary. Prereq: Consent of instructor.

5315 Band Literature (3) A study of band literature and the origins of the band emphasizing its important, expanded cultivation during the past century in the 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) Survey of music from 1400 to 1600. Mass, motet, chansons, madrigal, and other vocal and instrumental forms and genres.


5355 Music in the Classic Period (3) Pre-classic music (Rococo) and music of Haydn, Mozart and early Beethoven. Includes background of other cultural and artistic activities.

5500 Flute (1-4)

5505 Oboe (1-4)

5510 Bassoon (1-4)

5515 Clarinet (1-4)

5520 Saxophone (1-4)

5525 Horn (1-4)

5530 Trumpet (1-4)

5535 Trombone (1-4)

5540 Baritone (1-4)

5545 Tuba (1-4)

5550 Percussion (1-4)

5555 Viola (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) May be repeated. Maximum 9 hrs. Prereq: 3198 and consent of instructor.

**5600 Small Ensemble (1)**

**5602 Brass Choir (1)**

**5604 Jazz Ensemble (1)**

**5606 Trombone Choir (1)**

**5607 Tuba Ensemble (1)**

**5610 Percussion Ensemble (1)**

**5612 Baroque Ensemble (1)**

**5620 UT Singers (1)**

**5630 Chamber Singers (1)**

**5632 Collegium (1)**

**5634 Saxophone Choir (1)**

**5640 Opera Theatre (1)**

**5642 Opera Workshop (1)**

**5650 Concert Band (1)**

**5652 Campus Band (1)**

**5654 Varsity Band (1)**

**5656 Laboratory Band (1)**

**5657 Marching Band (1)**

**5670 Symphony Orchestra (1)**

**5680 Concert Choir (1)**

**5682 University Chorus (1)**

**5684 Campus Chorus (1)**

**5686 Men's Glee Club (1)**

**5689 Women's Chorale (1)**

**5599 Accompanying (1)**

* May be repeated.

** May be repeated. Maximum 6 hrs.

**Philosophy**

MAJOR DEGREES

Philosophy M.A., Ph.D.

Professors: J. W. Davis (Head), Ph.D. Emory; R. B. Edwards, Ph.D. Emory; R. D. Hurnann, Ph.D. Marin (Germany); M. H. Moore (Emeritus), Ph.D. Chicago; D. Van de Vate, Jr., Ph.D. Yale.

Associate Professors: R. E. Aguil, Ph.D. Northwestern; L. B. Scher, Ph.D. Nebraska; G. C. Grabi, Ph.D. Michigan.

Assistant Professors: J. O. Bennett, Ph.D. Tulane; G. G. Brokert, Ph.D. Michigan; S. H. Cohen, Ph.D. Northwestern; K. A. Emmert, Ph.D. Ohio State; H. P. Hamlins, Ph.D. Georgia; R. Jones, Ph.D. Chicago; B. C. Latta, Ph.D. Yale; S. Reaven, Ph.D. California (Berkeley).

M.A. or Ph.D.

**5910-20-30** May be repeated for credit in major. May be repeated for credit in major. Courses below 4000 may not be taken for graduate credit by philosophy majors except with special permission.

**DOCTORAL PROGRAM**

Specific requirements for doctoral students in philosophy include a minimum of 3 academic years of graduate study involving at least 72 quarter hours credit in course work (normally 24 quarter courses or their equivalent, exclusive of credit for the thesis and dissertation) of which not less than 45 shall be in courses numbered over 5000, and of which at least 9 shall be in a subject other than philosophy. The specific number and distribution of courses will be determined by the student’s faculty committee.

Two foreign languages, normally French and German, are required.

Registration in any course in the 5000 or 6000 series (except 5050 and 5910-20-30) may be repeated for credit with the consent of the department.

That is, courses having the same number,
but with different subject matter, may be taken with each separate subject description.

MEDICAL ETHICS

The department has an M.A. and Ph.D. program of graduate study with a concentration in Medical Ethics. Details concerning the program can be obtained from the department.

RELIGIOUS STUDIES

The department has an M.A. program of graduate study with a concentration in philosophy of religion and other religious studies. Details concerning the program can be obtained either from the departments of Philosophy or Religious Studies.

3111 History of Ancient Philosophy (4) Pre-Socratic through Aristotle.

3121 History of Hellenistic, Roman, and Medieval Philosophy (4)

3131 History of Seventeenth- and Eighteenth-Century Philosophy (4)

3141 History of Nineteenth- and Early Twentieth-Century Philosophy (4)

3270 Russian Philosophical and Theological Thought (4) (Same as Religious Studies 3270)

3311-12 American Philosophy (4, 4) 3311—Colonial to late 19th century. 3312—Late 19th century to present.

3315 American Ideals (4) Ideological variants in the American scene.

3320 Philosophy of Law (4) Nature, sources, function of law.

3330 Philosophy of History (4) Speculative and critical aspects of the philosophy of history.

3410 Philosophical Ideas in Literature (4) Philosophic assumptions and implications in major literary works.

3420 Philosophy of Literature (4) Study of the nature, functions, value and epistemic principles of literary arts.

3430 Concepts of Woman (4) Examination of some of the theoretical foundations of feminism and anti-feminism.

3440 Social Ethics (4) Ethical theory as related to politics, economics, law, religion and the family.

3510 Existentialism (4)

3550 Marxism as Philosophy (4)

3550 Philosophy and Religion in India (4) (Same as Religious Studies 3550)

3600 Buddhist Philosophy and Religion (4) (Same as Religious Studies 3600)

3690 Philosophy of Religion (4) Analysis of basic issues of religion. (Same as Religious Studies 3690)

3720 Science, Technology, and the Modern World: A Philosophical Approach (4)

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.

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.

3810 Introductory Symbolic Logic (4) Techniques for formal analysis of deductive reasoning (propositional logic and quantification theory).

3910 Contemporary Aesthetics (4) Philosophical discussion of contemporary art.

4000 Special Topics (4) A student- or instructor-initiated course to be offered at the convenience of the department. Subject matter to be determined by mutual consent of students and instructor with approval of department. Prerequisites to be determined by department.

4111-21 Modern Religious Philosophies (4, 4) (Same as Religious Studies 4111-21)

4310 Intermediate Ethics (4) Topics in meta-ethics or ethics. Prereq: Elementary Ethics.

4370-71 Theoretical Issues in Medical Ethics (4, 4) Prereq for 4370: Elementary Ethics or Religious and Philosophical Issues of Medical Ethics or consent of instructor. Prereq for 4371: 4370 or consent of instructor. (Same as Religious Studies 4370-71)

4410 Plato (4) Prereq: 8 hrs of philosophy or consent of instructor.

4420 Aristotle (4) Prereq: 8 hrs of philosophy or consent of instructor.

4430 Medieval Philosophy (4) Prereq: 8 hrs of philosophy or consent of instructor.

4450 Continental Rationalism (4) Prereq: 8 hrs of philosophy or consent of instructor.

4460 British Empiricism (4) Prereq: 8 hrs of philosophy or consent of instructor.

4470 Kant (4) Prereq: 8 hrs of philosophy or consent of instructor.

4480 Advanced Topics in Existentialist and Phenomenological Philosophy (4) Prereq: 8 hrs of philosophy or consent of instructor.

4490 Process Philosophy (4) Prereq: 8 hrs of philosophy or consent of instructor.


4511 Advanced Topics in Logic (4) Prereq: Consent of instructor. May be repeated.

4610 Philosophical Analysis (4) Prereq: 8 hrs of philosophy or consent of instructor.

4620 Philosophy of Mind (4) Problems of mind and body in relation to consciousness and personal identity. Prereq: 8 hrs of philosophy or consent of instructor.

4630 Philosophy of Language (4) Prereq: 8 hrs of 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 of natural science.

4720 Philosophy of Social Science (4) Examination of methods of inquiry and modes of explanation in social sciences. Prereq: 3770 or 2 yrs of social science.

4810 Metaphysics (4) Prereq: 8 hours of philosophy or consent of instructor.

5000 Thesis

5050 Symbolic Logic (4)

5080 Philosophy of Nature (4) Nature of logic: epistemological, metaphysical and axiological assumptions and Implications in various theories of logic. Prereq: 4510 or its equivalent.


5250 Studies in the History of American Philosophy (4) Intensive, critical work on a major philosopher or a school.


5370 Topics in Medical Ethics (4) Prereq: 4371 or permission of the Medical Ethics Committee.

5410 Philosophy of History (4) Theories of history and historical processes.

5430 Philosophy and Literature (4) Mutual influence of philosophy and literature, the possibility of a philosophy of literature, the philosophy of criticism.

5450 The Problem of the Self (4) Current studies in sociology, social psychology, and philosophy are used to amend and elucidate traditional philosophical treatments of the problem of the self.

5460 Philosophy of Mind (4) An examination of the relation of the mental to the physical and of the role of words in discourse for mental activities such as thinking and feeling.


5550-60 Philosophy of Science (4, 4) The nature of the subject matter and method of the sciences. 5550—Natural sciences. 5560—Social sciences.

5610 Recent Developments in Philosophy of Religion (4)

5710 Studies in Metaphysics (4) Metaphysics of a philosopher or systematic philosophic tradition.

5810 Social and Political Philosophy (4)

5910-20-30 Research (4, 4, 4) Independent study under the direction of a member of the department.

5950 Clinical Practicum in Medical Ethics (4-12) Prereq: Permission of the Medical Ethics Committee. Open only to students concentrating in medical ethics.

6000 Doctoral Research and Dissertation

6110-20-30 Seminars in the History of European Philosophy (4, 4, 4)

6150-50 Seminars in the History of American Philosophy (4, 4)

6250 Seminar in the Philosophy of Religion (4)

6310 Seminar in Axiology (4)

6370 Advanced Topics in Medical Ethics (4) Prereq: 5370 or permission of the Medical Ethics Committee.

6510 Seminar in Epistemology (4)

6550 Seminar in Philosophy of Science (4)

6950 Advanced Residence in Medical Ethics (4-12) Prereq: Permission of the Medical Ethics Committee. Open only to students concentrating in medical ethics.
and research work in areas pertinent to atmospheric and space flight are available at the Space Institute, Tullahoma.

All first-year graduate students are required to take comprehensive examinations in undergraduate physics during the fall quarter registration period.

M A S T E R ' S P R O G R A M

The Physics department has 2 Master's degree programs—thesis and non-thesis.

The thesis program is primarily designed for students intending to work in industry or governmental laboratories as physicists. The course requirements include 36 quarter hours in such courses as Physics 4610-20-30, 4610-20-30, 5110-20-30, 5210-20-30, 5310-20-30, 5610-20-30 and appropriate courses in related fields. Each candidate must present an acceptable thesis, equivalent to 9 hours of credit, and pass an oral examination on course material and thesis.

The non-thesis program is primarily designed for students intending to teach in colleges or universities on the elementary or intermediate level, or for students specifically intending to work toward a Ph.D. Students seeking an M.S. in Physics by this method must apply to the department's graduate committee for permission to enroll under this program. The requirements for the M.S. under this method are the satisfactory completion of 45 hours of course work composed of 27 hours from courses numbered above 5000 (e.g., 5110-20-30, 5210-20-30, 5310-20-30, etc.); 9 hours in a minor field (e.g., mathematics); and 9 hours from other courses in physics numbered above 4000 (preferably of advanced laboratory nature). In addition, the candidate must pass a comprehensive examination administered by the committee.

The Physics department is also participating in the program which leads to the Master of Arts in College Teaching degree, in addition to the requirements for either of the Master's programs described above, the M.A.C.T. degree in physics requires 15 more hours of credit, making a total of 30 quarter hours. Nine of these hours are specified as follows: 3 hours in a seminar course dealing with general problems of college teaching; 3 hours in a seminar course dealing with special problems in the teaching of physics; and 3 hours in a course dealing with the history and philosophy of physics. The other 6 hours of course work may be elected from any of the physics courses numbered above 5000. During the two-year program leading to the M.A.C.T. degree, the candidate will be continually engaged in supervised teaching activities.

D O C T O R A L P R O G R A M

All students are expected to take Physics 4610-20-30, 4610-20-30, 5210-20-30, 5310-20-30, 5610-20-30, 5710-20-30, and 5810-20-30.

Physics 6210-20-30 are normally required of students specializing in nuclear physics, Physics 6500-10 of students in plasma physics, Physics 6610-20-30 of students in health physics. Physics 6710-20-20 of students specializing in molecular spectra. (The Master's degree is not required.)

A reading knowledge of one foreign language in which there exists a significant body of literature is required.

German or French 3030 with a grade of A or B may be substituted for the corresponding language examination.

The thesis topics are selected in consultation with reference to one of the fields in which research facilities can be made available either at the University laboratory or at the Oak Ridge National Laboratory, Oak Ridge, Tennessee.

A program leading to the Ph.D. in physics is conducted jointly with the Chemistry department, which offers a similar degree. Physics departmental requirements for the degree in chemical physics include the successful completion of: Physics 4510, 4610-20-30, 5210-20-30, 5310-20-30, 5410-20-30, 5610-20-30, 6110-20-30, and either 6810 or 5720; Chemistry 4160, 5400, and any two of Chemistry 5340-50, 5460, 6730 or 6810-20.

A s t r o n o m y


P h y s i c s


3330 Heat and Thermodynamics (3) Concepts of temperature and heat; laws of thermodynamics; applications of laws to simple physical and chemical problems. Prereq: College physics and calculus; 3210-20 or consent of instructor.


3510-20-30 Physical Measurements (3, 3, 3) Laboratory measurement of some physical quantities. Theory supplied when necessary. Prereq: College physics and calculus; 3610 for 3520 and 3530. 3 labs.

3610-20 Electronics (3, 3) Electronic components and circuits of interest to physicists. Prereq: College physics and calculus. 3610 for 3630. 3 labs.

3630 Nuclear Electronics Laboratory (3) Elementary circuits of interest in nuclear instrumentation are designed and built, and their characteristics are tested as a function of various parameters. Prereq: 3610-20.

3640-50-60 Health Physics Practicum (3, 3, 3) Instrumentation; legal aspects and practice of applied health physics; problem solving; record keeping and report writing. For students in the health physics cooperative program.

3710-20-30 Introduction to Atomic and Nuclear Physics (3, 3, 3) Special relativity and early quantum theory. 3720—Atomic and

4040 Foundations of Physics (3) Development of concepts and principles of classical and modern physics; their use in constructing a working model of the universe. Prereq: Multivariable Calculus and Linear Algebra and Fundamentals of Physics: Waves and Optics. Prereq or coreq: 3710; Honors: Modern Physics or 3710 for 3720-30.

4100 Elementary Nuclear Physics (3) General properties of nuclei, two-nucleon systems, nuclear forces, nuclear models, nuclear reactions, nuclear disintegrations and beta-decay, nuclear spin and magnetism. Prereq: 3730 or 4120.

4150 Physical Acoustics (4) Considerations fundamental to detailed investigation of any branch of acoustics; propagation of acoustic waves, interference phenomena, audible, the infrasonic, and the hypersonic ranges of frequencies. 3 hrs and 1 lab. Prereq: 3210-20, 3230.

4210-20-50 Electricity and Magnetism (3, 3, 3) Intermediate level electrodynamics: steady and alternating currents; laws of electromagnetism; Maxwell’s equations; radiation of electromagnetic waves; reflection, refraction, electromagnetic fields of moving charges. Must be taken in sequence. Prereq: Fundamentals of Physics, general physics, or elementary physics and calculus and analytical geometry.

4240-40 Modern Optics (4, 4) Geometrical optics: Reflection and transmission of light at a dielectric interface; paraxial theory of light propagation, 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: 4210 or consent of instructor. 3 hrs and 3 labs.

4510-20-30 Atomic Physics Laboratory (3, 3, 3) Experiments in fundamental particle properties, photoelectricity, conduction of electricity through gases, atomic and molecular spectroscopy; atomic, X-ray, Prereq or coreq: 3710-20-30. 3 labs.

4540-50 Experimental Nuclear and Radiation Physics (4, 4) Interaction of charged particles and electromagnetic radiation with matter; theory and characteristics of various detectors; statistics of counting, nuclear properties. Experiments illustrate recent techniques for investigating the nucleus and nuclear radiation. 1 hr lecture, 6 hrs lab. Prereq: Fundamentals of Physics: Electricity, Waves and Optics, Modern Physics.

4580 Principles of Nondestructive Testing (3) The detection and characterization of discontinuities in materials by non-destructive physical measurements. Ultrasonic, electromagnetic, holographic and penetrating radiation techniques are discussed. Prereq: One year of Fundamentals of Physics: Mechanics or Optics, Modern Optics, Modern Physics, or consent of instructor.


4710-20-30 Introduction to Health Physics (3, 3, 3) Radioactivity, interaction of electromagnetic radiation with matter, radiation quantiles and units; radiation detectors; X-rays and gamma rays, neutron activation interaction of charged particles with matter, stopping power, ionization density; counting statistics, shielding, dosimetry, waste disposal, criticality prevention, radiation biology and ecology. Prereq: 3730.

5000 Thesis

5002 Non-Thesis Graduation Completion (3) Required of all students other than those 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.

5080 Graduate Research Participation (3) Advanced research techniques are studied under the supervision of a staff research director whose research area coincides with the interests of the student. Open to all graduate students in physics. Prereq: Consent of department and research director. Course may be repeated for credit with consent of department. S/NC only.

5110-20-30 Introduction to Theoretical Physics (3, 3, 3) Intermediate level theoretical physics, with limited use of mathematics. Prereq: 3210-20, 4210-20; advanced calculus, differential equations, and vector analysis. Prereq: Consent of instructor. 3 hrs and 3 labs.

5120-20-30 Advanced Modern Physics (3, 3, 3) Basic principles of wave mechanics: one-electron atom; vector model; atomic and molecular spectroscopy; molecular binding; relativistic properties of nuclei (spin, magnetic moments, etc.); scattering phenomena; nuclear models and forces. Prereq: 3710-20, 3720-30, 4210-20, differential equations. Must be taken in sequence.


5250 Electromagnetic Properties of Solids (3) Optical properties of solids, luminescence, magnetism, dielectrics and ferro-electricity, electron bands and moiré effects, and other topics. Applications discussed. Prereq: 4580 and 5210.


5440 Experimental Methods of Infrared and Raman Spectroscopy (3) Experimental equipment; instrumental optics; detection systems; analytical methods. Analysis of the vibrating-doubling, hot-doubling, and hot-infrared effect. Prereq: 4710-20 or equivalent. (Same as Chemistry 5440.)

5460 Radiation Chemistry (3) (Same as Chemistry 5460.)


5610-20-30 Mathematical Methods in Physics (3, 3, 3) Vector and tensor analysis; linear algebra, matrices, vector spaces; Fourier series and integrals; spherical harmonics; Bessel functions; linear integral equations; special functions and their applications. Prereq: Elementary course in differential equations and their associated boundary value problems. Variational calculus; Green’s functions; integral transform methods. Special attention is devoted throughout course to problems arising in physics. Prereq: Advanced calculus and differential equations. (Same as Math 5610-20-30.)

5640 Numerical Methods in Physics (3) Numerical methods available for solution of physical problems, pointed toward use of automatic computing machinery; analysis of errors. Prereq: 5610-20-30, or consent of instructor. (Same as Math 5640.)

5720 Physics of Polyatomic Molecules (3) Introduction to the classical and quantum mechanics of molecules and the physical processes of luminescence of these molecules; theoretical and experimental aspects of rotational and intramolecular electron excitation energy transfer and charge transfer; application of excitation energy transfer and charge transfer in such fields as organic molecular reactivity and organic scintillation. Prereq: 5210-20 or consent of instructor.

5910-20-30 Special Problems (3, 3, 3) Special advanced theoretical or experimental work on problems not covered in other courses.

5911 Special Problems in the Teaching of Physics (1, 1) Design of physics experiments. Prereq: Demonstrations, construction and analysis of physics tests and examinations, techniques in presentation of physics topics, and related problems. Prereq: Consent of instructor. Required of MACT candidates.


6000 Doctoral Research and Dissertation

6110-20-30 Quantum Mechanics (3, 3, 3) Functional principles of quantum mechanics and principal approximation methods. Applications to atomic, molecular and nuclear physics, Dirac equation; quantum electrodynamics. Prereq: 5110-20-30 or 5210-20-30, or 5410-20-30. Whichever of the latter series is not used as a prerequisite is to be considered corequisite.

6210-20-30 Nuclear Structure (3, 3, 3) General properties of the nucleus; two-body scattering problems; saturation and symmetry properties of nuclear forces; nuclear reactions; nuclear spectroscopy; special nuclear models; theory of nuclear reactions; theory of beta-decay. Prereq: 5110-20-30.

6310 Electromagnetic Theory of Light (3) Classical electron theory including theories of line breadth, dispersion and absorption; scattering of light and X-rays; dielectric and magnetic properties of gases and solids. Optical properties of electromagnetic waves in isotropic media and in anisotropic media; polarization and also theory of diffraction. Prereq: 5410-20-30.

6320 Special Relativity (3) Lorentz transformation; Einstein postulates; relativistic tensors; relativistic mechanics; or equivalent. Prereq: 5410-20-30, 5610-20-30, 6310.
Political Science

MAJOR

Political Science
M.A., Ph.D.

Public Administration
M.P.A.

Professors:

T. D. Ungs (Head), Ph.D. Iowa; R. S. Avery, Ph.D. Northwestern; D. H. Garsee, Ph.D. North Carolina; L. S. Greene* (Emeritus), Ph.D. Wisconsin; V. R. Iredell, Ph.D. Chicago; D. C. Minnis, Ph.D. Vanderbilt; Ph.D. Utah; N. M. Robinson, Ph.D. Syracuse; D. H. Stephens, Ph.D. Johns Hopkins; D. M. Weldon, Ph.D. Texas.

Associate Professors:

R. B. Cunningham, Ph.D. Indiana; J. Dodd, Ph.D. Tulane; A. Elliott, Ph.D. Columbia; R. B. Cunningham, A. H. Hucken, Ph.D. Syracuse; P. S. Kronenberg, Ph.D. Pittsburgh; S. Ossoffy, Ph.D. Columbia; L. P. Peterson, Ph.D. Yale; T. M. Simpson, Ph.D. Johns Hopkins; T. A. Smith, Ph.D. Ohio State.

Assistant Professors:

B. P. Greene, Ph.D. Indiana; F. R. Insoo, Ph.D. SUNY (Buffalo); W. Lyons, Ph.D. Oklahoma; G. J. Rhaten, Ph.D. Michigan State; H. Robson, Ph.D. Maryland; B. Rogers, Ph.D. Indiana; P. Schulman, Ph.D. Johns Hopkins.

Registration in any courses in the 5000-6000 series may be repeated for credit with consent of the department.

THE BUREAU OF PUBLIC ADMINISTRATION

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. Some of the courses are offered through the Bureau of Public Administration.

M. A. PROGRAM

See general requirements on page 17.

M. ST'S IN PUBLIC ADMINISTRATION PROGRAM

The department offers 2 programs leading to the degree of Master of Public Administration. The first program is available through the Knoxville campus. The second is joint offered by Middle Tennessee State University and The University of Tennessee. This program is directed primarily to career employees of federal, state and local governments in the second language or appropriate research tools or both.

3. Admission to candidacy shall be based on written and oral preliminary examinations which must be passed not later than 3 quarters before the date on which the degree is granted.

4. The candidate must pass a final oral examination on the dissertation.

5. Successful completion of the degree also depends on course performance and other evidence of professional interest and conduct.


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.

3565 Introduction to Public Administrative Organization and Management (4) Organization and decision-making theory, line and staff services, politics of organization, leadership, personnel and fiscal management, administrative responsibility. United States Government and Politics desirable as preceding course. (Same as Yater Resources Development 3565.)


3615-18 Dynamics of Black African Politics (4, 4)

3621-22 Politics of Asian States (4, 4)

3625-26 Latin American Government and Politics (4, 4)

3631-32 Government and Politics of the Soviet Union (4, 4)

3635-38 Politics in Western Democracies (4, 4) Political culture, patterns, and institutions of Western democratic systems.

3641 Government and Politics of Middle East and North Africa (4)

3655 Political Change in Developing Areas (4)

3710 State Politics (4) Focus on formal and informal setting of state government; governors, courts, legislatures, and state administrators. Attention will be paid to state government's role in formulating, enacting, and implementing state policy.

3715 Contemporary Problems of Soviet Foreign Policy (4)

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.

3801 Studies in Ancient Political Thought (4) Classical Greek and Roman political thought.

3802 Studies in Medieval Political Thought (4) From Augustine to Luther: Emphasis on problems and theories of religion and politics.

3803 Studies in Early Modern Political Thought (4) Machiavelli through the Enlightenment.

3804 Studies in 19th- and 20th-Century Political Thought (4) Political theories of industrial and technological societies; 19th and 20th century.

3880 American Political Thought (4) Examination of role of selected political ideas, doctrines, and themes in America, emphasizing their development and relationships to diverse political interests.

4410 Law and the Administrative Process (4) Powers of procedures of controls over administrators.

4535-36 Political Attitudes, Opinions and Communication (4, 4)

4540-50 Presidency, Congress and Public Policy (4, 4) The Presidency and Congress within framework of policy-making process.

4545-46 The Judicial Process (4, 4) The study of courts as components of political systems, and public policy formulation through judicial decision making. United States Government and Politics desirable as preceding course.

4575 Special Topics in United States Government and Politics (4) May be repeated with consent of department. Maximum 8 hrs.

4580-90 The Urban Policy (4, 4) Analysis of political institutions and processes in metropolitan areas; urban problems and policies.

4610 Budgetary Process (4) Fiscal planning, budget and expenditure processes in government, their policy and administrative implications.

4620 Public Personnel Administration (3) Development of the merit system in government, career systems, public personnel management functions, organization for personnel management.

4630 Problems in Public Management (3) Selected problems. Emphasis on internal and external communication and information systems in government and public access to information.

4665-66 Policy Making in Democracies (4, 4)

4675 Special Topics in Comparative Government and Politics (4) May be repeated with consent of department. Maximum 8 hrs.


4711 International Law (4)

4727 Politics of Inter-American Relations (4) Analysis of selected theoretical and policy issues concerning international relations in the Americas with emphasis upon imperialism, intervention, and the Cuban Revolution, nationalism, foreign assistance, trade and economic integration.

4740-50-60 Politics and Elections (3, 3, 3) 4740-50-60 Structure and function of party system; nominations and campaigns. 4740-Voting behavior of the electorate.

4815—Contemporary Soviet Marxism-Leninism (4)

4831-32-33 The Systematic Study of Politics (4, 4, 4)

4875 Special Topics in Political Thought (4) May be repeated with consent of department. Maximum 8 hrs.

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

4975 ProsSeminar in Political Science (4) Selected research for seniors; primarily for majors. May be repeated with consent of department. Maximum 8 hrs.

5000 Thesis

5002 Non-Thesis Graduation Completion (3) 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.

5101 Foreign Study (1-12) See page 146.

5102 Off-Campus Study (1-12) See page 146.

5103 Independent Study (1-12) See page 146.

5110-20 Seminar in Political Theory (3, 3) Selected political thinkers, schools, historical periods.

5140 Politics, Administration and Community in Non-metropolitan Areas (3) Analysis of problems and processes associated with community development.

5150 Internship in Political Science (3-9) Open to students participating in approved internship programs. May be repeated with consent of instructor. Maximum 9 hrs.

5210-20-30 Seminar in World Politics (3, 3, 3) Respective in world problems and organizations.

5211 Directed Readings in Political Science (3) May be taken for a letter grade or on a S/NC basis. May be repeated with consent of instructor and student's advisor. Maximum 9 hrs.

5250 Seminar in African Politics (3) Selected topics in African politics.

5270-80 Seminar in the Politics of Development (3, 3) Selected topics dealing with political problems of the less developed countries.

5310-20-30 Seminar in Comparative Government (3, 3, 3) Selected topics in modern government.

5340-50-60 Seminar in Latin American Government (3, 3, 3)

5370-80 Seminar in Soviet Politics and Government (3, 3)

5410-20-30 Seminar in Public Law (3, 3, 3) Special problems in constitutional and administrative law.

5449-50 Theory and Analysis of U.S. Foreign Policy Processes (4, 4) Theoretical approaches to decision making in the foreign policy area and an analysis of the policy-making process.

5510-20 Seminar in International Organization (3, 3) 5510—Introduction to regional international organizations; political integration at the international level. 5520—Functional international organizations.

5540 Seminar in Comparative Public Administration (3) Approaches to and methods used in comparative analysis.

5550 Seminar in Administration in Developing Countries (3)

5600 Public Administration (3) Survey of public administration theory and functions, approaches to public management, contemporary problems in public administration, organization, policy formulation through judicial, executive responsibility. United States Government personnel and fiscal management, administrative responsibility. United States Government and Politics desirable as preceding course. (Same as Yater Resources Development 5600.)

5650 Research and Methodology in Public Administration (3) Introduction to basic assumptions and techniques of research in public administration; topics include measurement, analysis, and reporting of data.

5650-20 Seminar in Organization Theory (3, 3) An appraisal of major theories of organization and their applicability to the public sector.

5611-21-31 Seminar in State-Local Administration (3, 3, 3)

5630 Seminar in Technology and Public Policy (3) Technological change and the policy process, government interactions with the scientific community, political characteristics of the scientific enterprise.

5635-45 Operations Research for Public Administrators (3, 3) Operations research methodology; applications and limitations of O.R. in the public sector; linear programming, transportation and assignment problems, network analysis, PERT, dynamic programming and other methods.

5640-50-60 Seminar in Metropolitan Areas (3, 3, 3)

5641 Seminar in Contemporary Public Policies (3) Examination of problems in one or more public policy areas from political and admin-
S/NC basis. May be repeated with consent of instructor and student's advisor. Maximum 9 hrs.

6810-20 Advanced Studies in the Political Process (3, 3) Open to advanced graduate students upon approval of instructor.

Psychology

MAJOR DEGREES

Psychology M.A., Ph.D.

Professors:

W. H. Calhoun (Head), Ph.D. California (Berkeley); G. M. Burghardt, Ph.D. Chicago; J. F. Byrne, Ph.D. Tennessee; H. J. Findley; Ph.D. Syracuse; L. Handler, Ph.D. Michigan State; J. F. Lubar, Ph.D. Chicago; K. R. Newton, Ph.D. Tennessee; H. R. Pollil, Ph.D. Michigan; N. L. Rasch,* Ph.D. Pennsylvania; R. R. Shrader, Ph.D. Tennessee; F. Samejima, Ph.D. Keio; W. S. Verplank, Ph.D. Brown; R. G. Wahler, Ph.D. Washington; J. A. Wiberley, Ph.D. Syracuse.

Associate Professors:

H. E. Baker,* Ph.D. Tennessee; C. P. Cohen, Ph.D. Kansas; L. F. Droppeleman, Ph.D. Catholic; H. R. Friedman,* Ph.D. Tennessee; H. G. Ganzinger, Ph.D. Indiana; S. J. Handel, Ph.D. Johns Hopkins; M. G. Johnson, Ph.D. Miami; M. M. Morgan, Ph.D. Tennessee; T. M. Morris, Ph.D. California; W. G. Morgan, Ph.D. Tennessee; W. M. Simmons, M.S., M.W. Tennessee.

Assistant Professors:


The Psychology department emphasizes doctoral degree programs with specializations in clinical, school, industrial-organizational and general psychology. Some students complete a Master's degree as part of the doctoral program.

For detailed information on graduate programs and admissions requirements, write: Graduate Secretary, Department of Psychology, University of Tennessee, Knoxville, TN 37916.

THE PSYCHOLOGICAL CLINIC

The Psychological Clinic supports graduate training in clinical psychology. Psychological diagnosis and psychotherapy are offered on an outpatient basis, with medical consultants, to the general public as well as to University students, on referral by a physician.

4107 Experience in Individualized Instruction (1-6) Supervision in the American Psychological Association as an individualized instruction. Prereq: Consent of instructor. May be repeated. Maximum 12 hrs.

4120 Topics in Social Psychology (4) Intensive analysis of selected research topics. Prereq: 3120 or Sociology 3130 (same as Sociology 4120).


4239 Laboratory in Sensory Processes and Perception (2) Prereq or coreq: 4230. 2 periods.

4460 Organizational-Industrial Psychology (3)

4510 Personality Theories (4) Prereq: Abnormal Psychology or equivalent.

4519 Research in Personality (4) Discussion and demonstration of research on individual as it relates to major theoretical issues and to substantive areas of investigation. Prereq: Descriptive Statistics or equivalent.

4520 Personality and Social Systems (4) Prereq: Abnormal Psychology.

4610 Group Processes (3) Study and experience of theory and techniques of group processing and facilitation. Those participating in 4610 are expected to continue into 4620 and 4630. Prereq: Human Relations and consent of instructor.

4620-30 Seminar in Group Processes (0, 6) Didactic and laboratory experience for those qualified for further training as group facilitators. Prereq: 4610 and consent of instructor. No credit given until sequence is completed.


4650 Symbolic Processes (4) The logic of symbolic processes, signs, symbols; directed and associative thinking; memory, problem solving, and concept-formation; the nature, use and development of language. Prereq: Learning and Thinking or consent of instructor.

4660 The Psychology of Language (4) Theories and descriptions of phonology, syntax, and semantics as applied to psychology and related disciplines. Recommended: 4650 or linguistics background.

4710 Physiological Psychology (4) Nervous system and physiological correlates of behavior. Prereq: 1 year of biology or zoology and Biological Foundations of Behavior.

4719 Physiological Psychology Laboratory (4) Coreq: 4710.

4720 Comparative Animal Behavior (4) Methods and principles. (Same as Zoology 4720.)

4729 Comparative Animal Behavior Laboratory (4) Laboratory and independent studies. Coreq: 4720. (Same as Zoology 4729.)

4750 Evolution and Ontogeny of Social Behavior (4) Genetic, evolutionary, ecological and developmental processes as they apply to social organization and dynamics of vertebrates. Prereq: Consent of instructor.

4830 History and Systems of Psychology (4) Prereq: 9 hrs of upper division psychology.

4850 Learning Theories (4) Historical and theoretical development of learning models. Prereq: Learning and Thinking.

4850 Programmed Learning (3) (Same as Curriculum and Instruction 4850.)

4870 Contemporary Research in Behavior of Women (4) Study of interaction of cultural and biological factors in determining the behavior of women, with emphasis on physiological mechanisms involved.

4880 Afro-American Psychology (4) Review and analysis of psychological literature on Afro-Americans. Prereq: Consent of instructor. (Same as Culture Studies 4880.)

4900 Aspects of Urban Environment (4) Interdisciplinary course in urban problems. Prereq: Consent of instructor. (Same as Architecture 4900, Political Science 4900, Real Estate 4900.)
5000 Thesis

5002 Non-Thesis Graduation Completion (3)
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.

5019-29-39 Laboratory Techniques in Experimental Psychology (3, 3, 3) Required of all first-year students in experimental, physiological, and comparative psychology. S/NC only.


5079 Practicum in College Teaching (2) Supervised participation in College Teaching. Required of all Ph.D. candidates. S/NC only.

5080 Current Topics in Applied Psychology (3)

5100 Development Psychology (3) Prereq: Child Psychology or Child Study-Education Psychology. (Same as Educational Psychology 5100.)

5110 Clinical Aspects of Human Sexuality (3) Nature of sexuality: sociological perspectives, personal identity, application, intimacy and isolation including psychosocial and psychological identity and models for decisions. Intended for graduate students in clinical psychology, social work, and community and mental health professionals. Prereq: Consent of instructor.

5111-12-13 Seminar in Current Issues in School Psychology (1, 1, 1) Historical, legal, ethical, and technological issues impacting on school psychological practice.

5140-50-60 Psychoeducational Assessment (3, 3, 3) Naturalistic, psychometric, and sociometric assessment methods in school learning environments. Must be taken in sequence. Coreq: 5479-69-90. Prereq: Admission to School Psychology program or consent of instructor. (Same as Educational Psychology 5140-50-60.)

5149-59-69 Practicum in School Psychology I (3, 3, 3) First-year School Psychology Program practicum core sequence. Coreq: 5140-50-60. S/NC only. (Same as Educational Psychology 5149-59-69.)

5170-80-90 Proseminar in Organizational Psychology (3, 3, 3) Introduction to the basic concepts and ideas required for graduate study in organizational psychology. Must be taken in sequence with the student's first year. Prereq: Consent of instructor. (Same as Industrial Management 5170-80-90.)

*5210 Readings in Psychology (1) S/NC only.

*5220 Readings in Psychology (2) S/NC only.

*5230 Readings in Psychology (3) S/NC only.

*5240 Readings in Psychology (4) S/NC only.

*5250 Readings in Psychology (5) S/NC only.

*5260 Special Problems in Psychology (1) S/NC only.

*5270 Special Problems in Psychology (2) S/NC only.

*5280 Special Problems in Psychology (3) S/NC only.

*5290 Special Problems in Psychology (4) S/NC only.

*5300 Special Problems in Psychology (5) S/NC only.

5319 Field Work in School Psychology; Level 1 (2) Supervised on-the-job training in school psychology. Limited to students fully admitted to the doctoral program in school psychology who are assigned to program approved field settings. May be repeated. Maximum 6 hrs. toward degree equivalent. S/NC only. (Same as Ed. Psych. 5319.)

5340 Group Dynamics (3) (Same as Educational Psychology 5340.)

*5350-60-70 Seminar in Psychology (3, 3, 3)

5400 Psychophysics and Scaling Methods (3) Prereq: 4239, 4490.

5445 Advanced Correlational Methods (3) Bi-serial, tetrachoric, and polychoric correlation; partial and multiple correlation and regression; stepwise regression and cross-validation; simple discriminant analysis; rank correlation methods. Prereq: 5430.

5450 Human Problems in Administration (3) (Same as Industrial Management 5530.)

5460 Personnel Research Seminar (3) (Same as Industrial Management 5540.)

5500 Fundamentals of Psychometrics (4) Basic ideas and orientation in psychometrics. All the graduate students who plan to take 1 or more courses in psychometric theory are required to take the course. Prereq or Coreq: 4640.

5510 Instrumentation for Psychological Research (3)

5520 Theory of Mental Measurement (3) Reliability, validity, scaling and equating, norms, combining tests into batteries. Prereq: Descriptive Statistics, Interpretation of Statistical Reports, 4640, and 5500.

5530 Test Construction and Interpretation (3) Construction of psychological and achievement tests, criterion development, item analysis, critical evaluation of published tests and manuals. Prereq: 5520.

5550 Advanced Social Psychology (3) Interaction between individual and group, theories of group behavior. Prereq: Social Psychology. May be used for credit in sociology. Maximum 7 hrs. toward degree equivalent.

5550-70 Seminar in Social Psychology (3, 3) Prereq: 5560-70-90. May be repeated with consent of instructor. Maximum 7 hrs. toward degree equivalent.

5560-70-90 Seminar in Psychology (3, 3, 3) Corequisites: Prereq: 5140-50-60 or equivalent. Offered in alternate years.

5580 Theories of Personality (3)

5581-82-83 Clinical Psychology I: Human Development and Personality (2, 2, 2) First quarter core of the doctoral program in clinical psychology. Prereq: Take the 3 two-credit courses concurrently, each covering the content area from 1 of the 3 major contemporary points of view.

5589 Psychological Techniques Laboratory (2) Basic techniques of psychological appraisal. Restricted to doctoral students in clinical psychology.

5590 Psychodynamics (3) A research-and-theory-oriented course focusing upon the origins of behavior. Prereq: 5580.

5591-92-93 Clinical Psychology I: Patterns of Adaptation (2, 2, 2) Second quarter core of the doctoral program in clinical psychology. Students take the 3 two-credit courses concurrently, each covering the content area from 1 of the 3 major contemporary points of view.

5599 Psychological Syndromes (3) An extension of general personality and psychodynamics into the study of patterns of behavior. Prereq: 5580.

5600 Clinical Psychology I: Behavioral Deviance and Psychopathology (2, 2, 2) Third quarter core of the doctoral program in clinical psychology. Clinical students take the 3 two-credit courses concurrently, each covering the content area from 1 of the 3 major contemporary points of view.

5610-20 Psychology of Learning (3, 3) Prereq: 3210 or Educational Psychology 3730.

5650 Ethics and Professional Practices (1) A review and discussion of professional issues and the practice of clinical psychology. Offered in alternate years. Prereq: M.A. in psychology or equivalent.

5670 Advanced Psychodynamic Psychology (3) The psychodynamist's role in relation to the law, including questions concerning licensure requirements, legal restrictions, and testimony as an expert witness. Offered in alternate years. Prereq: M.A. in psychology or equivalent.

5680 Neural Basis of Behavior (3) Neuroanatomy; the basis and symptomatology of neurological syndromes encountered in clinical psychology. Prereq: M.A. in psychology or equivalent.

5690 Psychopharmacology (3) A review and evaluation of pharmacology as it relates to the practice of clinical psychology. Prereq: M.A. in psychology or equivalent. Offered in alternate years.

5713 Learning Modules for Techniques in Professional Psychology (1-4) A set of learning packages, each of which develops a skill in assessment, theory, research, or pathology. Prereq: Consent of instructor. May be repeated. S/NC only.

5750 Ethological Psychology (3) Evolutionary and physiological basis of comparative psychology and implications for human behavior. Prereq: Introductory Biology and graduate standing.

5780 General Vertebrate Neuroanatomy (3) Lectures and laboratory dealing with structure and function of the central and peripheral nervous system. Prereq: 4710, 4719 or consent of instructor. (Same as Zoology 5780.)

5795 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.

5796 Seminar in Psycholinguistic Concepts in Speech Pathology (3) (Same as Speech Pathology 5796.)

5810-20 Techniques of Psychological Examination (3, 3) Designed as an introduction to the basic examination techniques. Intended primarily for students in fields related to psychology or related fields. Prereq: 5820 or Coreq: 4640 or equivalent and consent of instructor.

*5819-29 Practicum in Techniques of Psychological Examination (2, 2) Coreq for 5819: 5816; Coreq for 5829: 5820.

5840 Student Appraisal (3) (Same as Educational Psychology 5840.)

5850-60-70 Psychological Appraisal (3, 3, 3) Objective and projective tests, clinical interviewing, case study evaluation, organic and functional disorders. Prereq: 5819-29; Prereq or Coreq: 5850-60-90.

5859-69-73 Practicum in Psychological Appraisals (2, 2, 2) Ordinarily to be taken concurrently with 5850-60-70.

5860 Counseling Techniques (3) (Same as Educational Psychology 5860.)

5860-60-70 Consultation in Human Development Settings (3, 3, 3) Study of issues, models, and evaluation of the process of consultation in settings where human developmental needs and crises are managed by persons who seek aid from psychologists. Must be taken in sequence. (Same as Ed. Psych. 5560-60-70.)
Practicum in School Psychology II

6250-60-70 Seminar in Organizational Psychology or equivalent. Must be taken in sequence, evaluation and research in the community. Emerging psychological practices in intervention.

6210-20-30 History, Systems, and Theories in Psychology (3, 3, 3) Prereq: M.A. in psychology or equivalent. Must be taken in sequence.

6250-60-70 Seminar in Organizational Psychology (3, 3, 3) (Same as Industrial Management 6250-60-70.)

6280-90-300 Factor Analysis (3, 3, 3) Factor analysis; component analysis; introduction to latent structure analysis. Prereq: 4640 and 5500.

*6310 Seminar in Motivation and Emotion (3)

6319 Field Work in School Psychology: Level II (2) Supervised on-the-job traineeship in school psychology. Limited to students fully admitted to the doctoral program in School Psychology who are assigned to program approved field settings. May be repeated. Maximum of 6 hrs. S/NC only. (Same as Ed. Psych. 6316.)

*6320 Seminar in Research Methods (3)

*6330 Seminar in Learning (3)

*6340 Seminar in Developmental Psychology (3)

*6350 Seminar in Thinking (3)

*6360 Seminar in Sensation and Perception (3)

*6370 Seminar in Theoretical Psychology (3)

*6380 Seminar in Industrial Psychology (3) (Same as Industrial Management 6380.)

*6390 Seminar in Psychotherapy (2) The treatment of a current case, focusing upon psychodynamics, psychopathology, and the therapeutic techniques employed. Prereq: M.A. in psychology or equivalent.

*6395 Seminar in Assessment (3) Seminar for advanced graduate students in clinical psychology, to deal with current research on the methods of evaluating the status of individuals seeking clinical aid.

*6400 Seminar on Changing Concepts in Clinical Psychology (3) New developments in the field in relation to their impact on experimental and systems of thought. Prereq: M.A. in psychology or equivalent.

6405 Seminar in Psychopathology (3)


6411-12-14 Psychotherapy: Elective Concentration Learning Laboratory (2, 2, 2) Typically four psychotherapy concentration areas offered in each quarter. Clinical program students in the core psychotherapy sequence must elect at least one of these in each quarter of the sequence. May be repeated. Limited to clinical psychology students enrolled in the core psychotherapy sequence or consent of instructor.


6450-60 Advanced Psychometrics (3, 3) Construction and standardization of psychological tests, questionnaires, and rating scales; theory of errors or measurements; item analysis, scaling, equating, and norms development. Prereq: 4680, 5440, and 5500. May be repeated. Maximum 8 hrs. S/NC only.

6491 Field Placement in Clinical Psychology Level-1 (1-8) Supervised clinical experience. Required of and limited to students fully admitted to the Ph.D. program in clinical psychology. May be repeated. Maximum 8 hrs. S/NC only.

6492 Field Placement in Clinical Psychology Level-2 (1-8) Supervised clinical experience. Required of and limited to students fully admitted to the Ph.D. program in clinical psychology. May be repeated. Maximum 8 hrs. S/NC only.

6493 Field Placement in Clinical Psychology Level-3 (1-8) Supervised clinical experience. Required of and limited to students fully admitted to the Ph.D. program in clinical psychology. May be repeated. Maximum 8 hrs. S/NC only.

6494 Field Placement in Clinical Psychology Level-4 (1-8) Supervised clinical experience. Required of and limited to students fully admitted to the Ph.D. program in clinical psychology. May be repeated. Maximum 8 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.

6505 Seminar in Advanced Social Psychology (3) Prereq: Consent of instructor.

*6550 Directed Readings in Clinical Psychology (2) Required during clinical internship; not open to others.

6575 Seminar in Mental Health Administration (3) Theory and problems in the organization and management of mental health administration.

6590-60-70 Systems Approaches in Psychological Services (3, 3, 3) Systems and organization development approaches in schools and other human services settings. Prereq: Consent of instructor. (Same as Ed. Psych. 6590-60-70.)

6595-59-79 Practicum in School Psychology III (2, 2, 2) Third year School Psychology Program practicum core sequence. S/NC only. (Same as Ed. Psych. 6590-69-79.)

*6710 Seminar in Physiological Psychology (3)

*6720 Seminar in Comparative and Ethological Psychology (3)

*6730 Methods of Ethological and Naturalistic Research (3) Current laboratory and field techniques. Prereq: 4729, 5750, 6720, or consent of instructor.


6780 Advanced Psycholinguistics (3) Language from the psychological and associated points of view; methodological and theoretical problems. Prereq: Consent of instructor.


6870 Adult Psychotherapy (3) Prereq: 5580-90-600. Prereq or coreq: 5050-60.

6900 Field Work in Industrial and Organizational Psychology (3-5) (Same as Industrial Management 6900.)

*NOTE: Psychology 5210-5300, 5350-60-70, 5819-29, 6310-400, 6419-29-39, 6560, 6710-70-90, 6840-600-6870, and/or 6900 may be repeated for credit with the approval of the department.

Religious Studies

Professors:
F. S. Lusby (Head), B.D. Colgate Rochester;
D. L. Lundjan, Th.D. Harvard; R. V. Norman,
Ph. D. Yale.

Associate Professors:
B. L. Daniels, Ph.D. Duke; W. L. Humphreys,
Ph.D. Union; E. D. Lingp, Ph.D. Vanderbilt;

Assistant Professors:
J. Kim, Ph.D. Chicago; R. Lee, Ph.D. Harvard.

Instructor:

In M.A. in Philosophy with a concentration in Religious Studies is available for graduate work in these related fields. (Details of this program are available in the graduate catalog of either department.) Graduate courses in religious studies further provide opportunity for students in a variety of disciplines to pursue work in religious studies as a graduate concentration.

3061-71 History of Western Religious Thought and Institutions (4, 4) 3061—first century to the 13th century. 3071—13th century to 1900. (Same as History 3061-71.)

3210 Early Greek Mythology (3) (Same as Classics 3210.)

3220 Greek Mythology in the Classical Period (3) (Same as Classics 3220.)

3230 Roman Mythology (3) (Same as Classics 3230.)

3270 Russian Philosophical and Theological Thought (4) A survey of the development of philosophical and theological thought in Russia from the Middle Ages to the 19th century. Special emphasis on the expression of this thought in Russian literature and literary criticism. May be repeated for credit with the approval of the department. Prereq: (Same as Philosophy 3270 and Russian 3270.)

3411-12-13 Renaissance and Reformation (3, 3, 3) (Same as History 3411-12-13.)

3440 Religion of Primitive Peoples (3) (Same as Anthropology 3440.)

3650 Philosophy and Religion in India (4) (Same as Philosophy 3650.)

3660 Buddhist Philosophy and Religion (4) (Same as Philosophy 3660.)

3690 Philosophy of Religion (4) (Same as Philosophy 3690.)

4111-21 Modern Religious Philosophies (4, 4) Examination of the religious implications of major thinkers and movements. 4111—Nicolas of Cusa to Hume. 4121—Kant and the 19th century. Prereq: 9 hrs of philosophy other than logic. (Same as Philosophy 4111-21.)

4210 Topics in Ancient Israelite and Ancient Near Eastern Religions (4) Prereq: Ancient Israel's Historical and Religious Traditions, The Rise of Judaism, or consent of instructor. May be repeated for credit with the approval of the department.

4310 Jesus and Paul Compared (4) Jesus' teaching and activity in the context of first-
century Palestinian Judaism; analysis of what the Apostle Paul made of the tradition of and to Ancient Near-Eastern Religions and Images of Jesus. Recommended prereq: Introduction to Religions of the World or Introduction to Ancient Near-Eastern Religions and Images of Jesus.

4370-71 Theoretical Issues in Medical Ethics (4, 4) (Same as Philosophy 4370-71.)

4410 American Religious Thought (4) Selected figures, movements and problems in American religious thought from colonial period to present.

4450 Topics in American Religion (4) Prereq: one of the following: Religion in America, 4410; or consent of instructor. May be repeated. Maximum 12 hrs.

4540 Social and Religious Change (4) (Same as Sociology 4540.)

4610 Topics in Western Religious Thought and Institutions (4) Selected figures, issues and institutions. Seniors and graduate students only, except by permission of department. Prereq: History of Western Religious Thought and Institutions. May be repeated. Maximum 12 hrs.

4640 Topics in Early Christianity and Hel lenistic Religions (4) Selected figures, issues and institutions. Seniors and graduate students only, except by permission of department. Prereq: Introduction to Ancient Near Eastern Religions or permission 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 permission of department. Prereq: 3650-60. 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 the instructor. May be repeated. Maximum 12 hrs.

4940 Sociology of Religion (4) (Same as Sociology 4940.)

4950 Theory of Religion (4) Elements for construction of a theory of religion drawing on resources from fields of psycho-history, social psychology, sociology of religion, cultural anthropology, theology and comparative religion.

4960 Tradition, Change and Modernity in Asia (4) Comparative study of processes of religious and social change seen in historical context in Asian societies. Comparative focus of course will vary each year (e.g., China and Japan, India and South Asia, etc.) May be repeated. Maximum 8 hrs. (Same as Sociology 4960.)

5011 Foreign Study (1-12) See page 146.

5102 Off-Campus Study (1-12) See page 146.

5103 Independent Study (1-12) See page 146.

5310-20 Topics in Religion and Society (4, 4)

5510-20 Topics in the History of Religion (4, 4)

5710-20 Topics in Religious Thought (4, 4)

Romance Languages

MAJORS

DEGREES

French
M.A.

M.A., C.T.

M.A., Ph.D.

Spanish


Associate Professors:


Assistant Professors:

M. Handelman, Ph.D. Florida; C. D. Levy, Ph.D. Kentucky; C. Pinsky, Ph.D. California (Berkeley).

The Department of Romance Languages offers three advanced degrees: the Master of Arts in College Teaching (M.A.C.T.) in the Romance Languages only; the Master of Arts (M.A.) in French and Spanish; and the Doctor of Philosophy (Ph.D.) in Spanish. The MASTER OF ARTS IN COLLEGE TEACHING PROGRAM

This program requires a minimum of 60 hours of graduate work. Students must participate in the graduate seminar in college teaching during their first year of residence (3 hours credit). They must also complete 6 credits in supervised instructional experience. French or Spanish must be selected as the major subject, and at least 36 credit hours of graduate work, including 9 hours of thesis and 9 hours of linguistics and philology, and 3 hours of problems in language teaching, must be completed in it. In addition, civilization courses are strongly recommended. Spanish or French may be selected as the minor subject, and at least 18 hours of graduate work must be completed in it.

THE MASTER OF ARTS PROGRAM

The student may select either Plan A or B:

Plan A

1. Completion of a minimum of 36 quarter hours of which 24 must be taken in courses numbered above 4000, including 5011 (French or Spanish, as appropriate).


3. A written examination covering the course work and selected items from a master reading list.

4. A final oral examination covering the thesis.

Plan B

1. Completion of 45 quarter credits of which 33 must be in courses beyond 5000, including 5011 (French or Spanish, as appropriate).

2. Three term papers that have been accepted as satisfactory by the Advisory Committee.

3. A written examination covering the course work and selected items from a master reading list.

THE DOCTORAL PROGRAM

Residence and Course Work: Completion of at least 3 consecutive quarters of full-time residence, a minimum of 81 credit hours in course work beyond the Bachelor's degree, an equivalent, and a dissertation (36 credit hours).

No less than 54 quarter hours should be taken in courses pertaining to the student's major field; of these a minimum of 18 hours are to be taken in courses above 6000. A maximum of 12 hours may be taken in courses of the 4000 level and the rest in courses above 5000. All students must complete the series in methods of research (5151-61-71) for a total of 3 credits. The minor 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 concentration. In addition 9 hours of courses above 4000 in a related discipline are required. In special cases the latter requirement may be waived in favor of additional course work in the major field.

Language Requirements:

Students are expected to demonstrate written and oral fluency in Spanish as well as knowledge of 2 other foreign languages. One of these must be French; the second one should be chosen from such languages as German, Italian, Portuguese, Arabic or Hebrew in accordance with the student's field of concentration. Proficiency in Latin shall be required of all students specializing in an area related to philology or the medieval period.

Examinations:

A preliminary comprehensive examination, both written and oral, covering the major and minor fields must be passed before a student can become an official candidate for the degree. This preliminary examination is to be held at the time deemed most appropriate by the student's major advisor and his committee. The candidate is expected to defend the dissertation in a final oral examination.

For additional information on the program, consult pages 20-22.

Arabic

3510-20 Intermediate Modern Standard (4, 4)

3610 Islamic Literature in English Translation (4) Survey from origins to modern period of major Islamic literatures, especially Arabic, Persian, and Turkish. Readings include The Arabian Nights, The Rubaiyat of Omar Khayyam and Gibran's The Prophet.

5070-90-90 Hispano-Arabic Language and Culture (3, 3, 3) (Same as Spanish 5070-90-90.)

5101 Foreign Study (1-12) See page 146.

5102 Off-Campus Study (1-12) See page 146.

5103 Independent Study (1-12) See page 146.

French

3010-20-30 Elements of French for Upper Division and Graduate Students (3, 3, 3) Elements of language, elementary and advanced readings. Open to graduate students preparing for language examinations, and upper division students desiring reading knowledge of the language. Undergraduate credit only. No credit for those having had Elementary French. No auditors.
5011 Techniques in Literary Analysis (2) See page 146.
5102 Off-Campus Study (1-12) See page 146.
A student uses university facilities and/or equivalent.

5002 Non-Thesis Graduation Completion (3) Prereq: Intermediate Spanish (3rd quarter) or equivalent.

4450-60-70 Studies in Modern Spanish Style (3, 3, 3) Prereq: Int. Composition and Conversation. Subjects range from travel and extensive training in prepared and spontaneous conversations. Prerequisite warrants their being excused by the department.

5151-61-71 Bibliography and Methods of Research (1, 1, 1) (Same as French and Italian 5181-61-71). B/NC only.

5211-21 Don Quijote (3, 3, 3) Must be taken in chronological order.

5212-22-32 Golden Age Prose (3, 3, 3) 5212—La Celestina: critical study of Fernándo de Rojas’ life and work. The Celestina genre; Félix Díaz de Silva’s Segunio Celestina; 5222—Spanish philosophical thought; mystical prose; satirical work; 5232—Guzman de Alfarache and the Spanish picaresque genre.

5231 The Exemplary Novels, Perales y Sigismunda (3)

5250-60 The Generation of ‘98 (3, 3) Angel Gavilán, Giner de los Ríos, Baroja, Unamuno, Valle Inclán, Benavente, Azorín, Pérez de Ayala.

5270 The Contemporary Novel (3) The Civil War and post-Civil War period.

5310-20-30 Directed Readings (3, 3, 3)

5311-21 Special Topics in Spanish or Spanish American literature (3, 3, 3) May be repeated.

5340 Problems in Hispanic Culture (3) Intensive study of 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 permission of the department. Maximum 6 hours.

5510-20-30 The Spanish Theatre after the Golden Age (3, 3, 3) 5510—From the 18th century through Romanticism. 5520—From Realism through the Generation of 1895. 5530—Contemporary theatre.

5550-60 The Golden Age Theatre (3, 3, 3) 5550—Introduction to the Spanish theatre, Lope and Tirso. 5560—Castro, Mira de Ame
soua and Alarcón. 5570—Rojas Zorrilla, Moreto, and Calderón.

5610 Spanish American Prose to 1900 (3) Novel, chronicle, essay.

5611-21 Spanish American Lyric Poetry (3, 3)

5620-30 The Modern Novel in Spanish America (3, 3)

5631 Spanish American Essay (3)

5632 The Spanish American Short Story (3) The short story as a major literary genre in Spanish America. Reading and criticism of the works of authors such as Dario, Quiroga, Borges, Arreola, and Rufio.

5633 Twentieth-Century Latin American Theatre and Film (3) Readings from the works of such playwrights as Carlos Solorzano, Rodolfo Uaggl, Rodolfo Nalé Roixo, Roberto Cossa, René MarQUés and Sebastián Salazar Bondy. Presentation of films as adaptations of classics such as Doña Bárbara, Los de abajo and Don Segundo Sombra as well as exponents of the experimental cinema of today.

5640 Latin American Women Writers (3) An introduction to the works of Latin American women writers, focusing on the feminine point of view, the modern image of woman, male-female relationships and society as a context for woman’s destiny. Readings from poetry and fiction, including such authors as Alfonsina Storni, Dolores Agustini, Gabriela Mistral, Silvina Bullrich, Silvina Ocampo, and Rosario Castellanos.

5650-60 Advanced Syntax and Stylistics (3, 3) Readings and written imitations of modern literary styles in their various forms of compositions, sketches and original stories.

Russian

See German

Sociology

MAJOR

DEGREES

Sociology

M.A., M.A.C.T., Ph.D.

Professors:

J. A. Black (Head), Ph.D. Iowa; D. J. Champion, Ph.D. Purdue; W. E.Cole (Emeritus), Ph.D. Cornell; L. E. Botson, Ph.D. Vanderbilt; L. Ebersole, Ph.D. Pennsylvania.

Associate Professors:

D. M. Betz, Ph.D. Michigan State; D. Clelland, Ph.D. Michigan State; D. Hastings, Ph.D. Massachusetts; T. C. Hood, Ph.D. Duke; N. Shover, Ph.D. Illinois; S. Wallace, Ph.D. Minnesota.

Assistant Professors:

S. Kurth, Ph.D. Illinois; S. Norland, Ph.D. Iowa; A. Perrin, Ph.D. British Columbia; T. Weirath, Ph.D. Wisconsin.

For a full statement of departmental requirements, students are referred to the Departmental Graduate Manual.

All registration for 3000- and 4000-level courses require the consent of the Instructor.

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 17. Those interested in the non-thesis option should obtain details from the department.

DOCTORAL PROGRAM

General requirements for the degree of Doctor of Philosophy are described on page 20. Additional specific requirements for the degree of Doctor of Philosophy in Sociology include:

1. A minimum of 108 credit hours fol-

lowing the Bachelor's degree, exclusive of credits for the Master’s thesis, is required. Of this number, 36 hours shall be allocated to doctoral research and dissertation. A maximum of 12 hours credit outside the major may be taken in related fields, with the approval of the student’s committee. Exclusive of doctoral research and dissertation at least one-half of all credits shall be in courses numbered 5600 or 6000.

2. A written preliminary examination covering sociological theory, research methodology, and two other areas in

5670 Problems in Romance Linguistics (3) (Same as French 5670.)

5810-20-30 Spanish Lyric Poetry (3, 3, 3)

5910 Literary Criticism: The Foundations of Romance Criticism (3) (Same as French 5910.)

6000 Doctoral Research and Dissertation

6210-20-30 Seminar in Spanish Literature (3, 3, 3) Topics vary in the field of Peninsular Literature. May be repeated with consent of the department.

6310-20-30 Seminar in Latin American Literature (3, 3, 3) Topics vary. May be repeated with consent of the department.
sociology must be passed prior to admission to candidacy. This examination must be passed not later than one academic year before the date on which the degree is granted.

3. No later than one month before granting of the degree, the candidate will be required to pass an oral examination on the doctoral dissertation. At the oral examination the candidate will be expected to show a thorough knowledge of sociological theory and methodology related to the research.

4030 Sociology and Law (4) A general treatment of the social origins and consequences of law and the legal process. Particular emphasis is placed on problems of law and social change, and on the structure and functioning of legal sanctions. Some attention is paid to law and law-like phenomena in formal organizations and primitive societies.

4110 Population Problems (4) Demographic functions and social structure; trends in fertility, mortality, population growth, migration, distribution, and composition; population policy.

4120 Topics in Social Psychology (4) (Same as Psychology 4120.)

4130 Sociology of Punishment and Corrections (4) An analysis of the development of correctional movement, develops a critical sociological perspective on contemporary correctional programs, and provides overview of evaluative research in corrections.

4310 Criminology (4)

4330 Urban Ecology (4) Examination of public, private, collective, and individual space. Classical school of ecology, its neo-classical revivals, social area analysis, and cognitive symbolic ecology emphasized.

4410 Educational Sociology (3) (Same as Curr. and Inst. 4410.)

4530 Community Organization (4) Structure; function; linkages; change and development; important community studies are reviewed and discussed. Emphasis on sociological analysis, not on the implementation of change.

4540 Social and Religious Change (4) (Same as Religious Studies 4540.)

4550 Formal Organization (4) Analysis of the bureaucratisation process, division of labor, delegation of authority, channelled communication under a norm of rationality.

4820 American Minority Groups (4) Minority groups and social structure in American society; analysis of inter-group relations with attention given to both past and present relationships of selected groups to broader society.

4930 Social Movements (4) Development, organization, and function of social movements; attention is given to the ideology, leadership and organization of political, religious and other types of social movements.

4940 Sociology of Religion (4) Interrelationship of society, culture, and religion. (Same as Religious Studies 4940.)

4960 Tradition, Change and Modernity in Asia (4) (Same as Religious Studies 4960.)

5000 Thesis

5002 Non-Thesis Graduation Completion (3) Required for the non-thesis student not otherwise granted 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.

5040 Methodological Issues in Social Research (3)

5050 Seminar in Political Sociology (3) The political system from the societal, organizational, and group perspectives.

5060-70 Special Social Investigation (5, 3) Directed readings and/or research projects.

5200 Seminar in Collective Behavior and Social Movements (3)

5210, 5420-30 Social Theory (3, 3, 3)

5220 Social Control (3)

5230 Seminar in Sociology of Medicine (3)

5240 Theory and Research in Human Migration (3)

5250 Selected Topics in Migration Research (3)

5310 Seminar in Methods of Sociological Research (3) A consideration of major methodological issues in sociology; scaling techniques; reliability, validity, sampling, and qualitative methodology.

5320-30 Social Statistics (3, 3) General survey of parametric and non-parametric procedures in analysis of sociological data; assumptions underlying procedures; advantages, disadvantages and special applications. Must be taken in sequence.

5520 Crime, Law, and Social Control (3)

5530 Seminar in Community (3)

5550 Seminar in Community Power (3) Analysis of theories and methods used in studying social power in communities.

5560-70 Field Research in Deviance (3, 3)

5580 Sociology of Mental Disorders (3) Relationship between formal sociological models and substantive theories of mental illness. Historical development of theoretical conceptualizations. Interdependence of theory and therapeutic techniques. Epidemiology of mental disorders. Review of major studies.

5590 Social Differentiation and Stratification (3) An examination of various sources of differentiation in society, their relation to conflict in society, and their relationship to class structure in society.

5610 Seminar in Occupations (3) Occupations and their relation to the individual and the society; technology and occupations; unique rewards and occupations; social organization and occupations.

5620 Seminar in Occupations (3) A continuation from the material in Sociology 5610; the interface between occupations and the settings in which they are performed.

5630 Seminar in Occupations (3) Research participation; directed projects on subjects developed in 5620. Prereq: 5610 or 5620.

5640 Social Structure and Personality (3) Social interaction and personality; the genesis and functioning of the self; the cultural basis of personality. May be used for credit in psychology.

5670 Social Organization (3) Structure and function of human groups with special attention to voluntary associations and administrative organizations.

5720 Small Group Theory and Research (3) A critical assessment, through reading and actual research, of contemporary theoretical orientations to the study of small groups. Research will be designed to test selected theoretical problems. May be repeated for credit.

5730 Seminar in Research Problems in Inter-
6530 Sociology of Law (3) An analysis of the social and cultural factors influencing the emergence and maintenance of law as a social institution and affecting the relations between law and deviant behavior; an appraisal of the theoretical and methodological issues encountered in studying the law.

6540 Readings in Criminology and Deviance (3) Directed readings and selected topics on criminology and deviance.

6550 Advanced Studies in Community (3) Analysis of concepts of community, theories of community change, and techniques used in community research.

6610 Seminar in Formal Organization (3) Major formal organizational theories; bureaucracy; functions of theoretical models of organizations; major organizational variables; organizational authority patterns; communication in formal organizations. Prereq: 3610-20.

6710 Seminar in Class and Status (3) Classic and recent studies of class and status. Methods used in the research and current position of theory.

6810 Advanced Studies in Social Psychology (3) Social interaction and personality; the genesis and functioning of the self; the interaction of social structures and individual actions; theory and social psychology related to these problems and recent research are discussed. May be repeated. Prereq: Social Psychology 5600 or Psychology 5560.

6840-50 Social Change (3, 3) Major theories, methods and research.

6940 Advanced Studies in Urban Sociology (3) Field work projects and community studies examined and/or applied in specified areas. Prereq: 3410-20.

Spanish

See Romance Languages

Speech and Hearing Sciences

See Audiology and Speech Pathology

Speech and Theatre

MAJOR DEGREES

Speech and Theatre

MA, M.A.C.T.

Professors:

R. G. Allen (Head), D.F.A. Yale; T. P. Cooke, Ph.D. Florida; 6840 or Ph. M. Cuthran;

Associate Professors:

R. C. Field, M.A. Miami (Ohio); J. F. Fields, M.A. Ohio State; R. W. Glenn, Ph.D.


Assistant Professors:

R. S. Ambler, Ph.D. Ohio State; J. F. Buckley, Ph.D. Northwestern; R. L. Conville, Ph.D.

Louisiana State; N. C. Cook, M.A. Alabama; M. Custer, M.F.A. Wisconsin; B. V. Daniels, Ph.D. Cornell; L. W. Lester, Ed.D. Tennessee; R. R. Mathburn, M.A. Tennessee.

MASTER’S PROGRAM

The departmental requirement for the M.A. degree in Speech and Theatre is 45 quarter hours (inclusive of hours taken toward a major), at least 22 hours of which must be earned in courses numbered 5000 or above. For the degree of Master of Arts in College Teaching, 57 quarter hours are required, in addition to 5110-20-30, Conti-

5911 Directing the Forensic Program (4) Philosophy and methods of directing co-curricular and extracurricular forensic activities in high schools and colleges; competitive or non-competitive approaches to directing debate, oral interpretation and public speaking events. (Same as Curriculum and Instruction 5911).

Speech and Theatre

4170-80-90 Film History and Theory (3, 3, 3) Analysis of cinematic forms and styles. 4170—Narration, 4180—Exposition and persuasion, 4190—Experimental forms; films and other media.

4511 Theories of Oral Interpretation (4) Theories concerning the literary, psychological, communicative, and aesthetic approaches to the methods and techniques of oral interpretation.

4611 Production Techniques for Oral Interpretation (4) Problems in collection, adaptation, and presentation of literature.

5002 Non-Thesis Graduation Completion (3) 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.

5110 Introduction to Graduate Research in Speech and Theatre (3)

5120 Directed Reading and Research (3) May be repeated. Maximum 9 hrs.

Theatre

3121-22 Advanced Acting (4, 4) Prereq: Consent of instructor.

3151-52 Major Productions (1-4, 1-4)

3153 Outdoor Repertory Production (4)

3221-22 Introduction to Scene Design (4, 4) Descriptive drawing as an approach to three-dimensional design; theatrical graphic standards; problems in stage design with reference to lighting; movement, scale and style. Prereq: Stagecraft or consent of instructor.

3252-53-54 History of the Theatre (4, 4, 4) Drama in performance with particular emphasis on text, architecture, social conditions and other influences on the production of classical and contemporary theatre. 3252—Antiquity to the Renaissance. 3253—The European Theatre, 1650-1850. 3254—The American Theatre.

3262-63 History of American Theatre (4, 4) Development of theatre as social institution in American life. 3262—from its beginnings to 1900. 3263—from 1900 to present.

3321-22 Introduction to Lighting Design (4, 4) Mechanics of stage lighting; elementary theory; problems in basic lighting practice. Prereq: Stagecraft or consent of instructor.

3451-52 Play Directing (4, 4) Must be taken in sequence. Prereq: Acting.

3511-12 Introduction to Theatre Costume Design (4, 4) Costume as an expression of character on stage; the application of costume history to specific design projects. Prereq: Basic stage costuming or consent of instructor.

4133-34 Special Problems in Acting (4, 4) Advanced exercises in voice and movement; preparation of major role under performance conditions. Prereq: Advanced acting and consent of instructor.

4151-52 Major Productions (1-4, 1-4) Continuation of 3151-52. Available for credit only to theatre majors Prereq: Consent of instructor.
College of Liberal Arts

4153 Outdoor Repertory Productions (4) Continuation of 3153. Available only to members of summer company by consent of instructor.

4241-42 Advanced Scene Design (4, 4) Play interpretation through scenic means; setting as environment for dramatic action. Prereq: 3221-22 and consent of instructor.

4341-42 Advanced Lighting Design (4, 4) Relationship of light to setting in creating stage environment. Prereq: 3221-22 and consent of instructor. Must be taken in sequence.


4541-42 Advanced Theatre Costume Design (4, 4) Problems in costume design; construction; pattern drafting; draping. Prereq: 3511 or 3512.

4751-52 Dramatic Theory and Criticism (4, 4) From Aristotle to Lessing. 4751—From Goethe to Sartre. 4752—From Prereq: Consent of instructor.

4951-52 Playwriting (4, 4) Prereq: Consent of instructor.

5250 Seminar in Playwriting (3)

5310 Studies in European Theatre History (3) May be repeated. Maximum 9 hrs.

5320 Studies in American Theatre History (3) May be repeated. Maximum 9 hrs.

5602 Projects in Lighting Design (3) May be repeated. Maximum 9 hrs.

5630 Projects in Play Directing (3) May be repeated. Maximum 9 hrs.

5640 Projects in Scene Design (3) May be repeated. Maximum 9 hrs.

5560 Projects in Costume Design (3) Problems of play interpretation and theatrical costume design centering around individual projects. Students will design the costumes for a complete play for public performance. May be repeated. Maximum 9 hrs.

5890 Studies in Theatrical Production (3) May be repeated. Maximum 9 hrs.

5912 Play Production in Secondary Schools (4) Auditioning and methods for directing high school dramatic programs. (Same as Curriculum and Instruction 5912.)

5950-60-70 Studies in Dramatic Theory and Criticism (3, 3, 3)

Speech Pathology

See Audiology and Speech Pathology

Zoology

MAJORS

DEGREES

Radiation Biology M.S., Ph.D.

Zoology M.S., Ph.D.

Professors: J. C. Daniel, Jr. (Head), Ph.D. Colorado; D. L. Bunting, Ph.D. Oklahoma State; J. G. Carlson, Ph.D. Pennsylvania; A. C. Cole, Jr. (Emeritus), Ph.D. Ohio State; R. C. Fraser, Ph.D. Minnesota; R. F. Greif, Ph.D. Tennessee; B. Hochman, Ph.D. California (Berkeley); J. C. Howell, Ph.D. Cornell; K. W. Jem, Ph.D. London (England); A. W. Jones, Ph.D. Virginia; M. Ketchel, Ph.D. Harvard; J. N. Liles, Ph.D. Ohio State; L. E. Roth, Ph.D. Chicago; C. A. Shivers, Ph.D. Michigan State; J. T. Turner, Ph.D. Indiana; J. B. Turner (Emeritus), Ph.D. Duke; G. L. Whitson, Ph.D. Iowa; D. P. Young, Ph.D. Kansas.

Associate Professors: R. M. Bagby, Ph.D. Illinois; K. D. Burnham, Ph.D. State University of Iowa; D. A. Enright, Ph.D. University of Michigan; J. R. Kennedy, Ph.D. Iowa; H. G. Welch, Ph.D. Florida; M. C. Whiteside, Ph.D. Indiana.

Assistant Professors: P. B. Coulson, Ph.D. Illinois; A. C. Echtenach, Ph.D. Kansas; D. J. Fox, Ph.D. Johns Hopkins; M. A. Handler, Ph.D. Kansas; A. M. Jungreis, Ph.D. Minnesota; J. A. MacCabe, Ph.D. California (Davis); M. L. Pan, Ph.D. Pennsylvania; S. E. Riechert, Ph.D. Wisconsin; J. A. Vaughan, Ph.D. Duke.

Requirements for Admission: Applicants for graduate study are expected to have a background no less extensive than that required of undergraduate majors in this department. This includes a knowledge of the basic principles of cell biology, genetics, and ecology. Other requirements for admission are: (1) general zoology or general biology, 12 quarter or 8 semester hours; (2) upper division zoology, 18 quarter or 12 semester hours; (3) chemistry, 2 years including 12 quarter or 8 semester hours of general inorganic; (4) mathematics, 9 quarter or 6 semester hours including differential and integral calculus; (5) physics, 12 quarter or 8 semester hours; (6) Graduate Record Examination scores (Verbal, Quantitative and Advanced Biology); and (7) a grade point average of 3.0 out of a possible 4.0. Otherwise superior students, deficient in one or more of the above requirements, may be admitted at the discretion of the Graduate Affairs Committee.

Preparation for Thesis or Dissertation: During the first year a written examination and a special research problem in each of two faculty members' laboratories will determine the student's preparation for thesis or dissertation study.

DOCTORAL PROGRAM

Special requirements in zoology are as follows: (1) course requirements shall be determined by the student's faculty committee; (2) the preliminary examination will be an oral and written examination in zoology and allied fields in which the candidate has had training; (3) the candidate for the doctorate must possess a reading knowledge of at least 1 foreign language in which there exists a sizeable amount of literature relevant to the major field of study. The student has the option of demonstrating a reading knowledge of this foreign language by (a) passing the official reading examination given by the language department or (b) earning at least a B in 3030 language courses. This requirement for the first language must be fulfilled before the student can take the preliminary examination.

The student's faculty committee may require of the student any level of training or proficiency in a second foreign language but may not require that the student take the official language examination in the second language.

3040 Natural History of the Vertebrates (3) Behavior, life history, phylogeny, and classification. 3 hrs and 2 labs or field periods.

3050 Comparative Vertebrate Embryology (5) Developmental morphology of selected vertebrates. 2 hrs and 3 labs.

3060 Comparative Vertebrate Anatomy (4) Anatomy of organ systems of shark and cat used in laboratory, 2 hrs and 2 labs.

3071 Immunology (3) (Same as Microbiology 3071.)


3110 General Entomology (5) Introduction to insects; basic structure, development, behavior; classification of insect orders and representative families; interpretation and use of keys. Prereq: General Ecology or consent of instructor. 3 hrs and 2 labs.

3150 Invertebrate Zoology (5) Biology of invertebrates (except insects) with emphasis on ecology and behavior. Prereq: General Ecology, 3 hrs and 2 labs.

3220 Physiology of Reproduction (3) (Same as Animal Science 3220.)


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.

4007, 4010-4017 Minicourse in Zoology (2) Selected advanced topics in zoology, concentrated in time and subject matter. Consult departmental listing for actual topics to be offered. Prereq: As posted. May be repeated.

4050 Developmental Biology (4) Experimental morphogenesis, fertilization, cellular interactions, hormonal effects and related topics with examples drawn primarily from invertebrates and vertebrates. Prereq: 3550, Cell Biology and General Ecology, 2 hrs and 2 labs.

4120 Undergraduate Research Participation (2) Experience in active research projects under supervision of staff members. Prereq: Consent of instructor.

4140 Practicum in Zoology (1-3) Participation in practical application of zoology in community institutions and government organizations and industry. Approximately 5 hours involvement per week. Prereq: General Genetics, Cell Biology, General Ecology, and senior standing.

4190 Mammalogy (4) Classification, evolution, distribution, reproduction, populations, and behavior, 2 hrs and 2 lab or field periods.

4230 Ichthyology (5) Classification, collection and identification, distribution, life histories, and economic importance of fishes. Prereq: General Ecology or consent of instructor. 2 hrs and 2 lab or field periods.

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 course. Coreq: Chemistry. Recommended: Biochemistry, 3 lectures and 1 lab.

4240 Animal Ecology (4) Environmental factors determining the distribution and number of animals; infraspecific relations; problems and methods. Prereq: General Ecology, 2 hrs and 2 labs.

4250 Comparative Animal Physiology, I (3) Environmental physiology. Survey of physiological mechanisms and their relation to ability of animals to survive in diverse physical environments. Prereq: Cell Biology, General Ecology and 2 yrs chemistry.
4259 Comparative Animal Physiology Laboratory, I (1) Coreq: 4250.
4269 Comparative Animal Physiology Laboratory, II (1) Prereq: Principles of Animal Physiology and consent of instructor. Coreq: 4260.
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: Principles of Animal Physiology and Hormones and Endocrine Function, 3 hrs and 1 (3/hr) lab.
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.
4500 Ornithology (4) Morphology, physiology, behavior, reproduction, populations, evolution, field identification. 2 hrs and 2 labs or field periods.
4510 Animal Cytology (4) Structure and function of cells and their components; special emphasis on mitosis and meiosis. Recommended prereq: General Genetics. 2 hrs and 2 labs.
4520 Microtechnique (4) Prereq: 3320 recommended. 2 hrs and 2 labs.
4569 General Genetics Laboratory (2) Experiments designed to illustrate basic principles of inheritance. Prereq: General Genetics. 2 labs.
4410 General Parasitology (4) Morphology, taxonomy and ecology of parasitic worms and protozoa, with emphasis on host-parasite relationships. 3 hrs and 1 lab.
4430 Medical Entomology (4) Distinctive morphological features, distribution, life histories, and control of arthropods that parasitize man or serve as vectors of human pathogens. Recommended prereq: Agricultural Biology 3210 or General Ecology. (Not open to students with credit for 3430.)
4450 Protozoology (4) Morphology, taxonomy, and physiology of protozoa in relation to fundamental biological concepts. 2 hrs and 2 labs. Recommended prereq: Cell Biology.
4610-20 Comparative Animal Pathology (2, 2) Abnormal morphological changes and their causes, 4610—Cell and tissue changes. 4620—Organ, organ system, and organism changes. Required: 3060, 3060, 3320.
4619-29 Comparative Animal Pathology Laboratory (2, 2) 4619—Cell and tissue changes. 4620—Organ, organ system, and organism changes. Coreq: 4610-20.
4660-70 Limnology (4, 4) 4660—Effects of origin, age, and location of lakes on their physical and chemical nature. 4670—Lake communities, productivity and pollution. Prereq: General Chemistry, General Ecology. Recommended: General Botany and Intro. Physics, 2 hrs and 2 labs (4660); 3 hrs and 1 lab (4670). Must be taken in sequence, except with consent of instructor. Not open to students with credit for former 3640 or 4650.
4700 Arachnology (4) Biology of spiders, mites, scorpions, and relatives. Prereq: 3110, or 3150. 2 hrs and 2 labs.
4720 Comparative Animal Behavior (4) Methods and principles. (Same as Psychology 4720.)
4729 Comparative Animal Behavior Laboratory (4) Laboratory and field studies. Coreq: 4720. (Same as Psychology 4720.)
4810-20-30 Insect Morphology and Taxonomy (4, 4, 4) 4810—Internal morphology of both generalized and minor orders. 4820—Taxonomy of minor orders and immature forms. Prereq: 3110 or consent of instructor for 4820-30. 2 hrs and 2 labs.
4940 Physiology of Exercise (4) Functions of body in muscular work; physiological aspects of fatigue, training, and physical fitness. Prereq: Human Physiology or 3060. 3 hrs and 1 lab. (Not open to students with credit for 3940.)
5000 Thesis
5080 Graduate Research Participation (3) Advanced research techniques are studied under the supervision of a staff research director whose research area coincides with the interests of the student. Open to all graduate students in good standing. Consent of department and research director. Course may be repeated with consent of the department. S/NC only.
5110-20-30 Special Problems (2, 2, 2)
5150 Zoological Bibliography (1) Study and practice of zoological bibliography and use of zoological literature, bibliographies, and abstracts, and of preparing bibliographies and scientific papers.
5160 Fresh Water Invertebrate Zoology (4) Ecology and taxonomy of fresh water invertebrates exclusive of insects. Laboratory and field study. Prereq: 3180.
5210 Plant Parasitic Nematodes (4) (Same as Agricultural Biology 5210.)
5220-30-40 Advanced Vertebrate Physiology (4, 4) Advanced vertebrate cellular and systemic physiology; 5220—membrane, blood, immunity, neurophysiological mechanisms and muscle physiology; 5230—respiratory, cardiovascular, renal, thermo-regulatory, and digestive physiology; 5240—endocrinology, physiological genetics, reproductive physiology, sensory physiology, and aging. Must be taken in sequence, except with consent of instructor. Prereq: 4250, Coreq: Biochemistry 4120.
5270 Advanced Neuro muscular Physiology (5) Cellular and molecular aspects of phenomena associated with conduction of excitation and muscular contraction. Prereq: 4250. 3 hrs and 2 labs.
5280 Insect Physiology (4) Functions and interrelationships of the systems relative to metabolism, growth, coordination, movement, and reproduction. Prereq: 4610, 1 yr General Chemistry or consent of instructor. 2 hrs and 2 labs.
5290 Quaternary Problems (4) (Same as Geology 5290.)
5310-20 Seminar in the Teaching of College Zoology (2, 2) Seminar in the teaching of zoology; modern techniques and instrumentation; supervised application of teaching principles and methods. Must be taken in sequence. Prereq: Consent of instructor. S/NC only.
5350 Biometry (3) Statistical methods used in analysis of quantitative biological data. Prereq: 1 quarter statistics or consent of instructor.
5410 Advanced Parasitology (4) Life cycles, techniques of collection, preservation, and identification of parasitic worms and protozoa. Prereq: Consent of instructor.
5430 Advanced Medical Entomology (3) Prereq: 4430.
5550 Advanced Ornithology (4) Classification, distribution, and anatomy of birds. Prereq: 4500.
5570 Animal Populations (3) Characteristics and methods of study of animal populations.
5610-20 Foundations of Radiation Biology (4, 4) Physical, chemical, and biological mechanisms involved in the action and the effects of different kinds of radiations on the living cell and its components. Recommended prereq: 1 yr biological science, General Physics, Biochemistry, Calculus. 3 hrs and lab.
5630 Methods of Experimentation with Laboratory Mammals (3) Designed to give competence in handling research mammals. Techniques of anesthesia, drug administration, radiography and surgery will be included. Prereq: 4050, or 4410, or consent of instructor.
5670 Cellular Immunology (4) Laboratory course with emphasis on immunological phenomena at the cellular level. Includes preparation and use of immunofluorescent reagents, macrophase migration inhibition, skin allograft reactions, diffusion chamber cultures, and antibody formation at the cellular level. Recommended prereq: Immunology. 4 hrs and 2 labs.
5760 General Vertebrate Neuroanatomy (3) (Same as Psychology 5760.)
5780 Radiation Physiology (4) Effects of different kinds of radiations on the functions of cells, tissues, and organ systems of animals. Recommended prereq: 5610.
5820 Methods of Taxonomy (4) Methods employed in classification of animals; rules of nomenclature; problems in priority; preparation of keys, descriptions, and figures. Prereq: Consent of instructor.
5840 Aquatic Insects (4) Taxonomy and biology of aquatic insects, study of their morphology and function on immature forms. Offered spring quarter. 2 hrs and 2 labs.
5860 Geographic Distribution of Animals (4) Distribution patterns of vertebrate and invertebrate animals in all major habitats. Prereq: Consent of instructor.
5870 Insect Synecology (4) Ecology of insect communities.
6000 Doctoral Research and Dissertation
6110 Seminar in Cellular Biology (2) Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.
6140 Seminar in Immunobiology (2) Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.
6210 Seminar in Physiology (2) Prereq: Two physiology courses or consent of instructor. May be repeated. Maximum 6 hrs.
6310 Seminar in Cytology (2) Prereq: 4310. May be repeated. Maximum 6 hrs.
6350 Seminar in Developmental Biology I (2) Introduces students to the differentiating cell. Prereq: 3050, 4050; Biochemistry 4110-20.
6410 Seminar in Parasitology (2) Prereq: 5410. May be repeated. Maximum 6 hrs.
6510 Seminar in Genetics (2) Prereq: General Genetics. May be repeated. Maximum 6 hrs.
Seminar in Ornithology (2) Prereq: 4500. May be repeated. Maximum 6 hrs.

Seminar in Aquatic Biology (2) Prereq: Any 2 of 4620, Freshwater Fishery Biology, 4660-70, Botany 5061, or consent of instructor. May be repeated. Maximum 6 hrs.

Seminar in Ecology (2) Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.

Seminar in Entomology (2) Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.

Seminar in Aquatic Biology (2) Prereq: 4660-70, Botany 5061, or consent of instructor. May be repeated. Maximum 6 hrs.

Seminar in Radiation Biology (2) Prereq: 5610, Coreq: 5620. May be repeated. Maximum 6 hrs.

Seminar in Ecology (2) Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.

Seminar in Radiation Biology (2) Prereq: 5610, Coreq: 5620. May be repeated. Maximum 6 hrs.

Interdepartmental Program In Radiation Biology

John R. Totter, Director

MAJOR
Radiation Biology

DEGREE
M.S., Ph.D.

A graduate major in the field of radiation biology is offered through the Institute of Radiation Biology. This is a program crossing both departmental and institutional lines. Included on the institute staff are certain scientists from the Departments of Biochemistry, Botany, Chemistry, Microbiology, Physics, Zoology and the Memorial Research Center and the Comparative Animal Research Laboratory of The University of Tennessee, the Biology and Environmental Sciences Divisions of the Oak Ridge National Laboratory, and the Medical Division of Oak Ridge Associated Universities.

Formal courses in this program are offered mainly on the Knoxville campus. Thesis research may be carried on either at the University or, by special permission, at one of the Oak Ridge laboratories. Problems selected for thesis research shall involve the interaction of radiations or long-lived fission products with biological systems, at the molecular, cellular, or organismal, or ecological level of complexity. Areas of radiation specialization include biochemistry, biophysics, cytology, ecology, electron microscopy, embryology, entomology, genetics, hematology, immunology, microbiology, molecular biology, oncology, parasitology, pathology, physiology, and tissue culture.

Requirements for Admission: The minimum academic requirements for admission to the Institute are: (1) A Bachelor's degree from an accredited college or university, (2) biological science, chemistry, physics: 30 quarter hours in one and 12 in each of the others, (3) college mathematics: potential candidates for the Master's degree, 9 quarter hours; potential candidates for the Doctor's degree, differential and integral calculus, (4) for the Ph.D. program, Graduate Record Examination scores.

Requirements for the Master of Science Degree: Course requirements shall include: (1) Zoology 5610. (2) Zoology 5620 or 5770 or 5780. (3) Zoology 5350 or Plant and Soil Science 5810. (4) Chemistry 3810 or Botany 5240. (5) Biochemistry 4110-20. (At least one-half of the student's program must be at the 5000 level.) A thesis is required of all students.

Requirements for the Doctor of Philosophy Degree: (1) Courses: In addition to those required for the Master's degree, Chemistry 4140-50 or 5410-20; Physics 3710-20-30; (2) Chemistry 3810 may be substituted for Physics 3730; Zoology 5620. Additional course requirements are determined by the student's faculty committee. The student's special field of interest and plans for a career determine these requirements. The more important courses from which selection may be made are advanced courses in biochemistry, botany, chemistry, electrical engineering, mathematics, microbiology, physics, and zoology.

Courses are available in The University of Tennessee Graduate School of Biomedical Sciences at Oak Ridge. (2) The preliminary examination will consist of oral and written portions in radiation biology and in allied fields in which the candidate has received training. (3) Candidates will be required to pass, before the preliminary examination is taken, the official reading examination of the University in only one foreign language, or must earn a B average or at least a B in the last quarter of an appropriate language sequence, but the student's faculty committee may require other levels of training or proficiency in an additional foreign language. (4) The final examination will be an oral examination covering the candidate's dissertation and such other fields as the candidate's faculty committee may specify.

Regular attendance at the weekly Radiation Biology Seminar or an appropriate Departmental Seminar is expected of all students.

General Information for the College of Liberal Arts

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.

School of Nursing

Sylvia E. Hart, Dean

4770 Comprehensive Health Assessment (4)
Principles and theories underlying health screening of children and adults, including health history, interviewing and physical examination. 20 hrs lecture and 80 hrs lab or practice.
The University of Tennessee-Oak Ridge Graduate School of Biomedical Sciences, located within the Biology Division of Oak Ridge National Laboratory, offers programs leading to the Master of Science and Doctor of Philosophy degrees. The National Laboratory, one of three installations operated at Oak Ridge by Union Carbide Corporation for the United States Energy Research and Development Agency, is a well-known center of basic research. The school utilizes the staff and facilities of this laboratory, and thus brings directly into the mainstream of full-time graduate study in the life sciences the talent and experience of that staff, as well as the most advanced research methods and technology.

The program of study, which incorporates a high faculty-to-student ratio, is based on intensive graduate courses supplemented by tutorial instruction, participation in a wide variety of seminars, and a heavy emphasis on communication skills, research training and independent study. The program encourages students to pursue graduate studies to the limits of their abilities.

The school is not departmentalized, and, apart from certain basic requirements, each student's curriculum is planned to meet individual needs, with the aim of giving: (1) strength in the basic sciences; (2) perception of the biomedical sciences as a whole; and (3) experience and training in a chosen specialty.

The research areas available for Masters and Ph.D. thesis work are biochemistry, biophysics, carcinogenesis, cell biology, genetics, and physiology. Included are such subjects as microbiology, immunology, protein and enzyme chemistry, nucleic acid chemistry, cytology, radiation biology, virology, developmental biology, plant physiology and photosynthesis, experimental pathology, microbial and mammalian genetics, mutagenesis, and problems of aging.

**ADMISSION**

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, general genetics, calculus, physics, and organic and physical chemistry. It is possible to remedy deficiencies in biology, general genetics and physical chemistry during the first year of residence. All other deficiencies in meeting entrance requirements should be eliminated prior to entrance.

Requests for application forms, information on admission, financial support, and housing should be sent to: Director, University of Tennessee-Oak Ridge Graduate School of Biomedical Sciences, Biology Division, ORNL, Box Y, Oak Ridge, Tennessee 37830.

**DOCTOR OF PHILOSOPHY DEGREE PROGRAM**

Requirements for the Ph.D. degree are:

1. Satisfactory (B grade or better) completion of the following core courses or their equivalent: Biochemistry (5110-20); Biophysics (5140); Genetics (5160); Molecular Genetics (5170); Cell Biology (5180-90); Mammalian Physiology (5200) and Statistics for Biologists (5720).

2. Three quarters Biomedical Sciences Laboratory (5310-20-30-40).

3. Participation in Biomedical Sciences Seminar (5350-60-70) for one year.

4. Participation in at least three formal courses in the advanced area of the student's interest.

5. Pass a written preliminary examination. This examination will be given at the end of the student's first academic year, unless other arrangements are made between the student and the Director of the Biomedical Graduate School. Such arrangements should be made during the student's first quarter in attendance at the School.

6. Pass an oral examination by the end of the student's second academic year. This includes the ability to formulate specific hypotheses and experiments and to present and defend these ideas orally before a selected group of scientists.

7. A dissertation reporting the results of original and significant scientific research. A minimum of 36 quarter hours of course 6000 is required.

8. A final oral examination on the dissertation.

9. A formal seminar presentation of the dissertation research.

**SPECIAL MASTER OF SCIENCE DEGREE PROGRAM**

The graduate faculty has designed a Master of Science program in Biomedical Sciences primarily to fill the need for such a degree within the Oak Ridge National Laboratories; however a limited number of students from other institutions may be accepted if qualified and as space is available.

Requirements for the M.S. degree are:

1. Graduate credit or a proficiency in the following core courses: Biochemistry

Courses

5000 Thesis

5070-80 Physical Chemistry for the Life Sciences (3, 3) Thermodynamics; phase equilibria; chemical equilibria; electromotive force; surface chemistry; electrolyte solutions; kinetics; conductance; viscosity; diffusion.

5110-20 Biochemistry (3, 3) Chemistry of carbohydrates, lipids, proteins, nucleic acids, and coenzymes; enzyme kinetics; intermediary metabolism; biosynthesis processes of amino acids, purines, pyrimidines, lipids, and macromolecules. Coreq: 5070-80.

5140 Biophysics (3) Energy levels and excited states of large molecules; optical instrumentation; adaptations to system perturbations; properties of macromolecules in solutions; molecular conformations; interaction and intramolecular forces; principles of microscopy. Prereq: 5070-80.

5160 Genetics (5) Mendelian genetics, mitosis and meiosis; Genetics of phage, bacterial and eukaryotic organisms; Mapping and linkage; mutagenesis; cytoplasmic inheritance; meiosis and mitosis. Genetics of phage, bacterial and eukaryotic organisms; Mapping and linkage; mutagenesis; cytoplasmic inheritance; mechanism of recombination; chromosome structure, replication, and segregation.

5170 Molecular Genetics (3) Molecular biology of genetic processes. Gene regulation; coding; protein synthesis; suppression of missense and nonsense mutations; mutagen mechanisms; complementation; recombination. Preq: 5110-20, 5160.

5180 Cell Biology I (3) Structure and composition of major nuclear and cytoplasmic organelles of eukaryotic cells. Peritoneum instruments and techniques; meros and mitosis; cell cycle; chromosome structure; nuclear RNA metabolism; ribosome biogenesis; survey of specialized cells. Structure of genetic transcription and translation in bacteria. Coreq: 5110.

5190 Cell Biology II (3) Comparative bio-chemical approach to cell structure and function. Membrane systems and metabolism; development and function of the mitochondrion; chloroplasts and other organelles as related to metabolism and regulation; transport phenomena; cell cycle. Preq: 5110, 5180; Coreq: 5120.

5200 Mammalian Physiology (4) Survey of mammalian organ systems and their functions. Nervous, muscular, endocrine, digestive, respiratory, circulatory, reproductive, and excretory systems will be included; interrelationships of these systems and their mechanisms will be discussed. Emphasis is placed on current biochemical advances in basic and clinical medicine. Preq: 5200, 5110-20.

5320 - 50-30-40 Biomedical Sciences Laboratory (3, 3, 3) Experimental laboratory course for students majoring in biomedical sciences and related disciplines. Prerequisite: completion of 12 credits of basic and clinical sciences. This course is offered in sections to accommodate student needs.

5350-60 Biomedical Sciences Seminar (1, 1) Critical analysis of recent journal publications in various areas of modern biology. Written analysis of papers will be required of each student. Required of all first-year students.

5370 Biomedical Sciences Seminar (1) Basic principles of scientific writing. Research articles, grant applications, and book reviews; abstracts; research articles, review articles; progress reports. Required of all first-year students.

5430-50-60 Graduate Research Participation (3, 3, 3) Special advanced research project covering an area not related to dissertation research. Topics chosen with consent of instructor. May be repeated.


5740 Statistics for Biologists (3) Application and interpretation of statistical methods in data analysis. Random variations; normal, binomial, and Poisson distributions; statistical presentation of data; estimating means and variances; confidence intervals; tests of significance for comparing samples; analysis of variance; contingency tables; chi-square tests; correlation and association of data. Preq: Introductory Statistics or consent of instructor.

5750 Experimental Design in Biomedical Research (3) Requirements for a valid experiment: designs for reducing effect of error; including paired comparisons, randomized blocks, and Latin squares; use of supplements; observations to reduce errors; randomization; investigating several variables simultaneously by factorial and fractional experiments; determining the number of observations. Preq: 5740.

5830 Physical Biochemistry (3) Methods and concepts relevant to the determination of size, shape, and other properties of macromolecules.
shape and molecular weight of biological macromolecules. Discussion of optical activity and light scattering of macromolecules in solution. Prereq: 5070-80, 5110-20, 5140.

5840 Bioorganic Reaction Mechanisms (3) Nature of the chemical bond, nucleophilic and electrophilic reactions, molecular rearrangements, oxidation-reduction, solvolysis, protein and nucleic acid modification reagents, reactions involving proteins and nucleic acids on polymer supports.

5860 Cryobiology (3) Physical and chemical responses of cells and bacteriophage to low temperatures and ice formation. Relation of these responses to permeability, structure of semipermeable membranes, conformation of macromolecules, and the nature and state of water in cells; and how they bear on other fields of biology and medicine—including electron microscopy, photobiology, cell physiology, exobiology, ecology, and cryosurgery. Prereq: 5070-80 or equivalent, and 5190.

5920 Mammalian Genetics (3) Orderly presentation of known genetic variants affecting each of the organ systems of experimental mammals, especially the laboratory mouse. Prereq: 5170.

5940 Classic Experiments in Genetics (3) Original papers presenting new and lasting insights into the fields of biology and medicine—including electron microscopy, photobiology, cell physiology, exobiology, ecology, and cryosurgery. Prereq: 5070-80 or equivalent, and 5190.

5960 Bioorganic Reaction Mechanisms (3) Nature of the chemical bond, nucleophilic and electrophilic reactions, molecular rearrangements, oxidation-reduction, solvolysis, protein and nucleic acid modification reagents, reactions involving proteins and nucleic acids on polymer supports.


6240 Chemistry and Metabolism of Lipids (3) Nomenclature, chromatographic isolation, chemistry, physical properties, and enzymology of lipids. Hormonal action of prostaglandins and the role of lipids in membranes, enzyme expression, and nervous tissue. The main emphasis is on lipid biochemistry of mammals, although comparative aspects, particularly the lipid pathways in bacteria and yeast are also described. Prereq: 5110-20.

6250 DNA, RNA, and Protein Synthesis (3) DNA and RNA synthesis; mechanism of RNA and DNA synthesis. Role of different cellular components in vivo and in vitro synthesis of RNA and DNA. II. Protein synthesis: activation of amino acids, structure and function of RNA, transfer factors, initiation, translation and termination. Prereq: 5110-20.

6260 Advances in Animal Virus Research (3) Mechanisms of infection, replication, and maturation; alternations of host cell structure and function; host immunological responses; oncogenesis; pathogenesis; genetics; interferon. Prereq: 5110-20, 5180-90.

6270 Viral Carcinogenesis (3) History of viral oncology and descriptive catalog of tumor viruses. The biology of normal and transformed cells. DNA tumor viruses; replication cycle; transformation; genetics; natural history. RNA tumor viruses; endogenous and exogenous states; genetics; induction; transformation; natural history.


6290 Cancer Biology and Biochemistry (3) Pathology and nomenclature of cancer. Tumor immunology and immunotherapy. Biochemistry of tumor cells; enzymology, metabolism; membranes; DNA repair; regulation; strategies in chemotherapy.

6300 Mutagenesis (3) Course will include basic mechanisms in chemical and radiation mutagenesis and dosimetry in a variety of systems including bacteria, fungi, Drosophila, and mice.

6510-20-30-40 Advanced Topics in Biomedical Sciences (3, 3, 3, 3) Emphasis on current and future research developments. Offered on the topics listed under the Special Topics Courses and can be taken either as tutorials or as independent literature survey courses requiring substantial student participation. May be repeated.
Graduate School of Library and Information Science

Gary R. Purcell, Director

MAJOR
Library Science

DEGREE
M.S.L.S.

The Graduate School of Library and Information Science provides a library education program leading to the preparation of librarians for work in all types of libraries. The programs of study of this School include the graduate curriculum leading to the degree of Master of Science in Library Science.

MASTER OF SCIENCE IN LIBRARY SCIENCE

The objective of the program is to prepare responsible and competent individuals to assume a professional role in libraries and information centers. In the course of study, students are exposed to various ideas about the role of libraries and information centers in society and the processes by which knowledge is communicated through the medium of the graphic record. Students acquire a familiarity with the bibliography and the literature of various subject fields. They are expected to develop the ability to evaluate and use various types of print and non-print materials. Students are also introduced to current concepts of the management of library operations and services.

PROGRAMS OF INSTRUCTION

The program leading to the degree of Master of Science in Library Science involves a total of 51 quarter hours of graduate courses, 21 hours of which form a core curriculum required of all students. Either a thesis or a non-thesis program is available, with nine hours allowed for thesis credit. At least 36 hours must be taken in the GSLIS, allowing up to 15 hours outside the school. Upon completion of the program, all students are subject to an examination. For students who elect the thesis option, the examination will be a defense of the thesis. Students who elect the non-thesis option will be given a written comprehensive examination. Programs are designed for persons interested in school libraries, public libraries, academic libraries, information science/technical information service, and library management.

ADMISSION REQUIREMENTS

The minimum grade point average for admission to the Graduate School is 2.5. Candidates who have at least a 3.0 average in the junior and senior years will receive first consideration. Applicants are required to take the aptitude test of the Graduate Record Examination. The test should be taken at least one quarter in advance of application for admission to the Graduate School.

Foreign applicants are required to take the Test of English as a Foreign Language.

APPLICATION PROCEDURE

Admission to the programs in the Graduate School of Library and Information Science should be made in advance of the quarter for which admission is requested. Applicants should submit the "Application for Admission" form (printed as the first page of the Graduate School Catalog) and should request the registrars of all colleges and universities attended to send two official transcripts to the Graduate School. In addition, each applicant should make arrangements to take the GRE and TOEFL exams, if applicable. A personal data sheet and three recommendations (obtained from the Graduate School of Library and Information Science) should be returned to the Director of the School.

FINANCIAL ASSISTANCE OPPORTUNITIES

Arrangements made with the University of Tennessee Libraries provide a work-study plan for selected students who wish to obtain experience in academic librarianship while pursuing the degree. Such students are expected to work at least 20 hours each week and to extend the period required for the degree to approximately two years. Similar arrangements exist with some of the other libraries in the Knoxville area.

A limited number of graduate assistantships are available through the School for the degree. Assistantships of this type carry a waiver of tuition and fees as well as a stipend, and require that recipients work 10 hours per week in the School.

Information on financial assistance is available from the Director of the Graduate School of Library and Information Science.

Faculty

Professors:
E. E. Mauldin, M.S.L.S. Illinois; G. R. Purcell (Director) Ph.D. Case Western Reserve.
Associate Professor:
Assistant Professors:

Courses

4140 Libraries and Librarianship (3) Librarianship as an occupation: its organization, responsibilities, problems and prospects.
4150 School Library Administration (3) Objectives, functions, and place of the school library; relationship to local and state services; cooperative planning for quarters and materials; evaluation. (Same as Curriculum and Instruction 4150.)
4270 Organization of Library Collections I (6) Acquisitions, cataloging and maintenance of library collections.
4330 Introduction to Reference Materials (3) Basic information sources and services for all libraries.
4750 Audiovisual Methods and Techniques (3) (Same as Curriculum and Instruction 4750.)
5000 Thesis

5002 Non-Thesis Graduation Completion (3) 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 repeated. S/NC only.

5110-20-30 Problems in Library Science (3, 3, 3) (May be repeated with consent of the school.)

5140 Research Methods in Library Science (3) Research methods applicable to librarianship. Emphasis on the process and conduct of research; includes analysis of published research.

5200 Subject Reference and Bibliography (3) General patterns of bibliographical organization and basic information sources in subject fields including non-English materials; experiences in bibliographic methods and search techniques. Prereq: 4330.

5210 Sources and Services for the Social Sciences (3) Study and use of English and non-English literature and bibliographical sources in education, economics, political science, history, geography, anthropology, psychology, sociology, and religion; emphasis on organization of collections for optimum use. Prereq: 5200.

5220 Sources and Services for the Natural Sciences (3) Use of English and non-English literature and bibliographical sources in mathematics, physics, astronomy, chemistry, geology, biology and medicine; emphasis on organization of collections for optimum use. Prereq: 5200.

5230 Sources and Services for the Humanities (3) Use of English and non-English literature and bibliographical sources in literature and language, fine arts, music, philosophy and religion; emphasis on organization of collections for optimum use. Prereq: 5200.

5240 Organization of Library Collections II (3) Construction and maintenance of the library catalog as a retrieval instrument, including indexing and subject analysis theory, comparative classification with emphasis on the Library of Congress system, and problems in reclassification. Prereq: 4270.


5260 Government Publications II (3) Acquisition, organization and utilization of the publications of foreign governments and international organizations such as the United Nations, UNESCO, and others.

5270 Legal Bibliography (3) Introduction to the literature of Anglo-American jurisprudence. Emphasis on use of reports, statutes, administrative regulations and decisions, treatises, periodicals, and indexes as bibliographic tools.

5300 Library Management (3) A basic overview of management and organization concepts applicable to libraries and librarians.

5310 Library Systems and Services (3) National, state, and regional systems of library service with attention to organization and planning, staff utilization standards and evaluation, and problems of jurisdictional relationships brought about by organizational patterns in multi-unit public library service systems.

5320 Library and Information Networks (3) National and regional information systems will be examined. Primary attention will be given to the design and analysis of existing systems within the academic or special library sphere.

5330 Academic Libraries (3) Discussion of persistent and current problems. Topics vary depending upon needs and interests of the group.

5350 School Libraries (3) Discussion of persistent and current problems. Topics vary depending upon needs and interests of the group.

5360 Technical Libraries and Information Centers (3) Purpose, functions, and organizational characteristics of those libraries and information centers, private and public, which offer scientific and technical information services. Problems related to the acquisition, organization, and servicing of technical information collections.

5370 The Library in the Community (3) Public library as a social agency; its role in the education and communication systems of the community.

5380 Seminar: Academic, Public, School or Special Libraries (3) Prereq: Consent of instructor.

5400 Library Facilities (3) Problems inherent in the planning and construction of library quarters. Examination of the interrelationships of staff, materials and user space requirements.


5510 Multimedia Resources of Libraries (3) Selection, acquisition, processing, storing, and servicing non-book materials, with special attention to films, recordings, microforms, photocopying.

5520 History of Books and Printing (3) Development of the book in its various forms. History of the alphabet and writing; early writing materials; book in manuscript; history and technique of printing; book illustration and binding; standards of modern fine printing.

5530 Contemporary Publishing (3) Creation, production, marketing, and distribution of materials acquired by libraries, with special attention to various types of publishers.

5540 Special Collections—Archives and Rare Books (3) Problems involved in the acquisition, organization, preservation and utilization of rare books and archival materials.

5550 Reading Guidance for Children and Young People (3) Organization to meet needs, interests, abilities of different age and socioeconomic groups. Prereq: 5640 or consent of instructor.

5560 Reading Guidance for Children and Young People (5) Organization to meet needs, interests, abilities of different age and socioeconomic groups. Prereq: 5640 or consent of instructor.

5570 Mass Communications and the Library (3) Mass media of communication in terms of their relation to modern library service, considered as forces that influence what people read, see, and hear.

5580 Traditional Literature and Oral Narration (3) Fundamental principles of the art of storytelling including techniques of adaptation and presentation for various age groups; instruction and practice in oral techniques.

5590 Critical History of Children's Literature I (3) Development of literature for children noting influence of changing social and cultural factors; attention to emerging genres through primary sources. 15th century to 1920.

5600 Critical History of Children's Literature II (3) Development of literature for children noting influence of changing social and cultural factors; attention to emerging genres through primary sources. 1920 to present.

5610 Production and Use of Audiovisual Materials (3) (Same as Curriculum and Instruction 5691.)

5700 Automation of Library Processes (3) Analysis of the application of data processing methods to basic library operations such as bibliographic control, technical processes, circulation control, and management functions.

5710 Introduction to Information Science (3) Survey of the content and method of information science with emphasis on the application of research findings to general library practice.

5720 Information Systems Analysis and Design (3) Elements involved in the design and operation of information retrieval systems, including acquisition, indexing vocabularies, information representation, file organization, search procedures, and system evaluation.

5730 Information Retrieval Systems Laboratory (3) Comparative capabilities of various types of information retrieval systems; analyzing the performance of systems to arrive at generalizations with respect to the theory, design and operation of IR systems.

5999 Practicum (6 or 9 or 12) An opportunity to translate library theory into practice under the guidance of qualified librarians. Prereq: Completion of the 21-hour core curriculum plus approval of the director.
Graduate School of Planning

J. A. Spencer, Director

The Graduate School of Planning offers a two-year graduate course leading to a degree of Master of Science in Planning.

The purpose of study is the education of professional planners, competent to handle positions of increasing technical and administrative responsibility. Graduates are candidates for professional service in regional, city, county, and metropolitan area planning agencies, in local, state, and federal agencies concerned with physical, economic and administrative planning, in private businesses and organizations dealing with urban problems, and in private consulting practices.

The curriculum is organized on a basis of six quarters, or 72 credit hours, and provides the student with core courses in planning theory, methods, and techniques, and also takes advantage of offerings at The University of Tennessee in related fields such as government, geography, sociology, and economics. Students in the latter quarters of the first year, and in the second year, are permitted to pursue particular interests through the choice of electives approved by the Graduate School of Planning. Practice in research and analysis on a particular planning problem or topic is obtained through the preparation of an individual thesis or through the thesis option.

Core planning courses are taught by the faculty of the Graduate School of Planning. Related courses are taught by other specialists drawn from the University faculty. In addition, the services of experienced professional planners in TVA and other public and private organizations are called upon to broaden the scope of the students' understanding. A variety of outside speakers and seminar leaders provide insight into particular problems of significance to planners.

ADMISSION PROCEDURES

All applicants should submit two letters of recommendation with their applications. Both letters should be from teachers familiar with the applicant's undergraduate or, where applicable, graduate academic record. In the event the applicant has had planning experience, a third letter is required from a supervisor or other person familiar with the planning work of the applicant. All applicants who wish to be considered for financial assistance from the University or the Graduate School of Planning should also submit recent Graduate Record Examination scores for the Aptitude (verbal and quantitative) portion of that test. Applicants are also encouraged to submit a statement of career goals in support of their application.

Applications will be acknowledged upon receipt. The applications will then be held by and reviewed in the Graduate School of Planning. The applicant should not anticipate an immediate response in regard to admissibility. All applications will be held until mid-April. Recommendations will then be made to the Graduate Office regarding the applicant's admission status. The Graduate School will then notify the applicants whether they have been admitted to the University and under what conditions the admission has been made.

All inquiries concerning admission should be addressed to:

Director
Graduate School of Planning
The University of Tennessee
Knoxville, Tennessee 37916

DEGREE REQUIREMENTS

Each student will be required to complete a minimum of 72 hours credit including at least 36 hours at the 5000 level or above.

Each student will be required to demonstrate competence in individual research. This may take either of two forms.

Plan I—Complete a thesis for nine hours credit.

Plan II—Complete a major study with acceptable documentation. In order to be eligible for the major study the student must have earned a grade of B+ or higher in Research Methods II, have a 3.5
cumulative grade point at the time of approval of the major study proposal, and have completed at least 24 hours of graduate study. The student meeting these criteria may present a proposal for a major study, which must include written documentation. Approval of the documentation, which must include written documentation, is a prerequisite for graduation.

Students in the Graduate School of Planning will be given a comprehensive written examination after approximately four quarters of course work. In addition to testing the knowledge of the student, the examination is designed to integrate knowledge from previous courses. Interrelationships will be stressed and the student will be required to use judgment in evaluation and creation of plans and policies addressed to real world situations. Extensive laboratory experience. Fees. Prereq: 4100.

5500 Synthesis (9) Problem-oriented experience designed to integrate knowledge from previous courses. Interrelationships will be stressed and the student will be required to use judgment in evaluation and creation of plans and policies addressed to real world situations. Extensive laboratory experience. Fees. Prereq: 4100.

5670 Social Planning (3) Theory, philosophy and implications of programs for planned social change. Consideration of major social planning issues in diverse fields of service (aging, corrections, education, health, manpower, mental health, social services, etc.). Prereq: Consent of Instructor. (Same as Social Work 5670.)
Graduate School of Social Work

Ben P. Granger, Dean
Betty J. Cleckley, Assistant Dean
Ronald K. Green, Director, Continuing
Social Work Education
David P. Fauri, Branch Director,
Nashville
Roger M. Nocoe, Branch Director,
Knoxville
Kate Mullins, Branch Director,
Memphis

SOCIAL WORK

Major: Social Work
Degree: M.S.S.W.

The University of Tennessee School of Social Work is a fully accredited two-year graduate professional school, with a program (thesis or non-thesis option) leading to the degree of Master of Science in Social Work. The full two-year curriculum is offered in all three branch locations.

GRADUATE PROFESSIONAL EDUCATION

The goal of graduate professional social work education is the education and training of personnel for leadership roles in the social welfare community and in the social work profession. Leadership roles include those in social welfare management and administration, social planning, social policy development, and research. Social treatment leadership roles include treatment team leaders, consultants, supervisors, and expert practitioners.

In order to help reduce and eliminate such basic social problems as poverty, racism, crime, social injustice, and illness, both educational and social welfare service organizations must focus on preventive as well as restorative objectives and functions.

The School of Social Work's curriculum provides a core program and two areas of specialization: social treatment, and social welfare administration and planning. The two-year or six-quarter program is designed to provide the student with the basic components of professional competence through a progression of course work and supervised practice experience.

At the core of professional practice is the individual's capacity for self-awareness and self-discipline and the commitment to the values and goals of the profession. The student must be able to think independently and analytically in order to use the skills and knowledge for purposeful and effective intervention at all societal levels.

THE PROFESSIONAL CURRICULUM

The curriculum offered during the first two quarters of the first year, the Core Curriculum, is required for all students. This Core Curriculum is designed to provide students with knowledge and skills that are common to social work practice at the social treatment and at the administrative and planning levels of intervention. The Core Curriculum also provides students in social treatment with knowledge and skill about administration and planning and vice versa. The Core Curriculum is composed of the following units: (1) human behavior and social environment, (2) social welfare policy and services, (3) research, (4) social work practice, (5) field instruction.

Human behavior and social environment courses focus on community structure and process, systems theory, culture and ethnicity, role theory, small group theory, personality theory, the family, and social deviance. The social welfare policy and services courses focus on the social work profession's interest in the analysis and formulation of contemporary social policy, and the analysis of organizations that implement policy and deliver services. The research courses focus on methodology as applied to problems in social welfare. Social work practice courses, which may include a skills laboratory, focus on interviewing, formulating objectives, observing and reporting behavior, managing group discussion, and other practice skills.

Field instruction is a practicum that provides students with experience in a social welfare agency or program.

At the beginning of the third quarter of the first year, the student selects a specialization—Social Treatment or Administration and Planning. Students are required to take 12 credit-hours in their specialization. Students may take electives in the other specialization. The first-year curriculum is on a concurrent class and field plan, with students participating in the classroom study program two or three days per week and spending two days in field instruction in a social welfare agency.

In the second year, students are involved full-time in classroom courses during the fall quarter, and a block field placement in the winter and spring quarters with at least one concurrent classroom course per quarter.

The availability of second-year field placements in social agencies in principal cities in Tennessee and in areas immediately adjacent to the state enables the student to have some choice as to field instruction assignments.

The School of Social Work recognizes and accepts the cultural pluralism of society and seeks to prepare the student for practice through the planned inclusion of significant and pertinent racial and ethnic content throughout the curriculum. Such knowledge and its application should provide the student with the educational background to take a creative and objective role in the efforts of the social work profession toward the elimination of racism, poverty, and other social ills.

A special bulletin describing the facilities, admission, fees, and degree requirements is obtainable from The School of

ACCELERATED PROGRAM

The University of Tennessee School of Social Work has a special accelerated program which enables eligible candidates to complete the MSSW degree in twelve consecutive months. This Accelerated Program is approved by the Council on Social Work Education.

Students who qualify for the Accelerated Program must:
1. Have maintained a 3.0 or above grade point average (on a 4.0 scale) in undergraduate work.
2. Have an undergraduate major in social work which included a supervised field practice component, or have two years full-time practice in the field of social work.
3. Pass a qualifying examination administered by the UTSSW faculty.

The twelve-month program begins in June with an intensive ten-week term from June to August. The second year shows typical programs for social work.

APPLICANTS FOR ADMISSION

The Accelerated Program is through the regular admissions process.

GENERAL REQUIREMENTS FOR ADMISSION

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 failing 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.

DEGREE REQUIREMENTS

1. Satisfactory completion of the curriculum.
2. All courses taken as part of the degree programs, whether taken within the School of Social Work or outside, must be acceptable for graduate credit, relevant to social work and to the student's career objectives, and have the approval of the student's faculty advisor.
3. Achievement of a B average on all work presented for the Master's degree.
4. Students who elect a thesis must pass an oral examination conducted by a faculty committee.
5. Students who elect a non-thesis option must pass a written comprehensive examination.
6. Credits to be counted toward the degree must be earned within six years from the beginning date of the earliest course applied toward the degree, except in cases where permission to take courses while a student is employed has been granted.
7. The minimum number of credit hours required for a degree shall be 72 hours including a maximum of 38 S/NC hours.

PART-TIME STUDENTS

Courses in the regular curriculum of the School are open to persons who meet the admission requirements for full-time study and who are planning to complete the work for the degree within the next two to three years. Application should be made to the School in the regular way, but the applicant should inform the Director of Admission of the wish to begin part-time study on a planned basis.

TRANSFER CREDITS

Courses completed in another accredited school of social work are usually accepted for The University of Tennessee School of Social Work degree requirements providing the applicants meet the admission requirements of the Graduate School and The University of Tennessee School of Social Work, if previous courses are equivalent to required or elective courses offered here. The University of Tennessee School of Social Work allows a maximum of 45 credit hours of graduate course work taken at another accredited institution to be transferred into the student's Master's program. Such work must have been taken for graduate resident credit and passed with a B or better. In addition, it must be part of an otherwise satisfactory graduate program (B average) and be approved by the branch director and the dean. This course work must be completed within the six-year period prior to the receipt of the degree. In addition, Pass/Fail credit earned for the field practicum is also accepted.

Graduate students majoring in fields other than social work are admitted to certain social work courses with the approval of the School of Social Work and the student's major professor.

The Core Curriculum

The core curriculum is essentially the same for all students.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>5220</td>
<td>Human Behavior and Social Environment I</td>
<td></td>
</tr>
<tr>
<td>5420</td>
<td>Social Work Practice I</td>
<td></td>
</tr>
<tr>
<td>5520</td>
<td>Field Practice</td>
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<td>TOTAL QUARTER HOURS</td>
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</table>

The Specialization

The curriculum outlined below for the spring quarter, first year, and for the second year shows typical programs for students after they have completed the Core Curriculum. A student may earn nine hours of elective credit through completion of a Master's thesis.

Spring Quarter, First Year

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credit Hours</th>
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<tr>
<td>5330</td>
<td>Field Practice</td>
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<td>5960</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>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
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<tr>
<td>5940</td>
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<tr>
<td>5950</td>
<td>Field Practice</td>
<td>8</td>
</tr>
<tr>
<td>5961</td>
<td>Integrative Seminar</td>
<td>2</td>
</tr>
<tr>
<td>51 Elective</td>
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<td></td>
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<tr>
<td>TOTAL QUARTER HOURS</td>
<td>12 or 13</td>
<td></td>
</tr>
</tbody>
</table>

AREAS OF SPECIALIZATION

A specialization is a focus within the student's program involving intensive study, through class and field instruction. The University of Tennessee School of Social Work offers specializations in the following areas:

Social Treatment

Social treatment deals with those individual, family, and group methods utilized to enhance the social functioning of individuals and effectively ameliorate problems of social dysfunction. The specialization attempts to develop a thorough knowledge of the theory and methodology basic to varied individual, family, and group methods applicable in the social treatment of diverse client problems.

Social Work Administration and Planning

Social work administration and planning deals with the design, implementation, and continued operation of effective programs for client service. Specifically, the method deals with assessment of client characteristics, development of environmental resources, design of effective organizational structures, management, staff development, program evaluation, social planning, neighborhood and community development, financing, and coordination of services.

Preparations for Fields of Practice

Within the curricular specializations described above, the School offers opportunities for preparation for careers in fields of social work practice such as the following: corrections, including work with children and adults in courts,
correctional institutions, and in probation and parole; family and child welfare services in public and voluntary agencies; group services in neighborhood and community; family therapy and mental health services; including work with individuals and groups in programs of health and medical care in public health departments, hospitals, and clinics; mental retardation, including work with individuals and groups in clinics, schools, and hospitals; public welfare services, including economic assistance and family services; mental health services, work with individuals and groups in mental health programs including comprehensive mental health clinics, traditionally oriented psychiatric clinics, and hospitals; rehabilitation services in a variety of settings to individuals with medical, psychiatric, and social disabilities; social work services to children and their families concerning school-related problems; social gerontology, individual and group services to the aging in a variety of settings.

Faculty

Professors:
- M. H. Bloch, M.A.S.S.A.; P. C. Benovitch, D.S.W., G. W. Fryer, Ed.D.; B. P. Granger, Ph.D., B. E. Orchard, M.S.S.A. (Emeritus);
- J. W. Spencer, M.S.S.A. (Emeritus).

Associate Professors:
- L. Beasley, D.S.W.; B. J. Cleckley, Ph.D.;
- C. T. Cruthirds, Jr., D.S.W.; J. C. Eades, Jr., Ph.D.;
- R. D. Rowen, Ph.D.; D. Kuehn, Ph.D.;
- M. Eisen, M.S.S.W.; K. Mullins, Ph.D.
- B. F. Boardman, Ph.D.;
- R. A. Moses, M.S.W.
- P. Popple, Ph.D.; G. Rubeiz, Ph.D.;
- B. C. Mason, Ph.D.; A. E. Moses,
- M. H. Bloch, M.A.S.A.; R. C. Bonovich, M.S.S.W.; H. A. Wilson, M.S.S.W.
- M. S. W.; H. A. Wilson, M.S.S.A.

Instructors:
- M. Hartikaino, M.S.S.W.; L. McCellough, M.S.S.W.

Courses

5000 Thesis

5002 Non-Thesis Graduation Completion (3) 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. Must be repeated. S/NC only.

5070 Social Work Research I (3) Examination of research methodology as applied to problems in social work research. Topics will include the socio-political and organizational context of research design and methodology appropriate to evaluative research, and the utilization of research findings. Prereq: Completion of core or consent of instructor.

5082 Practicum in Social Work Research (3-9) Supervised practice in the application of research methods and tools to a social welfare program. Problems may be generated by the faculty, the student, or a social welfare agency or organization. Prereq: 5080 and consent of the faculty member conducting the investigation. S/NC only.

5083 Directed Readings in Research (2-4) May be repeated with approval of instructor. Maximum 4 hrs.

5090 Special Problems in Social Work (2-9) Individual study or research on problems of special significance to the student's program, under supervision of the major professor. May be repeated.

5110 Social Welfare Policy and Services I (3) The focus is on the interests of the social work profession in the development of contemporary social policy at the local, national, and international levels; social policy development and implementation; the application of research to social welfare delivery settings. Through the transformation of collective social welfare resources into divisible and indivisible social welfare benefits through organized instrumental action of a professional nature.

5130 Social Policy Analysis (2-3) "Policy science" techniques are considered for their appropriation in assessing the social, political, and economic implications of social policy proposals. Prereq: Completion of core or consent of instructor.

5161 Social Welfare Seminar (2-3) An examination of significant historical periods and contemporary social welfare service delivery settings. The transformation of collective social welfare resources into divisible and indivisible social welfare benefits through organized instrumental action of a professional nature.

5162 Social Policy Seminar (2-3) A problem area is selected for in-depth discussion, focusing on substantive knowledge about a social problem or condition and the interrelationships among the social, political, social welfare program, and social work practice. Fields such as health, mental health, child and family welfare, education, corrections, housing, labor force development, income maintenance, and aging may be examined. Prereq: Completion of core or consent of instructor.

5180 Human Behavior and Social Environment I and II (3, 3) Examination of theories and methods of assessment, intervention, and evaluation in the social work profession. Prereq: Completion of core or consent of instructor.

5210-20 Human Behavior and Social Environment I and II (3, 3) Examination of theories and methods of assessment, intervention, and evaluation in the social work profession. Prereq: Completion of core or consent of instructor.

5240 Family Therapy in Social Work Practice (4) Theories and methods of assessment, intervention, and evaluation in the social work profession. Prereq: Completion of core or consent of instructor.

5280 Special Accelerated Program in Social Work (15) A ten-week program providing qualified students with an intensive academic and field experience that qualifies them to enter into the second year of graduate study upon successful completion of this term. S/NC only.

5301 Human Behavior and Social Environment (3-2) Deepens and extends the student's knowledge of the cognitive and behavioral domains of the human personality and spirit through the interaction of persons with one another and with society are analyzed. Prereq: Completion of core or consent of instructor.

5302 Human Behavior and Social Environment (3-2) Deepens and extends the student's knowledge of the cognitive and behavioral domains of the human personality and spirit through the interaction of persons with one another and with society are analyzed. Prereq: Completion of core or consent of instructor.

5311 Imaginative Perspectives on the Human Condition (2-3) Examination of the usefulness to social work students of prose, drama, and poetry, which may illuminate and expand the knowledge and appreciation of every person's humanness. Prereq: Completion of core or consent of instructor.

5312 Psychosomatic and Social Deviance (2-3) An examination of the human personality and spirit through the interaction of persons with one another and with society are analyzed. Prereq: Completion of core or consent of instructor.

5313 Declarative Behavior of Children and Youth (2-3) An examination of the human personality and spirit through the interaction of persons with one another and with society are analyzed. Prereq: Completion of core or consent of instructor.

5315 Human Sexual Problems (2-3) Deepens and extends the student's knowledge of the cognitive and behavioral domains of the human personality and spirit through the interaction of persons with one another and with society are analyzed. Prereq: Completion of core or consent of instructor.

5316 Mental Health and Employment (2-3) Deepens and extends the student's knowledge of the cognitive and behavioral domains of the human personality and spirit through the interaction of persons with one another and with society are analyzed. Prereq: Completion of core or consent of instructor.

5317 Human Social Problems (2-3) Deepens and extends the student's knowledge of the cognitive and behavioral domains of the human personality and spirit through the interaction of persons with one another and with society are analyzed. Prereq: Completion of core or consent of instructor.

5340 Family Therapy in Social Work Practice (4) Theories and methods of assessment, intervention, and evaluation in the social work profession. Prereq: Completion of core or consent of instructor.

5340 Family Therapy in Social Work Practice (4) Theories and methods of assessment, intervention, and evaluation in the social work profession. Prereq: Completion of core or consent of instructor.

5341 Transactional Analysis (2-3) Theories and methods of assessment, intervention, and evaluation in the social work profession. Prereq: Completion of core or consent of instructor.

5342 Short-Term Treatment (2-3) Theories and methods of assessment, intervention, and evaluation in the social work profession. Prereq: Completion of core or consent of instructor.

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5342 Short-Term Treatment (2-3) Theories and methods of assessment, intervention, and evaluation in the social work profession. Prereq: Completion of core or consent of instructor.
5443 Seminar on Behavior Therapy (2-3) Behavior modification methodology as applied to clinical assessment, choice of designs to assess treatment interventions, skill in evaluating data on effectiveness of treatment interventions. May be repeated. Maximum 6 hrs. Prereq: Completion of core or consent of instructor.

5444 Social Work Practice with the Poor (2-3) Examines some of the problems, issues, and dilemmas of practice in social work with poor and considers the attributes of service-delivery systems which make that practice possible. Prereq: Completion of core or consent of instructor.

5450 Social Work Treatment with Individuals and Families (3) Draws primarily on social work literature and examines in detail social casework as a method of social work practice and as a form of interpersonal treatment. Prereq: Completion of core or consent of instructor.

5453 Social Work Practice with Groups (3) Focusing on the development of knowledge and skill in the use of group methods in social work practice with emphasis on organizing and managing the group, structuring group tasks and experiences, understanding and enhancing group functioning, enabling problem-solving, and facilitating change. Prereq: Completion of core or consent of instructor.

5459 Interpersonal Skill Development (2-3) A training group is employed to enhance interpersonal competence in the application of human relations skills in social work practice. Prereq: Completion of core or consent of instructor.

5570 Comparative Methods of Group Treatment (2-3) Comparative analysis and critical review of one of the methodologies used in the research of one or more of the major group treatment modalities with emphasis on theory-base, leadership, technical, ethical, research, and evaluation approaches. Prereq: Completion of core or consent of instructor.

5601 Social Work in Rural Communities (3) Focuses on characteristics of rural populations and rural community analysis. Outline and analysis of rural social services and delivery systems. Development of social work generalist concept and the occupational function in rural areas. Prereq: Completion of core or consent of instructor.

5611 Community Organization (2-3) Methods of using behavioral and social science knowledge about communities and organizations to assist in the development of resources to meet human needs. Prereq: Completion of core or consent of instructor.

5670 Social Planning (3) (Same as Planning 5614) An introduction to the concept and practice of planning in the social service field, with emphasis on the relationship of the social service agency to its environment. Prereq: Completion of core or consent of instructor.

5701 Administration in Social Work (2-3) Introduction to the function of management as it relates to social work purpose and values and the development of administrative principles that make possible the effective provision of welfare services.

5702 Organizational Design of Social Welfare Agencies (2-3) Critical problems of adapting organizational structure and operational patterns to new tasks, objectives, and mandates. Analysis of planning and design techniques for new programs and for modification of existing programs for appropriate deployment of resources and personnel for maximum effectiveness and efficiency. Emphasis on integration of theory and experience for development of practical skills for coping with a variety of situations. Prereq: Second-year administration or community organization studies, or consent of instructor; Social Work 5761 or equivalent.

5741 Supervision in Social Work (2-3) Dual roles of the supervisor in various settings, and supervision will be distinguished from individual, group, and general supervision. Emphasis will be placed on the middle management position of the supervisor, differences and similarities in supervision of various levels of personnel will be analyzed. Goals, tasks, techniques, and processes in relation to individual and group supervision and field work practice will be considered. Prereq: Second-year status or consent of instructor.

5742 Consultation in Social Work (2-3) Consultation of roles, relationships, and behavior required of a consultant. Consultation as distinguished from supervision, administration, and direct practice. Types of consultation considered in relation to various settings and levels of personnel will be analyzed. Prereq: Consultation and practices of consultation and the dilemmas and pitfalls of the consultant's position. Prereq: Second-year status or consent of instructor.

5743 Management of Human Resources in Social Welfare (2-3) Examination of the personnel function in administration of human services programs and agencies. Topics include 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 core or consent of instructor.

5744 Education and Training in Social Welfare (2-3) Examines philosophies and practices of teaching and learning as they relate to adult education and the provision of social welfare services. Topics include: distinctions between teaching and learning; training and education; unique aspects of adult learning; current issues; models and styles of education. Prereq: Completion of core or consent of instructor.

5745 Professional Leadership in Social Work (2-3) Examination of leadership in social welfare. Consideration is given to various theories of leadership; the complexity of leadership function, effectiveness, and satisfactions of leaders; leadership styles, values, motivation, and morale; and leadership development and training. Prereq: Completion of core or consent of instructor.

5750 Social Welfare Administration and Planning (3) An initial sequence course in social welfare administration and planning which examines the impact of the contemporary administrative planning role such as decision making, budgeting, planning, and programming. Prereq: Completion of core or consent of instructor.

5751 Seminar in Social Welfare Administration and Planning (3) Designed to assist students in acquiring specific administrative and planning techniques appropriate for social welfare delivery. Prereq: Completion of core or consent of instructor.

5752 Social Welfare Administration and Planning (3) Designed to assist students in acquiring specific administrative and planning techniques appropriate for social welfare delivery. Prereq: Completion of core or consent of instructor.

5771 Information Systems and Decision Making (2-3) Explores decision making in human services organizations, the utilization of information in formula planning, delivery of services, and evaluation of performance. Information generation, collection, processing, storage, retrieval, and utilization as considered to include management control, evaluation and forecasting. Prereq: Completion of core or consent of instructor.

5772 Financial Management for Social Welfare Administration (2-3) Focuses on centralized decision making related to the allocation of scarce resources in social services organizations. Technical aids to budgetary choice and other aspects of financial management will be examined for the utility, parsimony, and feasibility. Prereq: Completion of core or consent of instructor.

5800 Management of Residential Settings (2-3) Includes theory and practice in residential facilities for the aged, mentally ill, mentally retarded, juvenile and adult offenders, and other groups. Prereq: Completion of core or consent of instructor.

5812 Organizational Perspectives to Juvenile Justice (2-3) Aspects of the Juvenile Justice System: overview of juvenile delinquency, introduction to the process of police in detecting delinquency and apprehension of delinquent offenders, police procedures, role of the juvenile justice system in institutions, correctional institutions, aftercare programs, and preventive strategies. Prereq: Second-year standing.
5930:40-50 Field Practice (4, 8, 8) Specialized instruction and supervised practice in methods of social work treatment, administration, and planning in community health and welfare programs and agencies. Prereq: Admission to the school. To be taken in sequence. S/NC only.

5961 Integrative Seminar (3) Required seminar facilitates integration of the two year MSSW program; attention is given to current issues in the profession and to pressing social problems. Student participation in symposia, discussions, simulations, and gaming situations prepares the graduating student to assume positions of responsibility and leadership within the profession. The graduating student is helped to plan toward continuing his/her education and professional development. S/NC only.

5970 Outcomes in Social Work Practice (2-3) Application of substantive knowledge to comprehensive problem-solving within existing service and community systems. Critical appraisal of functional relationships between problem, policy, planning, practice, and outcomes. Examination of problems from practice to determine key elements of optimal services and implications for policy decisions. S/NC only.

5980 Practicum in Governmental Social Welfare Policy Making (2-3) Practical introduction to the process of legislative and/or administrative policy making at the state or local governmental level, through assignment of students to the offices of elected or appointed policy makers. Limited social welfare policy research activities. Seminar used to present normative and descriptive theory about the policy-making process, and models of policy analysis. May be repeated. Prereq: Social Work 5110 and consent of instructor.
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The University of Tennessee offers its programs of instruction to all qualified persons regardless of race, creed, color, sex or national origin.