of oral and aural communication. Students will be expected to master the accumulated knowledge in the area of:
1. Basic speech, hearing and language processes;
2. Speech, hearing and language disorders;
3. Related disciplines providing insight into human communication processes;
4. Technical skills in instrumentation and experimental design which enable the student to investigate problems pertaining to speech and hearing processes.

The program will normally consist of three or more calendar years of graduate study beyond the Master's degree with the first year being devoted primarily to formal course work and the last year to full-time research culminating in the doctoral dissertation. Specific programs of study will be determined by the student in consultation with his/her faculty committee. In addition to the general Graduate School requirements, specific requirements for the degree of Doctor of Philosophy in Speech and Hearing Science will include:
1. Successful completion of course work in the study of one or more research tools, or other specific scientific methodological vehicles pertinent to the research interests of the candidate. The choice of research tool(s) is subject to departmental approval.
2. A minimum of 9 quarter hours of graduate credit obtained in course work in a cognate field outside the Department of Audiology and Speech Pathology. These hours are in addition to those required in item 1 above.
3. Sufficient course work within the department but outside the area of specialization to give a broad foundation and understanding.
4. A comprehensive examination to demonstrate a general knowledge of the basis of audiology, speech and language pathology, and speech and hearing science; advanced knowledge of the specifics of the area of specialization.
5. Research and dissertation to give at least 36 hours of graduate credit (6000 level).
6. A final oral examination.

4040 Appraisal of Speech and Language Disorders (4) Diagnostic procedures for children and adults with speech and language problems including observation and practice with diagnostic tests. Prereq: 3040, 3050, or consent of instructor. (Same as Special Education 4040). F, Sp.

4070 Free Association (4) Oral and written free association process for diagnosing and treating communication disorders. Includes didactic self-analysis. W.

4190 Speech Development of the Hearing Impaired (3) (Same as Special Education 4190.)
4200 Practicum in Speech Development of the Hearing Impaired (3) (Same as Special Education 4200.)
4210-20 Language Development of the Hearing Impaired I, II (3, 3) (Same as Special Education 4210-20.)
4250 Introduction to the Psychology and Education of the Hearing Impaired (3) (Same as Special Education 4250.)
4310 Stuttering (3) Nature and treatment. Review and integration of various theories. Prereq: 3040 or consent of instructor. (Same as Special Education 4310). F, Su.
4320 Introduction to Clinical Practice in Speech Pathology (3) Prereq: 3040, 3050, 3310, 4040, and consent of instructor. (Same as Special Education 4320.) S/NC only. E.
4330 Clinical Practice in Speech Pathology (1-6) Prereq: 4320 and consent of instructor. (Same as Special Education 4330.) S/NC only. E.
4450 Clinical Practice in Audiology (1-6) Prereq: 4720 and 4900. E.
4460 Clinical Practice in Audiology (1-6) Prereq: 4450, 4720 and 4930. E.
4470 Clinical Practice in Audiology (1-6) Prereq: 4460, 4720, and 4930. May be repeated. Maximum 9 hrs. E.
4490 Clinical Practice in Audiology (1-6) Prereq: 4720 and 4950. E.
4520 Speech Pathology (3) Independent study of special problems in speech pathology. Prereq: Consent of instructor. W.
4550 Problems in Speech Pathology (1-6) Prereq: Consent of instructor. E.
4560 Problems in Audiology (1-6) Prereq: Consent of instructor. May be repeated. Maximum 6 hrs. E.
4620 Birth Defect Syndromes and Language Retardation (3) Examination of research literature relevant to birth defects and language retardation including clinical, educational and socioemotional implications of such disorders. Prereq: 4610 or consent of instructor. W.
4630 Practical Applications of Language Habilitation Techniques (3) Discussion and demonstration of various methods and procedures used in treating language retarded children. Prereq: 4610 or consent of instructor. W.
4640 Parent Participation in Language Habilitation Programs (3) Nature of counseling and educational relationships with parents of exceptional children including emotional support for families, behavior management strategies, home training methods. Prereq: 4610 or consent of instructor. Sp.
4650 Speech and Language of the Culturally Different Child (3) Discussion of speech and language differences of children of various minority groups, of different ethnic and class membership and from different geographic regions; their causes, and their effects upon educational programs. F, W, Su.
4660 Topics in Language Retardation and its Habilitation (3) Lectures on selected topics by representatives of such fields as special education, educational psychology, genetics, and psychology. Prereq: 4610 or consent of instructor. W.
4720 Audiology II (4) Basic principles of clinical audiometry, pure-tone, speech, masking and overview of special auditory tests. Prereq: 3710. (Same as Special Education 4720.) W, Su.
4930 Aural Rehabilitation: Speechreading and Auditory Training (3) Rehabilitation of acoustically impaired by maximizing use of residual hearing and utilizing speechreading as receptive communicative process. Prereq: 4720. (Same as Special Education 4930.) F, W, Su.
4940 Introduction to the Verbo-Tonal System (4) Prereq: 3710. Recommended prerequisite: 4380 and 3050. (Same as Special Education 4940.) F, W, Su.
5000 Thesis (1-15) Prereq: 4930. E.
5002 Non-Thesis Graduation Completion (3-15) Required for the non-thesis student not otherwise registered during any quarter when such a student uses university facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. S/NC only. E.
5040 Advanced Clinical Practice in Audiology Study and Practice in Audiology (1-6) Prereq: 4720 and 4930. May be repeated. Maximum 12 hrs. (Same as Special Education 5040.) E.
5045 Practicum in Hearing Aid Orientation and Communication Counseling (1-6) Practical exposure to counseling hard of hearing and family members concerning use and expectations of hearing aids. Prereq: 4720 and 4930, and consent of instructor. May be repeated. Maximum 9 hrs. E.
5050 Practicum in Verbo-Tonal Habilitation (1-6) Prereq: 4940, 4950, or consent of instructor. May be repeated. Maximum 9 hrs. E.
5051 Practicum in Aural Rehabilitation (1-6) Prereq: 4720 and 4930. May be repeated. Maximum 9 hrs. F.
5060 Neural Bases of Speech and Language (3) Structure and function of central and peripheral nervous systems, with emphasis on their role in speech and language. Prereq: 3065. F, W.
5070 Anatomy and Physiology of Hearing (3) Structure of human ear, pathology of hearing impairment, and psychoacoustics of audition. Prereq: 3710. E.
5071 Electrophysiological Assessment of Auditory Function (2) Techniques for electrophysiological measurement of auditory sensitivity, sound transmission by ear, distortion in ear, and ear as an acoustic mechanism. Prereq: 4720, 5070 or consent of instructor. Sp, Su.
5100 Comparative Anatomy of the Peripheral Auditory Structures (3) Tutor laboratory course in comparative anatomy of temporal bone employing microscopic dissection techniques. Prereq: 5070 or consent of instructor. W.
5110 Introduction to Research in Speech and Hearing (3) Analysis of research techniques, application of statistics, and completion of pilot research project. Prereq: Elementary statistics. F, W, Su.
5119 Laboratory in Instrumentation in Audiology and Speech Pathology (1) Laboratory assignments designed to familiarize student with instruments for measuring speech and hearing processes. Prereq: 5117. E.
5200 Seminar on Stuttering (3) Current significant research in problem of stuttering. Prereq: 4310 or consent of instructor. W, Su.
5201 Aphasia (3) Historical review of aphasia literature; theories of brain functioning, aphasic classification and terminology, tests and rationale for testing, etiology, therapy considerations and prognosis for recovery. Prereq: 5950 or equivalent or consent of instructor. W, Su.
5220 Seminar: Articulation Disorders (3) Current significant research in therapy and management of articulation disorders. Prereq: Undergraduate course in articulation disorders or consent of instructor. F, Sp.
5320-30 Advanced Clinical Practice in Speech Pathology
and Language Disorders (1-6, 1-6, 1-6) Prereq: 4340 or equivalent and consent of instructor. May be repeated. Maximum 6 hrs. E

5350-60-70 Advanced Clinical Practice in Speech Diagnosis (1-6, 1-6, 1-6) Prereq: 4040, 4340, or equivalent. 5370 may be repeated. Maximum 9 hrs. S, E

5380 Cerebral Palsy (3) Neurological foundations and management of adult dysarthric speakers. Prereq: 5060. Su

5390 Cleft Palate (3) Etiology, diagnosis and clinical management of cleft palate speakers, emphasis on speech. Prereq: 3310. (Same as Special Education 5390.) W, Su


5450 Sound Measurement and Audiometry Calibration (3) Noise measuring systems and techniques; factors in military and industrial audiology, role of audiologist in industry. Prereq: Basic Acoustics or consent of instructor. W

5451 Noise and Audiology (3) Audiologist's role in noise-related activity: clinical, legal and consulting applications. Prereq: 5450 or consent of instructor.

5460 Advanced Audiology (3) Theory and practice of advanced pure tone and speech audiology; instrumentation and interpretation of audiometric findings with diagnostic differential. Prereq: 4720. F

5470 Impedance Measurement in Audiology (2) Theoretical considerations behind emergence of impedance measurement in clinical measurement of hearing. Practical experience in using several impedance measuring devices. Prereq: 4720 and 5070. W

5490 Practicum in Hearing Conservation (1-6) Supervised on-site experience in hearing conservation programs at industrial settings. Prereq: 5040. May be repeated. Maximum 6 hrs. E

5500 Seminar in Audiology (1-6) Significant research in various areas of audiology. Prereq: Consent of instructor. May be repeated. Maximum 16 hrs. F, Sp

5503 Special Auditory Tests (3) Theoretical and practical considerations of auditory procedures used for differentiating cochlear vs. retrocochlear auditory lesions, identifying central auditory lesions and nonorganic hearing loss. Prereq: 5460 S

5505 Special Problems in Audiology (1-6) Prereq: 4720 or equivalent and consent of instructor. May be repeated. Maximum 6 hrs. E

5520 Seminar in Speech Pathology (3) Current significant research in speech pathology. Topics vary from quarter to quarter. Prereq: 12 hrs in speech pathology. May be repeated with consent of department. Maximum 12 hrs. E

5540 Seminar in Language Pathology (3) Nature, etiology and treatment of retarded language development. Prereq: 4610 (Same as Special Education 5540). W

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

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

5570 Management and Supervision for Speech-Language-Hearing Professionals (3) Management systems, accountability, performance appraisal and clinical supervision. For audiologists and speech language pathologists interested in private practice, supervisory or administrative positions.

5600 Independent Study in Audiology (1-6) Special research, consultation, and research activities of field of audiology. May be repeated. Maximum 6 hrs. E

5610 Practicum: Language Pathology in Children (3) Seminar and/or practicum involving discussion and utilization of testing tools and analyses of habilitative philosophies, specialties and techniques. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs. E

5651 Seminar in Language Differences (3) Significant research relevant to language difference of culturally different children. Prereq: 4650. Su

5730 Hearing Disorders (3) Advanced study of auditory disorders commonly encountered in medical environment. Etiology, pathology and evaluative procedures to differentiate lesions of auditory mechanism. Field trips may be required. Prereq: 4720 or equivalent and 5070. Su

5740 Pediatric Audiology (3) Advanced study of theoretical and practical considerations of procedures to evaluate hearing of infants and small children. Prereq: 4720 or equivalent. Sp

5750 Educational Audiology (3) Advanced case management of hearing impaired child: audiologic follow-up; educational alternatives, teacher and parental counseling, social adjustment, classroom acoustics and state and federal guidelines. Prereq: 5040 and 5440.

5760 Seminar in Psycholinguistic Concepts in Speech Pathology (3) Psycholinguistic concepts and information theory in studying the normal acquisition of language and certain disorders of language. Prereq: Consent of instructor. (Same as Psychology 5790.) Sp

5930 Advanced Assessment and Rehabilitation (3) Procedures and program, assessment of communicative functions and counseling strategies for hearing-impaired. Prereq: 4930. Sp

5950 The Verbo-Tonal System (3) Theory, procedures, and instrumentation of the use of speech in habilitation, rehabilitation, diagnosis, speech therapy, and foreign languages. Prereq: 3710. Recommended prerequisite 3310, 4090, 4960, 4960. F, W, Su

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

6100 Experimental Phonetics (3) Acoustical and physiological analyses of speech production and perception. Prereq: 5119 or consent of instructor. F

6101 Experimental Phonetics Laboratory (2) Must be taken concurrently with 6100. E

6200 Psycholinguistics (3) Auditory reception and perception of nonspeech stimuli. Prereq: 6100 W

6290 Psycholinguistic Laboratory (2) Must be taken concurrently with 6100. E

6600 Applied Anatomy and Physiology of Speech Mechanism (3) Dissection and related readings. Prereq: 5060 or equivalent. Sp

6690 Laboratory in Applied Anatomy & Physiology of Speech Mechanism (2) Must be taken concurrently with 6660. Sp

6700 Experimental Techniques in Cochlear Physiology and Neurophysiology (3) Prereq: 5070 or equivalent. W, A

6800 Seminar in Speech Science (3) Advanced study of experimental areas such as speech physiology, acoustic analysis, recognition, perception and intelligibility of speech, communication theory, and psycholinguistic measurement of speech and language. Topics vary from quarter to quarter. Prereq: 4650 or consent of instructor. May be repeated. Maximum 9 hrs. F, W, A

6900 Seminar in Hearing Science (3) Advanced study of perception of nonspeech acoustic signal, detectability, pitch, loudness, differential threshold, adaptation, and fatigue. Prereq: 6020 or consent of instructor. May be repeated. Maximum 9 hrs. W, A

6110 Experimental Design in Speech and Hearing (3) Analysis of experimental design in theses and research proposals. Psychological methods for data acquisition. Generation of experimental designs based on parametric and nonparametric statistics. Prereq: 5110 or equivalent and consent of instructor. S, E

6117 Theories of Hearing (3) Physiological process basic to classical theories of hearing related to sensitivity, loudness, pitch, and discrimination of acoustic stimuli. Prereq: 570 or consent of instructor. Sp, A

6119 Advanced Instrumentation in Speech and Hearing Science (3) Selection, use and calibration of instrumentation used in speech and hearing research. Prereq: 5117, 5119 or equivalent. Sp

6500 Advanced Seminar in Audiology (3) Prereq: Consent of instructor. May be repeated. Sp

6520 Advanced Seminar in Speech and Language (3) Topics vary from quarter to quarter but include advanced study of aberrations of voice, articulation, speaking time and rhythm, language development or use, and language symbolization. Prereq: Consent of instructor. May be repeated. E

6550 Directed Research (1-6) Participation in ongoing or non-dissertation research. Prereq: Consent of instructor. May be repeated. Maximum 12 hrs. E

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

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

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

6680 Directed Study in Hearing Science (1-3) May be repeated. Maximum 9 hrs. E

Biochemistry

DEGREES

MAJOR

Biochemistry

M.S., Ph.D.

Professors:

W. D. Wicks (Head), Ph.D. Harvard; J. E. Churchich, Ph.D. Sheffield (England); J. G. Joshi, Ph.D. Poona (India); K. J. Monty, Ph.D. Rochester

Associate Professor:

L. Huang, Ph.D. Michigan State.

Assistant Professors:

L. B. Bratstein, Ph.D. Illinois; R. Bryant, Ph.D. Illinois; R. H. Feinberg, Ph.D. California (Berkley); E. Freire, Ph.D. Virginia; J. W. Koons, Ph.D. Kentucky.

The graduate program involves successful completion of a series of graduate courses and seminars and a qualifying examination at the end of the first year of study. The Ph.D. degree requires research leading to the writing and oral defense of a thesis, while the M.S. degree requires successful completion of a comprehensive examination and extensive research leading to the Ph.D. dissertation and its oral defense.

The qualifying examination: At the conclusion of the first year's work in 5510-20-30, 5310-20-30 and 4230, a comprehensive qualifying examination covering all of the material will be taken by all first year graduate students, without exception, in the first week of the summer quarter. On the basis of results of the examination, the student will be counseled concerning his/her future in the biochemistry program.

THE MASTER'S PROGRAM

This program requires about two years of full-time study and provides both breadth and depth of training by mixing classroom instruction with research laboratory.
experience. Students completing this program will have a sound foundation in modern biology and chemistry and will be equipped to follow and absorb future advances in these fields. Recent graduates of this program are now involved in such occupations as industrial pharmaceutical research, junior college and high school teaching, laboratory work, cancer research, scientific journalism, and pursuit of Ph. D. degrees.

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

1. Introductory Organic Chemistry with laboratory (at least one year)*; at least one quarter of analytical chemistry, and a minimum of three quarters of approved physical chemistry.

2. A minimum of 12 quarter hours of approved biology courses beyond the introductory level, including at least 3 hours of genetics and 3 hours of physiology.

3. Biochemistry 5510-20-30, 5310-20-30, 4250, and at least one special topics course (5450), or 5610 or 5110 or 5120 or 5310 or 5210.

4. A qualifying examination as described above.

5. At least 9 hours of advanced lecture-seminar courses from the following: Biochemistry 6410, 6010.

6. At least 9 hours of Master's research and a thesis.

7. A final comprehensive examination which will cover both the thesis endeavor and the subject matter of the course requirements.

THE DOCTORAL PROGRAM

An incoming student must present course work covered by an undergraduate major in either chemistry or biology. Departmental requirements for the awarding of the Ph.D. include mastery of the subject matter indicated in the following list of courses. Course contents listed in items 1 and 3 are prerequisites to taking the comprehensive examination; applicants usually should expect to complete these requirements within the first two years of graduate school.

1. Introductory Organic Chemistry with laboratory (at least one year)*; at least one quarter of analytical chemistry, Chemistry 4510, Introductory Physics, Differential and Integral Calculus*; at least three quarters of approved graduate courses in chemistry or physics, for example: Chemistry 5110-20-30-35, Chemistry 5340, Physics 5210-20-30, Physics 5440, Physics 5510-20-30; plus minimum of three quarters of approved physical chemistry (Biochemistry 4210-20-30, or Chemistry 4910-20 and Biochemistry 5110-20, or Chemistry 3410-20-30) and at least 18 hours of biology beyond the introductory level including at least 3 hours of genetics and 3 hours of physiology. At least 3 hours must be graduate credit in an approved area of specialization which should be identified early so that necessary prerequisites can be taken.


3. In addition to the courses listed in item 3 above, four courses selected from those numbered 5110 or higher, excluding 5300 or 5640.

4. Qualifying examination.

5. Participation in Biochemistry 6410 and in the advanced biochemistry seminars 6010 during the entire period of residence.

6. Comprehensive Examination: Students who pass the comprehensive qualifying examination with sufficiently high marks and who complete a mandatory M.S. degree (required prior to the comprehensive examination) will take the examination at a time and of a format compatible with Graduate School requirements as determined by the student's committee.

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

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

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

a. The completion of at least 45 hours of approved course work for graduate credit, at least two-thirds of which must be at or above the 5000 level.

b. The completion of at least 9 hours of advanced lecture-seminar courses from the following: Biochemistry 6410, 6010.

c. A final examination which will cover both the thesis endeavor and the subject matter of the course requirements.

THE DOCTORAL PROGRAM

An incoming student must present course work covered by an undergraduate major in either chemistry or biology. Departmental requirements for the awarding of the Ph.D. include mastery of the subject matter indicated in the following list of courses. Course contents listed in items 1 and 3 are prerequisites to taking the comprehensive examination; applicants usually should expect to complete these requirements within the first two years of graduate school.

1. Introductory Organic Chemistry with laboratory (at least one year)*; at least one quarter of analytical chemistry, Chemistry 4510, Introductory Physics, Differential and Integral Calculus*; at least three quarters of approved graduate courses in chemistry or physics, for example: Chemistry 5110-20-30-35, Chemistry 5340, Physics 5210-20-30, Physics 5440, Physics 5510-20-30; plus minimum of three quarters of approved physical chemistry (Biochemistry 4210-20-30, or Chemistry 4910-20 and Biochemistry 5110-20, or Chemistry 3410-20-30) and at least 18 hours of biology beyond the introductory level including at least 3 hours of genetics and 3 hours of physiology. At least 3 hours must be graduate credit in an approved area of specialization which should be identified early so that necessary prerequisites can be taken.


3. In addition to the courses listed in item 3 above, four courses selected from those numbered 5110 or higher, excluding 5300 or 5640.

4. Qualifying examination.

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c. A final examination which will cover both the thesis endeavor and the subject matter of the course requirements.

THE DOCTORAL PROGRAM

An incoming student must present course work covered by an undergraduate major in either chemistry or biology. Departmental requirements for the awarding of the Ph.D. include mastery of the subject matter indicated in the following list of courses. Course contents listed in items 1 and 3 are prerequisites to taking the comprehensive examination; applicants usually should expect to complete these requirements within the first two years of graduate school.

1. Introductory Organic Chemistry with laboratory (at least one year)*; at least one quarter of analytical chemistry, Chemistry 4510, Introductory Physics, Differential and Integral Calculus*; at least three quarters of approved graduate courses in chemistry or physics, for example: Chemistry 5110-20-30-35, Chemistry 5340, Physics 5210-20-30, Physics 5440, Physics 5510-20-30; plus minimum of three quarters of approved physical chemistry (Biochemistry 4210-20-30, or Chemistry 4910-20 and Biochemistry 5110-20, or Chemistry 3410-20-30) and at least 18 hours of biology beyond the introductory level including at least 3 hours of genetics and 3 hours of physiology. At least 3 hours must be graduate credit in an approved area of specialization which should be identified early so that necessary prerequisites can be taken.


3. In addition to the courses listed in item 3 above, four courses selected from those numbered 5110 or higher, excluding 5300 or 5640.

4. Qualifying examination.

5. Participation in Biochemistry 6410 and in the advanced biochemistry seminars 6010 during the entire period of residence.

6. Comprehensive Examination: Students who pass the comprehensive qualifying examination with sufficiently high marks and who complete a mandatory M.S. degree (required prior to the comprehensive examination) will take the examination at a time and of a format compatible with Graduate School requirements as determined by the student's committee.

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

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

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

a. The completion of at least 45 hours of approved course work for graduate credit, at least two-thirds of which must be at or above the 5000 level.

b. The completion of at least 9 hours of advanced lecture-seminar courses from the following: Biochemistry 6410, 6010.

c. A final examination which will cover both the thesis endeavor and the subject matter of the course requirements.
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; mathematics recommended; (4) college mathematics, 9 quarter hours.

General degree requirements are given on pages 18-21. Educational service is required of each graduate degree candidate and such service will include teaching and/or ancillary services performed in the department related to the instruction of courses. Special departmental requirements include successful completion of the following.

THE MASTER'S PROGRAM

A. Thesis Program
1. Satisfactory preparation of a written formulation and 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 2 credit hours at the 6000 level.
5. Presentation of a thirty-minute departmental seminar.

B. Non-Thesis Program
1. Satisfactory completion of 51 quarter hours of approved graduate courses of which 30 quarter hours must be in Botany 5003 and 5004.
2. Satisfactory completion of 2 credit hours at the 6000 level.
3. Satisfactory performance on a final written examination on all work offered for the degree. The department may or may not follow this examination with an oral examination.

THE DOCTORAL PROGRAM

1. Satisfactory 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 enrolment in Botany 6000.
2. Satisfactory performance on a written comprehensive examination.
3. Presentation of one or more cognate areas outside of the department totaling 9 graduate credit hours with at least a B average.
4. Satisfactory performance on an examination in one modern foreign language or A or B in French 3030 or German 3030.
5. Satisfactory completion of 9 credit hours at the 6000 level (excluding dissertation).
7. Presentation of a one-hour departmental seminar near the end of the doctoral program.

*Note: Graduate School requirements are denoted by an asterisk. These requirements should be interpreted as minimal requirements and specific stipulations or requirements such as additional foreign languages, additional oral preliminary examinations may be required by the individual student's faculty committee.

**3010-20 Plants in Evolution (4, 4) Monera to angiospermas; emphasis on evolutionary relationships, morphology and development. Prereq: 6 hrs. in biological sciences. F, W

**3030A Field Botany (4) Studies of plants in natural environments including plant identification, collection, preservation and basic ecological concepts. Prereq: 6 hrs. in biological sciences. S, Su

3031-32A Field Botany (4, 4) Emphasis on fall and winter flora respectively. Prereq: 3030. Need not be taken in sequence. W

**3050 Socioeconomic Impact of Plants (3) Significance of plants in origin and development of human cultures, evolution of cultivated plants, and role of plants in present civilizations. Occasional field trips. Sp, Su

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

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

**3210 Introductory Plant Physiology (4) Organismal physiology of plants; water relations, mineral nutrition, morphogenesis, elements of metabolic processes, effects of age, light, natural rhythms, temperature and other environmental factors. Lecture and lab. Prereq: general biology and 1 yr. chemical science. F, Sp, Su

4017 Field Mycology (3) Field experience on identification of higher fungi. Frequent field trips, field recognition of species and habitats; laboratory sessions. Prereq: 6 hrs botany. Recommended prereq: 3010-20 or equivalent. Sp, A

4021 Field Bryology (3) Field experience on identification of mosses and liverworts. Frequent field trips, recognition of species and habitats, laboratory sessions. Prereq: 6 hrs botany. Recommended prereq: 3010-20 or equivalent. Sp, A

4022 Field Lichenology (3) Field experience on identification of lichens. Frequent field trips, field recognition of species and habitats; laboratory sessions. Prereq: 6 hrs botany. Recommended prereq: 3010-20 or equivalent. Sp, A

4023 Field Agrostology (3) Field experience on identification of grasses and sedges. Frequent field trips, field recognition of species and habitats; laboratory sessions. Prereq: 6 hrs botany. Recommended prereq: 3010-20 or equivalent. Sp, A

4030 Mechanisms of Plant Speciation (3) Processes of plant speciation emphasizing population genetics, isolation, drift, hybridization, variation in populations, establishment of population barriers and other aspects of plant speciation. Prereq: 3010-20 and Biology 3110. W, A

4045 Aquatic Vascular Plants (3) Field experience on identification of aquatic vascular plants. Frequent field trips, field recognition of species and habitats. Prereq: 6 hrs botany. Recommended prereq: 3010-20 or equivalent. Sp, A

4050 Synanthrology (3) Field experience on identification of companion plants and field recognition of species and habitats; laboratory sessions. Prereq: 6 hrs botany. Recommended prereq: 3010-20 or equivalent. Sp, A

4065 Identification of Woody Plants (3) Field identification of native trees, shrubs and woody vines of Southern Appalachians. Use of identification manuals, recognition of key characteristics, significant aspects of natural history of local species. Characterization of major woody plant communities of re-
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Prerequisites</th>
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<tbody>
<tr>
<td>5000 Thesis (1-15) P/N/P only. E</td>
<td>Non-Thesis Graduation Completion (3-15) Required for the non-thesis student not otherwise registered during any quarter when such a student uses university facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. S/N/C only. E</td>
<td>105</td>
</tr>
<tr>
<td>5021 Bryology</td>
<td>Taxonomy, phytology, ecology, physical, and morphological characteristics of bryophytes with emphasis on field studies and current research. Prereq: 3020: 1 hr and 3 labs. W, A</td>
<td>105</td>
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<tr>
<td>5055 Phytoplankton Ecology (4) Interaction between environment and phytoplankton. Nutrient uptake, primary production, competition, ecological theory, energy and carbon fluxes, and physiological adaptations by populations to environment. Prereq: 3010 or consent of instructor. F</td>
<td>105</td>
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<tr>
<td>5070 Principles of Biological Illustration (3) Principles and application of photography, including photomicroscopy and photomacrophgraphy, drawing graphics, and other methods for recording and presentation for research and publication of data in pictorial or graphic form. 1 hr and 2 labs. W</td>
<td>105</td>
<td></td>
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<tr>
<td>5090 Morphology and Evolution of Basidiozymites (4) Structure and function of somatic and sexual life cycles as applied to evolution in group. Cultures and specimens in laboratory. Prereq: 3010 or equivalent. F, A</td>
<td>105</td>
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<tr>
<td>5120 Agrostology (4) Collection, identification, classification, and phylogeny of tribes of grasses. Prereq: 3030 or consent of instructor. 2 hrs and 2 labs. F, A</td>
<td>105</td>
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</tr>
<tr>
<td>5150 Advanced Morphology of Flowering Plants (4) Vegetative and reproductive organography; regeneration, germination, pollination mechanisms, embryo发育, and development, seed and fruit development. Prereq: 3020-30 or 4120: 3210 or consent of instructor. Sp, A</td>
<td>105</td>
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<tr>
<td>5160 Biosystematics (4) Major experimental methods used in systematics and application to specific types of systematic problems. Cytotaxonomy, numerical taxonomy and chemotaxonomy. Prereq: Consent of instructor. F, A</td>
<td>105</td>
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</tr>
<tr>
<td>5210 Advanced Plant Physiology I (3) Plant cell metabolism: carbon, nitrogen and sulfur assimilation, respiration and biosynthesis of specialized plant structures, ion transport and pigments. Prereq: Chemistry 3231. F</td>
<td>105</td>
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</tr>
<tr>
<td>5225 Advanced Plant Physiology III (3) Growth and differentiation of plants at molecular, cellular and organismic levels. Hormonal regulation of development and differentiation dormancy, germination, flowering, and senescence. Preq: 5210 or Biochemistry 4120 and Plant cell physiology course. Recommended preq: 1 yr of physics. W</td>
<td>105</td>
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</tr>
<tr>
<td>5310-20-30 Special Problems in Botany (1-6, 1-6, 1-6) Special Problems in Botany. Prereq: 3010 or consent of instructor. 2 hrs and 2 labs. F</td>
<td>105</td>
<td></td>
</tr>
<tr>
<td>5400 Seminar in the Teaching of College Botany (1, 1, 1) Objectives in teaching of general botany. Supervised teaching in general course; seminars in techniques, testing, concepts, and materials. Required of teaching assistants. Prereq: Consent of instructor, S/N/C only. F</td>
<td>105</td>
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<tr>
<td>5570 Plant Cytology (4) Intensive consideration of cellular organization, structure and function, with emphasis on cell divisions where possible of ultrastructure, biochemistry and function of subcellular organelles. Principles and application of various analytical and electron microscopic techniques. Cell fractionation and isolation of subcellular components; differentiation and analytical centrifugation; photomicrography and microcinematography. Intended for graduate students in the biological sciences. 2 hrs and 2 labs. F, A</td>
<td>105</td>
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<tr>
<td>5110 Mycology (4) intensive study of fungi, including all major classes, utilizing lecture, laboratory, and field studies. Prereq: 3010. 3 hrs and 1 lab. Sp</td>
<td>105</td>
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</tr>
<tr>
<td>5012 Morphology and Evolution of the Phycocyanetes (4) Similar to 5012, but dealing with Phycocyaneteous fungi. Prereq: 5011 or consent of instructor. 2 hrs and 2 labs. F</td>
<td>105</td>
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</tr>
<tr>
<td>5055 Phytoplankton Ecology (4) Interaction between environment and phytoplankton. Prereq: 3010 or consent of instructor. 2 hrs and 2 labs. Sp, A</td>
<td>105</td>
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<tr>
<td>5850-51-52-53-54 Methods and Instrumentation in Field Investigations (1, 1, 1, 1, 1) Laboratory course providing project experience and theoretical background in various research methods, long range research. Development and critique of formal research proposal like those required by granting and contracting agencies. Prereq: 4115 or 3250. F, W</td>
<td>105</td>
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</tr>
<tr>
<td>5870 Experimental Plant Genetics (4) Genetics of plants stressing molecular aspects and including mechanisms of gene action, controlling subcellular organelles. Principles and application of various analytical and electron microscopic techniques. Cell fractionation and isolation of subcellular components; differentiation and analytical centrifugation; photomicrography and microcinematography. Intended for graduate students in the biological sciences. 2 hrs and 2 labs. F, A</td>
<td>105</td>
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</table>
The program leading to the Ph.D. degree with specialization in polymer science is conducted jointly with the Department of Chemical, Metallurgical, and Polymer Engineering, which offers a degree with similar specialization. For the Ph.D. degree in Chemistry, the satisfactory completion of the following is required:

1. Research and a dissertation to give at least 36 hours of graduate credit (6000).
2. Participation in seminar (5911-21-31) during the entire period of graduate study.
3. Course and specialization requirements:
   a. 4160-70.
   b. Two of the following (except for polymer science): 5511, 5521, 5531.
   c. For specialization in analytical, inorganic chemistry, environmental chemistry, energy, inorganic chemistry, organic chemistry, polymer science, physical chemistry.
   d. For specialization in polymer science, 39 hours of additional graduate course work including at least 6 hours at the 6000 level and the following:
      (1) for analytical, 5260-50, 5410-20-30; (2) for inorganic, 5710-20-30; (3) for organic, 5110-20-29-30; (4) for physical, 5340-50, 5410-20-30-50; (5) for theoretical, 5340-50, 5410-20-30-50; (6) for polymer, 5210.
   e. For specialization in environment or energy, a six-month internship in a governmental or industrial laboratory; 39 hours of additional graduate course work including 6 hours at the 6000 level and the following:
      (1) for environment, 5220, 5250-60-70, Ecology 5310, Environmental Engineering 4030; plus selected courses from other areas of chemistry, environmental engineering, microbiology, health physics, computer science, statistics, and industrial health; (2) for energy, 5410, 5610-20-30, a chemistry sequence (5110-20-30-35 or 5260-60-70 or 5420-30 or 5710-20-30, 5810), Mechanical Engineering 4180, plus selected courses from other areas of chemistry, environmental engineering, microbiology, health physics, computer science, statistics, and industrial health.
   f. For specialization in polymer science, 4160-70, 5351, 5410-50, 5160 or 5170, Polymer Engineering 4810; plus selected courses from other areas of chemistry, environmental engineering, microbiology, health physics, computer science, statistics, and industrial health.
4. A comprehensive advanced examination in the field of specialization.
5. Demonstration of a reading knowledge of one of the following languages: French, German, Russian, or an approved alternate.
6. A final oral examination.
3211-21-31 Organic Chemistry (3, 3, 3) Compounds of carbon and their reactions, reaction mechanisms, spectroscopic and other physical properties. Must be taken in sequence. Prereq: 1110-20-30. 3219, 3529-39 as a coreq for students not having credit for the laboratory.

3219-29-39 Organic Chemistry Laboratory (1, 1) Experiments on topics discussed in 3211-21-31. Corresponding lecture (3211-21-31) is a coreq for students not having credit for the lecture.


3429-39 Physical Chemistry Laboratory (1, 1) Gases, liquids, chemical equilibria, solutions, phase equilibria, reaction kinetics and electrochemistry. Prereq or coreq: 3430-20. F, W, Sp


4119 Physical Chemistry Laboratory (1) Solutions, ionic equilibria, reaction kinetics and spectroscopy. The corresponding course 4100 is coreq. F, W

4160-70 Intermediate Physical Chemistry (3, 3) (Designed for entering graduate students who have had one year of physical chemistry.) 4160—The three laws of thermodynamics, phase equilibria and solutions, and chemical equilibrium. 4170—Gases and kinetic theory, chemical kinetics, molecular spectroscopy, and introduction to chemical statistics. F, W

4210 Advanced Analytical Chemistry (3) Electroanalytical methods of analysis (including potentiometry, spectrophotometry, polarography, and voltammetry); magnetic resonance methods; mass spectrometry; x-ray absorption and fluorescence techniques. Prereq: Analytical chemistry. Recommended: 3420 or 4920. Sp

4220 Advanced Analytical Chemistry (3) Electrometrical methods of analysis (including potentiometry, spectrophotometry, polarography, and voltammetry); magnetic resonance methods; mass spectrometry; x-ray absorption and fluorescence techniques. Prereq: Analytical chemistry. Recommended: 3420 or 4920. Sp

4229 Advanced Analytical Chemistry Laboratory (1) Experiments on topics discussed in 4220. Coreq: 4220. Sp

4420 Physical Inorganic Chemistry (3) Theoretical concepts leading to an understanding of inorganic chemistry: quantum theory of the atom, principles of molecular structure, and elementary nuclear chemistry. Prereq: 3410-20-30, 4110. W

4430 Intermediate Inorganic Chemistry (3) Application of theoretical concepts to inorganic elements, their chemical states, and their reactions. Prereq: 4420. Sp

4510 Organic Qualitative Analysis (3) Identification of pure organic compounds and mixtures. Prereq: 3211-21-31, 3219-29-39 or 3219, 3529-39. 3 labs. May open to students who have completed 4610. F

4550 Organic Reaction Mechanisms (3) Prereq: 1 yr of organic chemistry. W

4610-20 Advanced Chemical Experimentation (2, 2) Laboratory course in application of modern experimental techniques. Prereq: 3221-29-39. Similar to 3229-29-39. 3 labs. May open to students who have completed 4610. W

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: 1110-20-30; Mathematics 1540-50 or equivalent. F, W

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

5110-20-30-35 Advanced Organic Chemistry (3, 3, 3) Structure, reactions and reaction mechanisms of aliphatic, aromatic, and aliphatic compounds. Prereq: 3211-21-31, E

5129 Advanced Organic Chemistry Laboratory (3) Synthesis of organic compounds illustrating modern techniques. Prereq: 1 yr of organic chemistry. Sp


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

5150 Kinetics of Polymerization (3) Kinetics of formation and molecular weight distributions of polymers, homogeneous and heterogeneous step growth and chain growth polymerizations. Prereq: 3510 and 4160-30 or equivalent.

5160 Organic Chemistry of Polymers (3) Synthesis of monomers; monomer and polymer reactions; kinetics, mechanisms, and sequence distribution of polymerizations. Formation of block, graft, and network polymers. Reactions of stabilizers, including degradation. Prereq: 5140 and 5531. A

5170 Physical Chemistry of Polymers (3) Rubber elasticity; solution properties of macromolecules; structural, conformational and thermodynamic/statistical theories of polymers. Prereq: 5150. A

5220 Analytical Chemistry of Environmental Pollutants (3) Application of advanced analytical chemistry to problems in aquatic and atmospheric pollution. Prereq: 5250-60-70 or consent of instructor.

5240 Chemical Instrumentation (4) Principles of chemical instrumentation. Practice in design and construction of chemical instruments; special projects. Prereq: Consent of instructor.

5250-60-70 Advanced Analytical Chemistry (3, 3, 3) 5250—Absorption and emission spectrophotometry; structure elucidation by IR, NMR, UV, and mass spectra; 5260—Chemical separation methods: solvent extraction, chromatography, electro-chemistry, radiolabeling, radioactive and thermal analytical methods; on stream and automatic analysis. Prereq: 1 yr of physical chemistry. F, W, Sp

5340 Quantum Chemistry (3) Postulate approach to fundamental principles of quantum mechanics. Accurate solutions to Schrodinger equation; approximate solutions to close packed systems; calculation of molecular properties. F

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

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


5511 Survey of Inorganic Chemistry (3) Atomic structure, wave mechanical atoms, ionic and covalent bondings, periodic relationship of elements, inorganic stereochemistry, coordination chemistry, and descriptive chemistry of the elements. F

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

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

5550 Industrial Chemical Research (3) Practice of modern industrial research taught by case studies and visiting lecturers from industry. Course content varies, selected to illustrate good past and current industrial research practices. Prereq: Completion of a 5000 chemistry course sequence.

5610-20-30 Chemical Basis of Energy Conversion (1, 1, 1) Chemistry of various energy and fuel interconversion systems. Introduction to homogeneous and heterogeneous catalysis, thermodynamics of energy conversion systems, fuels chemistry, and electrochemical and photochemical conversion systems. Prereq: 5410 and one 5000 sequence. F, W, Sp

5710-20-30 Theoretical Inorganic Chemistry (3, 3, 3) 5710—Nature of chemical bonding; ionic, covalent, metallic, molecular. 5720—Coordination compounds. 5730—Investigational methods of structural inorganic chemistry. Prereq: 1 yr of physical chemistry. F, W, Sp

5810 Nuclear Chemistry (3) Nuclear properties, radioactivity, radioactive decay processes, nuclear structure and nuclei, nuclear reactions, radiation and matter, radiation detection. Prereq: 1 yr of physical chemistry. A

5911-21-31 Chemistry Seminar (1, 1, 1) Departmental research, current research literature, general topics. May be repeated. Registration required each
quarter except summer for resident graduate students. S/NC only. F, W, Sp


6165 Orbital Symmetry Control (3) Application of Woodward-Hoffmann rules and other theories to mechanisms and stereochemistry of concerted organic reactions. Prereq: Two of 5110-20-30-35.

6175 Organic Photochemistry (3) Physical and chemical effects of electron excitation of organic molecules. Experimental and theoretical techniques of photochemical importance. Inter-and intra-molecular reactions of alkenes, ketones, dienes, dienones, aromatic compounds, and other reactive species. Prereq: Two of 5110-20-30-35.

6190 Organometallic Chemistry (3) Structure, bonding and synthesis of organometallic reagents. Application to current problems in organic synthesis. Prereq: Two of 5110-20-30-35.

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

6211 Selected Topics in Analytical Chemistry (3) Subject matter varies among important topics of current significance: photochemistry, modern liquid chromatography, new electroanalytical methods, biochemical analysis, and other applications of microspectroscopic analysis in chemical instrumentalation. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs. A

6311 Selected Topics in Polymer Chemistry (3) Subject matter varies among important topics of current significance. Prereq: Two of 5110-20-30-35, either or both of 5140-50-60-70 or consent of instructor. May be repeated.

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

6411 Selected Topics in Physical and Theoretical Chemistry (3) Subject matter varies among important topics of current significance. Prereq: Two of 5410-50-50-50, 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 organic and inorganic structure and behavior. Prereq: Two of 5110-20-30-35.

6430 Photochemistry and Radiation Chemistry (3) Fundamental physical and chemical processes produced by excitation of molecules by photons and electrons; multiphoton processes and uses of laser sources; fluorescence and phosphorescence; radiationless transitions as studied by optoacoustic spectroscopy; chemical reactivity of excited states; ion-molecule and free radical reactions; electron capture and electron-transfer processes. Prereq: 5430.

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

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

6480 Statistical Thermodynamics (3) Application of statistical mechanical methods to systems of chemical interest such as isotope effects on equilibrium and rate processes, phase equilibria, condensation phenomena. Prereq: 5410, 5450.

6495 Advanced Chemical Kinetics (3) Mechanism of elementary chemical reactions at molecular level including topics such as dynamics of molecular collisions, potential-energy surfaces, reaction cross-sections, 'direct vs 'complex' modes of reaction, photonfragmentation, energy partitioning and transfer, chemiluminescence, and chemical lasers. Prereq: 5430.

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

6520 Magnetic Resonance (3) Principles of magnetic-resonance spectroscopy 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: photobehavior spectroscopy, transuranium chemistry, organometallic compounds, inorganic solution kinetics and mechanisms, crystal chemistry, nonaqueous chemistry, chemistry of halogen and compounds. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs. A

6730 Topics in Quantum Chemistry (3) Application of newer methods to complex systems including metal complexes, polymers, and molecules of biological significance. Time dependent phenomena. (Effect of external fields and collision processes.) Recent theories of chemical reactivity. Prereq: 5340-50.

6750 Molten Salt Chemistry (3) Structure, spectroscopic properties, solution thermodynamics, electrochemistry and phase equilibria of molten salts. Solutions of metals in molten salts. Prereq: 4110 and 5410 or equivalent.

6810 Vibrational Problems in Molecular Spectra (3) (Same as Physics 6810.)

6811 Selected Topics in Nuclear Chemistry (3) Subject matter varies among important topics of current significance: nuclear decay schemes, nuclear models, nuclear reaction theory, nuclear detection techniques, activation analysis. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs. A

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

Classics

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

Associate Professors: G. C. Geisel, Ph.D. North Carolina; J. E. Shelton, Ph.D. Vanderbilt.

Assistant Professors: C. P. Craig, Ph.D. North Carolina; S. D. Martin, Ph.D. Michigan; D. W. Tandy, Ph.D. Yale.

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

Greek

3010 Plato (3) A
3020 Herodotus (3) A
3030 Euripides (2) A
4020 Aeschylus, Sophocles (3) A
4030 Lysias (3) A
4040 Aristophanes (3) A
4050-40-70 Directed Readings in Greek (3, 3, 3) F, W, Sp

Latin

3440 Livy (3) A
3450 Pliny and Martial (3) A
3450 Elegiac Poets (3) A
3430 Selected Readings from Latin Literature (3, 3) May be repeated. A
3440 Horace, Odes (3) A
3450 Tacitus (3) A
3460 Lucretius (3) A
4370 Readings in Medieval Latin (3) A
5410-20-30 The Latin Epic: Lucretius, Vergil, Lucan (3, 3, 3) A; A; A
5510-20-30 Roman Comedy; Plautus, Terence (3, 3, 3) A; A; A

GENERAL COURSES

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

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

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

3310 Art and Archaeology of the Aegean Bronze Age and Early Greece (3) Troy, the Cyclades Islands, 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. F

3320 Art and Archaeology of Archaic and Classical Greece (3) Survey of development of Greek architecture, sculpture, and painting from 660 B.C. to death of Alexander. Illustrated lectures. W

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

**Computer Science**

**DEGREE**

M.S.

**Professors:**
- T. Faegin (Head), Ph.D. Texas (Aerospace Engineering); F. Donaldson,* Ph.D. Texas; R. C. Gonzalez, Ph.D. (Electrical Engineering); R. C. Gonzalez, Ph.D. Florida (Electrical Engineering); G. R. Sherman, Ph.D. Purdue (Director of Computing Center); M. G. Thomason, Ph.D. Duke.

**Assistant Professors:**
- J. R. B. Cockett, Ph.D. Leeds (United Kingdom); R. W. Heller, Ph.D. Southern Methodist; D. L. Matuzsek, Ph.D. Texas; M. R. O'Kennon, Ph.D. Clarkson; D. L. Ferry, Ph.D. Ohio State; R. H. Sady, Ph.D. Notre Dame; D. W. Straight, Ph.D. Texas.

**Instructor:**
- K. Y. Sowder, M.S. Tennessee.

**ENTRANCE REQUIREMENTS TO M.S. PROGRAM**

Upon admission to The Graduate School, students who wish to enter the Master's degree program in Computer Science should have the following background:

1. **Mathematical Maturity at least equivalent to that of a student who has completed the calculus sequence through one year of multivariable calculus and matrix algebra.**

2. Computer Science 3155 or an equivalent introductory numerical algorithms course.
3. An introduction to probability and statistics at least at the level of Statistics 3450.
4. Computer Science 2215 or an equivalent introductory programming course.
5. Computer Science 2610, 2710 and 3520 or equivalent courses in advanced programming, machine organization and assembler language programming.

**THE MASTER'S PROGRAM**

**All students must receive departmental credit for or exhibit proficiency in the following courses:**

- Computer Science 4510, 4550, 5100 and 5109.
- Electrical Engineering/Computer Science 5175 and 5940.
- One of the three courses Computer Science 4710, 4730, or 4225. The student may then select either Plan A or Plan B.

**Plan A: Thesis Option**

1. Complete 36 hours of courses at the 4000 level or above. These must include at least 18 hours at the 5000 level in addition to the 5000-level courses explicitly required for the degree.
2. Complete at least 9 additional hours of thesis credit, Computer Science 5000.
3. Pass an oral examination by a committee of at least three faculty members.

**Plan B: Non-Thesis Option**

- Complete 36 courses at the 4000 level or above. These must include at least 27 hours at the 5000-level in addition to the 5000-level courses explicitly required for the degree.
- Pass written and oral comprehensive examinations.

Under either plan, a student wishing to count a course from another department towards the graduate degree must have prior written approval from the computer science graduate committee.

**3150 Introduction to Numerical Algorithms and Programming (3) Roots of equations, systems of linear equations, least-squares data fitting, numerical integration, numerical methods for ordinary differential equations.**

**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. Introduction to programming in FORTRAN. 3150 and 3155 may not both be taken for credit. Students with a knowledge of FORTRAN should take 3155. Prereq or coreq: Mathematics 2860. (Same as Mathematics 3150.)

**3520 Assembly Language Programming (3)**

- Machine and assembly language programming. Elementary computer architecture. Interpretation of memory dumps. Prereq or coreq: Mathematics 2860. (Same as Mathematics 3155.)

**3725 Advanced Discrete Structures (3)**

- Advanced topics in discrete structures useful in computer science. Graphs and algorithms for manipulating data. Algebraic structures, Boolean algebra, lattices, groups, monoids. Prereq: 2215 or equivalent. (Same as Mathematics 3725.)

**4050 Number Systems for Digital Computers (3)**

- Floating-point number representation, fixed-radix number representation, multiple-modulus residue number representation, finite-segment p-adic number representation, errors in floating-point computation, finite fields and exact computation using digital computers. Prereq: 3155. W

**4210 Introduction to Artificial Intelligence (3)**


**4225 Numerical Solutions to Equations and Numerical Approximations (3) (Same as Mathematics 4225.)**

**4245 Numerical Linear Algebra (3) (Same as Mathematics 4245.)**

**4310 Statistical Data Processing (3) FORTRAN language for organization and analysis of scientific data. SPSS and SAS programs for standard statistical analyses; frequency distributions, percentiles, testing hypothesis, chi-square and analysis of variance. Not for credit for computer science majors. Prereq: Statistics 2100 or equivalent, F, Sp.

**4330 Independent Study in Computer Science (1-3)**

- Special project in area of student's personal interest. To be directed by Computer Science faculty, perhaps joint with student's faculty advisor. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs.

**4340 Interactive Statistical Data Processing (3)**

- Statistical data processing using interactive computer system. Timesharing simulation and statistics programs. Introduction to FORTRAN. Not for credit for computer science majors. Prereq: Statistics 2100 or equivalent and 4310 or knowledge of a procedure-oriented language such as FORTRAN.

**4470 Programming Languages (4) Comparison and analysis of programming languages, design, features and implementation. Processors, operations, sequence control, data control, and storage management. Detailed discussion and programming experience in LISP and either SNOBOL, APL, or SIMULA. Prereq: 4510.

**4510 Data Structures and Non-Numeric Programming (3)**

- Data structures and algorithms for their manipulation. Arrays and orthogonal lists; stacks, queues, linked lists, doubly-linked lists, trees; dynamic storage allocation; organization of files; programming languages for information structures. Prereq: 1625 and 2610.

**4550 Systems Programming (3)**

- Computer organization and operating systems. Machine language and design of computers, representation of information, microprogramming, software systems, input-output systems, interpreters, macro assemblers. Prereq: 3520 or equivalent. W

**4570 Introduction to Data Base Management Systems (3)**

- Hierarchical, network and relational models. Logical and physical views of data. Definitions and data manipulation languages. Data independence. Implementation and operational considerations; performance, integrity, security, and reliability. Prereq: 4510 or equivalent. Students may not receive credit for both 4570 and 5570. F

**4610 Operating Systems—Concepts and Facilities (3)**

- Detailed examination of major operating systems. Memory, processor, device and data management. Interrupts, machine-level input/output, loaders and relocation, device characteristics, data set organization. Stacked BOPOL SYSTEMS. Students may not receive credit for both 4610 and 5670. F

**4620 Operating Systems—Case Studies (3)**

- Alternatives in operating system design, dynamic relocation, paging, segmentation, time sharing, time slicing, protection, concurrency, real time systems. Examples from different organizations as appropriate. Prereq: 4610 or equivalent or consent of instructor. W
4860 Principles of Compiler Design (3) Techniques of compiler design, scanning and parsing of languages described by regular and context-free grammars. Prereq: 4510.


4750 Interactive Computer Graphics (3) Point plotting, vector generation, interactive graphical techniques, two- and three-dimensional transformation, perspective depth, hidden line elimination, shading and software hardware system design. Discussion of use of these techniques in design, program solving, mapping, architecture, and many other areas. Prereq: Senior standing in Computer Science, Electrical Engineering or Geography and a knowledge of computer programming, or consent of instructor. (Same as Geography 4750.)

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

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

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

4910 Analysis and Management of Computer Installations (3) Design of computer systems; implementation, justification, personnel in systems; perspective on systems. Prereq: 3520 or equivalent.

4980 Special Topics in Computer Science (1-4) Credit determined at registration. Prereq: Recommendation of Computer Science staff. May be repeated with consent of department. Maximum 9 hrs.

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

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

5010 Computer-Assisted Instruction (3) History and development of CAI systems. Emphasis on studying success and failure of major projects, future role of CAI in education. Use of a CAI programmed language to implement a CAI course. Prereq: Programming experience or consent of instructor.

5050 Computer Modeling and Simulation of Physical Systems (3) Techniques for computer modeling and simulation. Inputs, driving functions, errors, outputs, interactive simulations as applied to various physical systems. Models to represent spatial relationships. Prereq: 3510 or 3155, and 3520 and Statistics 3450. A

5100 Immigration to Computer Science (5) Designed for graduate students with limited computer science background who wish to enter computer science major or minor program. Advanced programming techniques, design of input-output devices, machine organization and assembly languages; programming; introduction to data structures and algorithm analysis. Prereq: One course in programming.

5109 Immigration to Computer Science Practicum (2) Design and implementation of medium to large-scale computer programs. Coreq: 5100.

5175 Introduction to Logic Design (3) (Same as Electrical Engineering 5175.)

5210 Artificial Intelligence (3) Simulation of intelligent processes by computer. Techniques of representation, search, and manipulation for various areas; problem solving, game playing, pattern perception, theorem proving, semantic information processing. Computational models of AI problems. Prereq: 4510 or consent of instructor. (Same as Electrical Engineering 5690.) W

5250 Medical Computing (3) Achievements and problems in computer applications of medicine and biology. Computing technology to field of health care. Various areas of medical computing; laboratory data systems, patient monitoring systems, diagnostic, coherence, patient records, automatic history taking, and hospital administration systems. Prereq: 4510. Sp

5430 Advanced Compiler Design (3) Design and implementation of compilers, affix and two-level grammars, compiler-compilers, incremental compilation, run-time organization, data flow analysis, optimization, and error recovery. Prereq: 4680 and 4710. A

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

5465 Finite Element Methods (3) (Same as Mathematics 5465.) W

5475 Advanced Topics in Numerical Partial Differential Equations (3) (Same as Mathematics 5475.) Sp


5670-80 Advanced Operating Systems (3, 3) Theory and analysis of operating systems. Synchronization and deadlock analysis. Analysis of operating systems using mathematical models, simulation, and hardware and software monitors. Comparison of good heuristic scheduling algorithms with best possible schedules; scheduling anomalies. Case studies of virtual memory systems. Analysis of page swapping and placement strategies. Prereq: 4610 or equivalent or consent of instructor. F, W


5720 Computability and Computational Complexity (3) Computability and decidability; Turing machines and other machines; Recursive and recursively enumerable sets; partial and total recursive functions. Time and space bounded computations; the P vs NP problems. Prereq: 4710. A

5750 Theory of Formal Languages (3) Phrase-structure languages, their generators and processors. Type 0, 1, 2, and 3 languages; operations on languages and grammars; deterministic context-free languages. Theory of translation. Prereq: 4710. W

5775 Combinatorial Algorithms (3) Algorithms for solving optimization problems in graphs, networks and matroids. Precise notions of time and space complexity. Prereq: 4730. (Same as Mathematics 5775.) A

5810 Information Organization and Retrieval (3) Organization, storage, searching and retrieval of information. Development of IR systems from off-line to modern on-line operations. Information analysis and dictionary construction and operations. Search and matching procedures; retrieval process. Information dissemination systems. Database retrieval systems. Prereq: 4510 or 4550. F


5880 Data Security (3) Need for security and methods for achieving it; encryption, machine architecture, hardware and software implementation; historical and current approaches. Case studies in fraud and misuse. Prereq: 3520 or consent of instructor.

5910-20-30 Special Topics in Computer Science (1-5, 1-5, 1-5) May be repeated. Maximum 9 hrs.

5940-50 Advanced Small Computer Systems (3, 3) (Same as Electrical Engineering 5940-50.)

5970 Independent Study in Computer Science (1-3) Special project under faculty guidance. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs.

Cultural Studies

Asian Studies

5870 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.

4010-20-30 Readings in Asian Literature (4, 4, 4) Prereq: Mastery of intermediate level of Japanese, Chinese, Sanskrit, or Arabic and consent of instructor.

4012 Selected Topics in Asian Studies (4) Content varies. May be repeated. Maximum 12 hrs.

4631-32-33-34 Advanced Chinese (4, 4, 4, 4) Taped language program. Prereq: 3531-32 or equivalent or consent of instructor. Must be taken in sequence.

4631-32-33 Advanced Japanese (4, 4, 4) Reading in graded primer with attention paid to finer points of grammar, conversation, drill and composition practice with native speaker. Must be taken in sequence. Prereq: 3631-32-33.

Afro-American Studies

3140-50-80 Directed Readings in Afro-American Studies (1, 1, 1) Designed for students who are interested in doing intensive reading in some area of Afro-American Studies which is defined by the student and the instructor. Prereq: 2010 or 2020 and consent of instructor.

4200 Senior Seminar on Pan-Africanism (4) Explores concepts and philosophers of Pan-Africanism and implication of this ideology for various societal institutions.

4300 Resource Materials in Afro-American Studies (4) Basic references such as bibliographies, indexes, and listings of audiovisuals in Afro-American history, African history, and children's literature. Prereq: 2010 or 2020 or consent of instructor.

4310 Research in Afro-American Studies (4) Deals with Black experience and research process.

4500 Issues and Topics in Afro-American Studies (3-4) Progress, topics and issues in area of Afro-American Studies. Content and credit determined by instructor. May be repeated. Maximum 12 hrs.

4830 Afro-American Women in American Society (4) Historical and contemporary social, economic and political factors in American society as they relate to the Black woman. (Same as Women's Studies 4830.)

4880 Afro-American Psychology (4) (Same as Psychology 4880.)
Comparative Literature

4012-23-2 Special Topics in Comparative Literature (3, 3, 3) Content varies; may be repeated. F, W, Sp

4050-60-70 Dante and Medieval Culture (3, 3, 3) Same as Italian 4050-60-70. A, A, A

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

5022 Approaches in Comparative Literature (3) French and American schools; "comparative literature" vs "general literature"; Van Tieghem, Carre, Baudenbseigner, Wellek. Prereq: 5012; completion of three literature courses in foreign language above 3000, or equivalent. F

5032 Studies in Comparative Literature (3) Independent research projects. Prereq: 5012 and 5022. Sp

Cultural Studies

5101 Foreign Study (1-12) See page 96.

5102 Off-Campus Study (1-12) See page 96.

5103 Independent Study (1-12) See page 96.

Linguistics

4000 Topics in Linguistics (3) Content varies. May be repeated. Maximum 9 hrs.

4020-30 Historical Linguistics, Neogrammarian School, and Growth of Structuralism (3, 3) 4020—Traces development of scientific approach to linguistics from Jacob Grimm and Franz Bopp through nineteenth century. 4030—Traces development of scientific approach to linguistic studies.

4250 Introduction to Descriptive Linguistics (3) (Same as French, German, Russian, Spanish 4250.)

4260 Introduction to Historical and Comparative Linguistics (3) (Same as French, German, Russian, Spanish 4260.)

4270 Introduction to Romance Linguistics (3) (Same as French, Spanish 4270.)

4271 Introduction to Slavic Linguistics (3) (Same as Russian 4271.)

4440 Sociolinguistics (3) (Same as English 4440.)

4450 Dialectology (3) (Same as English 4450.)

4480 Special Topics in English Linguistics (3) (Same as English 4480.)

4471-81 English as a Second or Foreign Language (3, 3) (Same as English 4471-81.)

Women's Studies

4830 Afro-American Women in American Society (4) (Same as Afro-American Studies 4830.)

5110 Psychology of Women (3) (Same as Educational and Counseling Psychology 5110.)

Economics

See College of Business Administration.

English

MAJOR

DEGREES

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

Professors:


Associate Professors:

J. M. Amatudded, Ph.D., L. H. Burghardt, Ph.D. Chicago; D. A. Carroll, Ph.D. North Carolina; D. R. Cox, Ph.D. Marquette; B. K. Dumas, Ph.D. Arkansas; D. F. Gossle, Ph.D. Yale; N. M. Gossle, Ph.D. Texas; J. E. Hall, Ph.D. North Carolina; T. J. A. Helfman, Ph.D. Cambridge, M.A. Lofaro, Ph.D. Maryland; C. J. Maland, Ph.D. Michigan; M. L. Pyse, Ph.D. California (Santa Cruz); M. P. Richards, Ph.D. Wisconsin; F. K. Robinson, Ph.D. Texas.

Assistant Professors:

K. Adams, Ph.D. Florida State; G. Hutchinson, M.A. Indiana; M. Kellei, Ph.D. Rutgers; M. Keene, Ph.D. Texas; I. Leki, Ph.D. Illinois; M. Newfield, M.A. Cornell; R. Sillman, Ph.D. Pennsylvania; S. Watt, Ph.D. Illinois.

Visiting Lecturer:

W. Dykeman, B.A. Northwestern.

Detailed information about the Master's and doctoral programs, and about individual graduate courses, is available by writing the Director of Graduate Studies of English, McClung Tower. For admission forms, write to The Graduate School.

THE MASTER'S PROGRAM

The departmental requirements for the M.A. degree in English include (1) thesis and 36 quarter hours of courses in the Department of English or 45 quarter hours without a thesis, (2) evidence of proficiency in one foreign language, and (3) a final examination. The courses should include 12 hours at the 6000 level, 12-21 hours of additional courses at the 5000-6000 level, and 12 hours at any level for graduate credit, including the 3000-4000 level. The M.A. with Writing Option is intended for those students who plan to do free-lance writing, specialize in teaching writing courses at the college level, or work as professional writers in business or industry. Students who go on to complete the Ph.D. may also find the M.A. with Writing Option helpful when they are seeking teaching positions.

1. A minimum of 36 quarter hours beyond the B.A. degree.
   a. 12 hours at the 6000 level.
   b. 12 additional hours at the 5000-6000 level.
   c. A student may take only 3 hours of 5103 Independent Study toward the degree.

2. Students in the M.A. with Writing Option program may choose one of the following writing projects:
   a. A thesis, using research to analyze some aspect of writing or rhetorical theory, for which 9 hours credit is given. The nature and length of each project will be determined by the Director of Graduate Studies after consulting with the student and his/her project director.
   b. A creative project, for which 9 quarter hours credit is given. A collection of poems or short stories, a novel, a play, or a creative work of non-fiction prose would be acceptable as creative projects. The nature and length of each project will be determined by the Director of Graduate Studies after consulting with the student and his/her project director.
   In addition to the director, two other English Department faculty members will supervise and approve the project.

3. A final examination. A candidate presenting a thesis or creative project must pass a one-hour oral examination, consisting chiefly of questions covering the general history and interpretation of English and American literature, not merely the courses which he/she has taken. A reading list of primary works designed to help the M.A. with Writing Option student prepare for these questions is available in the Office of the Director of Graduate Studies in English. This reading list may be modified by the M.A. examining committee, meeting in a body with the student, to reflect the candidate's particular writing emphasis, but most of the oral examination should focus upon the literature outlined in the original reading list.

4. Evidence of proficiency in one foreign language, to be fulfilled in one of the following ways:
   a. The completion of a second year of language at college level with a grade of C or better.
   b. The completion of French 3020 or German 3020 at UTK with a grade of B or better.
   c. The passing of the regular Ph.D. language examination as currently administered at UTK.

For the degree of Master of Arts in College Teaching (M.A.C.T.) the requirements include (1) 45 quarter hours of course in English, arranged as for the non-thesis M.A., (3) 2 hours in a seminar course for M.A.C.T. students, (3) 3 hours of a tutorial in the teaching of freshman composition, (4) a thesis or 9 additional quarter hours of 5000- and/or 6000-level courses in English, (5) evidence of proficiency in one foreign language, (6) a final examination, and (7) a program of supervised teaching approved by the department.

THE DOCTORAL PROGRAM

The departmental requirement for the Ph.D. degree in English is completion of a minimum of three academic years of resident graduate study. This includes a balanced program of at least 72 quarter hours of graduate credit (or 48 equivalent) in English: 36 hours at the 6000 level; 24 additional hours at the 5000-6000 level; and 12 hours for graduate credit at any level, including the 3000-4000 level. In addition, 9 (or 6) hours approved by the department must be taken for graduate credit in a subject or subjects other than English. Normally a student with the M.A. from another university may transfer at least 36 hours of graduate credit. After all, or most, of the course work has been taken and after the two language requirements have been satisfied, the student will take four comprehensive examinations from several areas divided as the department directs. Successful completion of these
examinations will be followed by the writing of the dissertation and by an oral examination in the field of the dissertation. Any course in the 5000 or 6000 series may be repeated for credit with the permission of the department.

*1311 Written and Oral English for Foreign Students (6) Rapid review of English grammar and pronunciation with intensive oral, aural, and written drill. Required during the first quarter of residence of all foreign students (graduates, undergraduates and transfer students) who are not excused from it on the basis of the English Proficiency Examination required of every new foreign student. A, B, C, I, F, W grading. Students registered for this course are permitted to register for only 2 other courses.

*1121 Written and Oral English for Foreign Students (6) Emphasis on the more advanced structures of English grammar and on paragraph writing. Required during the first quarter of residence of foreign students who on the English Proficiency Examination demonstrate need for work in English structure, but not at the intensive level of English 1211. Required also of foreign students who complete English 1211 and who register for this course. A, B, C, I, F, W grading. Students registered for this course are permitted to register for only 2 other courses.

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

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

3110-30-30 Romantic Poetry and Prose (3, 3, 3) 3110—Emphasis on Wordsworth and Coleridge. 3120—Emphasis on Byron, Blake, and Scott. 3130—Emphasis on Keats, Tennyson, and others. A, B, C, I, F, W grading. Students registered for this course are permitted to register for only 2 other courses.

3135 Tennyson and His Successors (3) Includes such poetry as that by the Pre-Raphaelites, humorists, and Decadents.

3136 Browning, Arnold, and Hopkins (3)

3150 Melville (3)

3210-20 English Literature and Culture of the Nineteenth Century (3, 3) Survey of literature dealing with English prewar developments, science, society, and the arts. 3210—1800 to 1835. 3220—1835 to 1890.


3510 Sixteenth-century Prose and Poetry (3) More and Wyatt to Spenser. A

3520 Elizabethan Drama (3) Marlowe, Jonson, and others. A

3530 Jacobean Drama (3) Defoe, Addison, Steele, Swift, and others. A

3540 Scott to Thackeray. A

3580 Special Topics in Writing (1-3) Topic varies. Prereq: 4270 or consent of instructor. (Same as Writing 5250.)

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)

3770 Literature of English Bible (3) Types of Old Testament literature, excluding Wisdom literature. A

3771 Literature of the English Bible (3) Old Testament Wisdom literature and types of New Testament literature. A

3721 Introduction to Folklore (3) Essential terms and concepts in modern folklore-folk life studies. Emphasis on North American materials: folk tale, folk song, myth, legend, proverbs, riddles, superstitions, dance, games, and architecture. A

3910-20-30 Comparative Literature (3, 3, 3) 3910—Ancient. 3920—Medieval and Renaissance. 3930—Modern. A

3940 The Novel of the Contemporary Western World (3) Prose: Joyce, and others. A

4010-20 Shakespeare (3, 3) 4010—Early plays, c. 1590-1601, including Henry IV, Twelfth Night, and Hamlet. 4020—Later plays, 1601-1613, with emphasis upon tragedies and dramatic romances. E

4042-43 Topics in Mode and Genre (3, 3) Content varies. Special topics in principal forms and modes of British and American Literature, e.g., comedy, tragedy, epic, lyric, satire, etc. May be repeated with consent of department. Maximum 6 hrs each.

4045-46 Topics in Literary Theory and Criticism (3, 3) Content varies. Special topics in theoretical and practical approaches to British and American Literature. May be repeated with consent of department. Maximum 6 hrs each.

4050-50-60 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 thirties to present. F, W, Sp.

4090 Topics in Film Study (3) Content varies. In-depth study of particular directors, film genres, national cinema movements, or other topics. May be repeated with consent of department. Maximum 5 hrs each.

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

4250 Advanced Fiction-Writing (3) Further development of basic writing fiction course. Prereq: 3450 or consent of instructor.

4254 Writing the Detective and Mystery Story (3) Instruction and writing cover entire crime field—suspense, police procedural, private eye, spy, and adventure fiction. Recommended prereq: 3450-70-80 or consent of instructor.

4256 Writing Science Fiction and Fantasy (3) Survey of general development and basic texts of Science Fiction, Speculative Fiction and Fantasy. Exercises in writing in genres, in accordance with techniques learned in basic Writing Fiction course.

4270 Advanced Poetry Writing (3) Further development of skills acquired in Basic Writing Poetry course. Prereq: 3470 or permission of instructor.


4440 Sociolinguistics (3) Exploration of language as Linguistics 4460.)

4450 Dielectricity (3) Theories and methodologies of dialect research, fieldwork, and analysis. Prereq: 3340 or consent of instructor. (Same as Linguistics 4450.)

4455 Varieties of English (3) Theories, methodologies, and findings of English and American dialectology with emphasis on implications for cultural pluralism. Prereq: 3340 or consent of instructor.

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

4471-81 English as a Second or Foreign Language (3, 3, 3) 4471—Applied linguistics in teaching and learning a second or foreign language. Phonological and grammatical structure of present-day English. Analysis of differences (phonological, grammatical, and lexical) between English and another language. Prereq: Second year of a foreign language. 4481—Materials and methods of language teaching, with emphasis on preparation of materials and structured teaching situations. Theory of language teaching competence and performance, with emphasis on construction of tests. Testing and teaching with an experienced member of the staff. Prereq: 4471. (Same as Linguistics 4471-81) W; Sp.

4510-20-30 Black Literature (3, 3, 3) Trends and developments.

4651 Southern Literature through the Nineteenth Century (3) Southern writing from colonial period to end of nineteenth century, including frontier humorists and local color writers. A

4552 Southern Literature in the Twentieth Century (3) Modern Southern literary renaissance, the Fugitives and Agrarians, Faulkner and more recent writers such as Welty, O’Connor, and Porter. A

4560 Emerson and Thoreau (3)

4580 American Humor through Mark Twain (3)

4721-31-41 Ballad and Folktales (3, 3, 3) 4721—Study of traditional English and Scottish popular ballads and their North American variants; 4731—Study of native American ballad and folktale; 4741—The folk narrative; functions, categories, and patterns of storytelling.

4850 Milton (3) Emphasis on major poems. A

4860 Seventeenth-century Prose and Poetry (3) Bacon and Donne to Marvell. A

4930-40 Chaucer (3, 3) 4930—The Canterbury Tales. 4940—Troilus and Cresside and early poems.

5000 Thesis (1-15) 5000 or consent of instructor.

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

5101 Foreign Study (1-12) See page 96.

5102 Off-Campus Study (1-12) See page 96.

5103 Independent Study (1-12) See page 96.

5140 Teaching Freshman Composition (3) Introduction to teaching of Freshman English through study of various techniques and philosophies of composition. Required of all first-year teaching assistants.

5150 Old English Prose (3) A

5170-80 History of the English Language (3, 3) 5170—The history and evolution of the English language. 5180—Structure and function of dialect research, fieldwork, and analysis. Required for the non-thesis student not otherwise registered during any quarter when such a student uses university facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. S/N only. E

5201-20-30 Reading in American Literature from the Colonial Period to the Present (3, 3, 3) F, W, A; Sp, A

5240 Readings in Black American Literature (3) Critical analysis of poetry, prose, drama, criticism; historical and cultural background; discussion of relevance or irrelevance of race as influence on text and reader.

5250 Fiction Writing (3) Advanced fiction projects, under supervision of instructor and time for independent study. Prereq: Extensive background in reading and writing fiction.

5255 Writing of Advanced Non-Fiction Prose: The Genres (3) Practice in writing of biography, travel book, historical study, and associated genres. Viewpoint is creative. Prereq: 4000-level writing course or consent of instructor.

5270 Poetry Writing (3) Major poetic project or concentration. Prereq: Project begun in 4270. Individual consultation with instructor supplements class analysis; readings in contemporary poetry and theory. Prereq: 4270 or consent of instructor.

5280 Special Topics in Writing (1-3) Topic varies.
May be repeated. Maximum 9 hrs. Enrollment by consent of Director of Graduate Studies only.

5290 Analysis of Technical Writing (3) Theory and practice of technical writing. Exploration of current theories of scientific, business, technical, academic, and governmental rhetoric. Analysis of shared elements and practices in producing such writing. Prereq: English 2050 or instructor consent.

5310 Rhetoric and Composition: History and Theory (3) Modern developments in rhetorical theory, their origins in Plato, Aristotle, and others.

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

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

5610-20-30 Reading in English Literature of the Nineteenth Century (3, 3, 3)

5690 Film History, Rhetoric, and Criticism (3) Film as narrative art form: historical development of film: the "rhetoric" of film; critical approaches to film study, including genre, auteur, formalist, and historical: critical analysis of individual films.

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)

5960 Introduction to Literary Research (3) Critical examination of aims of English studies, profession of English teacher, theory of literature, and methods of research, including collecting of information, evaluation of material, and transmitting of results of scholarship.

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

6000 Doctoral Research and Dissertation (3-35) P/NP only. E

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

6140 Studies in Old English Language and Literature (3) For students who know Old English well and who wish to do research in literature, structure of language, paleography, Anglo-Latin backgrounds and sources, and related topics.

6150 Old English Poetry (3) Prereq: 5150.

6160 Beowulf (3) Prereq: 5150, 6150.

6170 Studies in Middle English (3)

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

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

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

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

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

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

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

6550 Studies in Mode and Genre (3) Content varies. May treat drama, novel, short story, poetry, or satire; the comic, the tragic, etc., depending on professor.

6590 Special Topics (3) Content varies. Humor, history of ideas, biography, autobiography, literature of travel, literature and extra-literary disciplines, etc.

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

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

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

6860 Textual Bibliography and Criticism (3) Study of evidence gathered from printing process to make critical judgements about text of literary work. Prereq: 5860 or consent of instructor.

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

French

See Romance Languages

Geography

MAJOR

DEGREES

Geography

M.S., Ph.D.

Professors:

S. R. Jasper (Head), Ph.D. Tennessee; C. Aiken, Ph.D. Georgia; E. H. Hammond, Ph.D. California (Berkeley); C. W. Minkel, Ph.D. Syracuse; T. H. Schmudde, Ph.D. Wisconsin.

Associate Professors:

T. L. Bell, Ph.D. Iowa; L. W. Brinkman, Jr., Ph.D. Dover; C. T. Palatian, Ph.D. Denver (UT Space Institute); B. Ralston, Ph.D. Northwestern; J. B. Rehder, Ph.D. Louisiana State.

Assistant Professors:

T. J. Blasing (Adjunct), Ph.D. Wisconsin; R. Foresta, Ph.D. Rutgers; L. Pulipher, Ph.D. Southern Illinois.

The Department of Geography offers the degrees of Master of Science and Doctor of Philosophy with concentrations in geography of development, physical geography and human systems, urban geography, geography of Anglo-America, and rural and nonmetropolitan geography.

THE MASTER'S PROGRAM

The department offers both the thesis and non-thesis option for the Master of Science degree. Both options require a minimum of 45 quarter hours beyond completion of a sound undergraduate major program. At least two-thirds of the total hours in the graduate program must be at or above the 5000 level, and must include 5100 (at each offering during residency), 5150, 5160 and 6 quarter hours at the 6000 level. In the thesis option, no more than 9 hours may be thesis courses. A final examination is required in both programs.

THE DOCTORAL PROGRAM

The doctorate is a research degree and is granted only to those persons who demonstrate proficiency in conducting independent research. Students must have achieved the equivalent of a comprehensive Master's program before they will be admitted to the doctoral program. Course requirements for the degree shall be determined by the student's faculty committee in accordance with specific interests and needs. The program of study must include sufficient course work within the department, but outside the areas of specialization, to give a broad foundation and understanding of the discipline. The program must include 5160, 5170, 5720, and (at each offering during residency) 5100. A minimum of 15 hours of credit must be earned in related fields outside the department. Competence in a foreign language, cartography, and quantitative techniques is required. Other techniques pertinent to the student's areas of specialization may be required. The language will be French or German unless otherwise approved by the student's faculty committee. Comprehensive examinations required for admission to candidacy include a written comprehensive, written examinations on two special fields, and an oral examination on the student's program, the special fields, and the dissertation proposal. Also required is a final oral examination on the dissertation and on other aspects of the program as determined by the student's doctoral committee.

3410 Intermediate Geographic Environment (4) Concepts, theories, and applications in locating patterns of agriculture, manufacturing, and service activities. F or W

3430 Urban Geography (4) Concepts and theories concerning development and significance of systems of cities and internal morphology of cities. F or W

3450 Rural Geography (4) Geographical appraisal of rural areas of the United States, including small towns and urban fringes. Problems and potentials of rural America. F or W

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. F or Sp

3520 Climatology (4) General circulation system leading to world pattern of climates. Climatic change and modification, interrelationship of climate and human activity. W or Sp

3530 The Land-Surface System and Man (4) Nature and regional variations in relationships among surface form, water, vegetation, and surface materials. Humans as evaluators and agents of change. F, Su

3610 Political Geography (4) Importance of geographic factors for understanding political relationships within and among nations; spatial implications of political decision-making processes; geography of administrative units. F

3660 Cultural Geography (4) Basic concepts of culture; methods and background of cultural geography; world patterns in time and space. F

3790 Geography of Middle America (4) Covers Mexico, Central America, and the West Indies. F

3800 Geography of South America (4) W

3870 Geography of Asia (4) A survey of the physical, cultural and economic characteristics of the countries of Asia, excluding the Soviet Union.

3910 Regional Geography of United States and Canada (4) Major physical, economic, and social developments as they relate to the distinctive character to regions of United States and Canada. F

3920 Geography of the American South (4) Geographical appraisal of southeastern United States, including physical environment and human resources. Origin and development of the contemporary economic and cultural traits of the area. W

3940 Geography of Appalachia (4) Interrelation of physical, economic, and social patterns to give distinctive character to the region and its parts, especially Southern Appalachia. Appalachia in perspective in the current American scene. F

4075 Geography of Transportation (4) Geographic examination of transportation systems, emphasizing transport of people on highways, and public facilities. Relationship of these systems to changing geography of cities and urban hinterlands. Sp

4100 Quantitative Methods in Geography (4) Geometric applications of mathematical models to points, lines, and areas. Prereq: Mathematics 3000 or consent of instructor. W

4210 Problems in Geographic Method (4) Examples of problems and approach in geographic analysis and synthesis. Emphasis on characteristic of geographic analysis, sampling, generalization, classification, regionalization, and questions of scale. Sp

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. Sp
5410 Advanced Topics In Economic Geography
(3) Examination of trends, problems, and methods in modern economic geography. Prereq: 3410 or consent of instructor. May be repeated. Maximum 9 hrs. A

5520 Advanced Urban Geography (3) Analysis of research on urban systems, internal morphology, urban problems and urban spatial behavior. Prereq: 3410 or consent of instructor. Maximum 9 hrs. A

5410 Advanced Topics In Economic Geography
(3) Examination of trends, problems, and methods in modern economic geography. Prereq: 3410 or consent of instructor. May be repeated. Maximum 9 hrs. A

5180 Advanced Political Geography (3) Geographic consequences of public decisions, emphasis on understanding how administrative and political processes affect public land management, spatial distribution of public goods, and urban morphology. Prereq: 3610 or consent of instructor.

5710 Seminar in Geography (3)

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

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

5790 Topics in Cartographic Trends, concepts, problems, and methods of cartography. Prereq: 3730, or consent of instructor. May be repeated with consent of instructor. Maximum 9 hrs. A

5815 Regional Geomorphology (4) (Same as Geology 5815.)

5825 Topics In Historical Geography (3) Examination of trends, concepts and methods in historical geography. Prereq: 4240 or consent of instructor. May be repeated with consent of instructor. Maximum 9 hrs. A

5826 Advanced Cultural Geography (3) Geographical analysis of rural settlement in Eastern United States, with emphasis upon New England, Tidewater East, and Upland South, and specific application to Southern Appalachians. Includes field work and final paper. Prereq: 3660 or consent of instructor. A

NOTE: Registration in 6000-level courses may be repeated with consent of department.

5450 Geography of Soils (4) Soils as physical systems and their relationship to environments. Investigation of specific cases of the role of soil in management of environmental systems.


5420 Topics In the Geography of the American South (3) Geographic perspective on economic and cultural aspects of southeastern United States. Topics vary. May be repeated with consent of instructor. Maximum 9 hrs. A

5410 Advanced Topics In Economic Geography
(3) Examination of trends, problems, and methods in modern economic geography. Prereq: 3410 or consent of instructor. May be repeated. Maximum 9 hrs. A

5520 Advanced Urban Geography (3) Analysis of research on urban systems, internal morphology, urban problems and urban spatial behavior. Prereq: 3410 or consent of instructor. Maximum 9 hrs. A

5550 Topics in Geography of Land-Surface System (3) Examination of trends, problems, and methods in geography of land-surface system. Prereq: 3530 or consent of instructor. May be repeated with consent of instructor. A

5610 Topics In Climatology (3) Examination of trends, problems, and methods in modern climatology. Prereq: 3510 or consent of instructor. May be repeated with consent of instructor. A

5660 Advanced Political Geography (3) Geographic consequences of public decisions, emphasis on understanding how administrative and political processes affect public land management, spatial distribution of public goods, and urban morphology. Prereq: 3610 or consent of instructor.

Geological Sciences

MAJOR

DEGREES

M.S., Ph.D.

Geology

Professors:

R. W. Arnseth, Ph.D. Northwestern;

Assistant Professors:

R. W. Arnseth, Ph.D. Northwestern;
T. W. Broadhead, Ph.D. Iowa; P. A. Delcourt, Ph.D. Minnesota; D. G. Dries, Ph.D. Wisconsin; T. C. Labota, Ph.D. California Institute of Technology; N. B. Woodward, Ph.D. Johns Hopkins.

Two quarters each of general physics, chemistry, biology, and calculus are required if not taken as undergraduate.

A minimum of one quarter enrollment for undergraduate credit in Geology 5350 is required during the senior year.

THE MASTER'S PROGRAM

The department requires a minimum of 45 quarter hours including at least 21 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 camp are required to take Geology 4440, or an equivalent course elsewhere, as part of the above department requirements. One year of general physics is required, if not taken as an undergraduate. Thesis committee and topic must be approved by graduate program committee. Qualifying examination is given the second quarter.

THE DOCTORAL PROGRAM

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

1. Program to be determined by faculty committee. Requirements include a minimum of 84 quarter hours in courses for graduate credit, in addition to dissertation. These courses must include a minimum of 45 hours in the 5000 or 6000 series, of which at least 15 hours must be in the 6000 series. Up to one-third of the required hours may be taken in related fields. A Master's degree is recommended.

2. Comprehensive examination will be both written and oral. The exam must be taken by the end of the second academic year.

3. Each Ph.D. student must satisfy a research tool requirement which will be determined by his/her faculty committee and which will consist of one of the following:
   a. Demonstration by examination of a reading knowledge in one modern foreign language in which there is a significant body of geological literature.
   b. Completion of course 3030 in an appropriate foreign language with a B or better.
   c. Courses (minimum of 6 hours) at 3000 level or higher taken for 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


3180 Mineralogy (4) Introduction to crystallography and study of minerals. Laboratory includes hand specimen, chemical and x-ray methods of identification. Prereq: 1410. Chemistry 1110-20 or equivalent. 3 hrs and 1 lab.

3210-20 Invertebrate Paleontology (4, 4) Systematic review of important Metazoan invertebrate fossil groups. 3210—Porifera to Annelida, including cnidaria, brachiopods, and conodonts. 3220—Mollusca through lesser Chordata, including arthropods and echinoderms. May be taken separately or in sequence. Prereq: 3200; Biology 1210-20 or consent of instructor. 3 hrs and 1 lab or field period.

3280 Paleobiology (4) Introduction to principles and methods of paleobiology with a special emphasis on the fossil record of land plants and vertebrates. Prereq: Biology 1210-20 or consent of instructor. 3 hrs and 1 lab or field period.

3310 Introductory Petrology (4) Introduction to classification and properties of igneous and metamorphic rocks, processes which produce them, and their economic uses. Prereq: 12 hrs of geology and consent of instructor. 3 hrs and 1 lab or field period. 

3320 Geological History of Land Organisms (4) Geological history and development of terrestrial biota and ecosystem with special emphasis on fossil record of land plants and vertebrates. Prereq: Biology 1210-20 or consent of instructor. 3 hrs and 1 lab or field period.

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

3380 Stratigraphy-Sedimentation (4) Introduction to stratigraphic principles and practices and of sedimentary processes and interpretation of depositional environments. Prereq: 1420 and 3160. 3 hrs and 1 lab.

3370 Structural Geology (4) Introduction to the study of structures such as faults, folds, joints, cleavage, and primary structures. Laboratory work includes determination of age, dip and strike of structures, structure contour maps. Prereq: 1420, Mathematics 1840-50 or equivalent. 3 hrs and 1 lab.

3510 Introductory Environmental Geology (4) Geologic processes involving earth environment and resources, and geologic parameters associated with their control and misuse. Prereq: 1420 or consent of instructor. 2 hrs and 2 labs or field periods.

3610 Quaternary Geology for Engineers (3) Erosional and depositional processes, landforms, ground water. Prereq: 2610 or equivalent. 2 hrs and 1 lab or field period.

4110 Principles of Economic Geology (4) Geologic processes, classification, of mineral deposits, survey of different types of mineral deposits with examples. Prereq: 3160, 3190, 3510 or equivalents. Recommended prereq: 4610. 3 hrs and 1 lab.

4115 Elementary Applied Geophysics (4) Basic principles of electrical, seismic, gravity and magnetic surveying. Recommended: 1420, Physics 2220 or 2225. 3 hrs and 1 lab.

4130 Sedimentology (4) Introduction to physical processes of sedimentation: transport of sediments and formation of sedimentary structures, river flows, wave action, lakes, and ocean circulation. Recommended: Prereq: 3310. 3 hrs and 1 lab.

4230 Paleocology (4) Principles of environmental analysis applied to fossil assemblages and associated lithologies. Prereq: 3260 or consent of instructor. Prereq: 1410.

4240 Paleobotany (4) Survey of fossil record of plants with particular emphasis on comparative morphology and evolutionary trends in major plant groups and their pollen and spores. Prereq: 1420 or 2210; Botany 3010-20 or consent of instructor.

4260 Biostratigraphy (3) Application of paleontological data to stratigraphic study, codification of stratigraphic nomenclature and recommended practice. Prereq: 1420. 3 hrs and 1 2-hr seminar.

4270 Micropaleontology (4) Survey of geologically stratigraphically important microfossils and their biological association if known. Special emphasis is given to fossil foraminifers, protists, and palynomorphs. Prereq: 3260 or consent of instructor.

4307 Introduction to X-Ray Methods (1) Generation and nature of x-rays as applied to x-ray diffraction, x-ray fluorescence and electron microprobe analysis. Prereq: 3190 or consent of instructor.

4380 Electron Microprobe and X-Ray Fluorescence Analysis (3) Application of electron microprobe and x-ray fluorescence techniques as an aid to mineral identification and determination of field relations. Prereq: 3260 or coreq: 4307 or consent of instructor.

4309 X-Ray Diffraction Methods (3) Application of x-ray techniques to the study of mineral phases, including powder camera, Gandolfi camera and diffractometer. Prereq: or coreq: 4307 or consent of instructor. 2 hrs and 1 lab.

4310 Geological Mapping (4) Interpretation of maps and methods of geological mapping. Prereq: 12 hrs of geology. 3 hrs and 1 lab or field period.

4324 Quaternary Paleocology (4) Pollen and plant-microfossils, characterization of vegetation and climate change during Quaternary. Prereq: Consent of instructor. 2 2-hr lectures per week.

4333 Quaternary Field and Lab Techniques (4) Techniques for environmental characterization and reconstructions, pollen and plant-microfossil identification, description of site stratigraphy and sedimentology. Prereq: 1140, equivalent course, or consent of instructor. 2 2-hr lectures per week.

4440 Field Geology (9) Five-week field course, first term summer quarter. Advanced undergraduates or graduate students. Field trips include UPS, Great Basin, Rocky Mountains, and oceanic islands. Prereq: 1410, equivalent course, or consent of instructor. 3 hrs and 1 lab or field period.

4460 Geologic Photography, Photogrammetry and Remote Sensing (4) Terrestrial, airborne, and satellite geologic remote sensing, photographic principles and practice, photography and aerial photography, principles of nonphotographic remote sensing systems.

4510 Principles of Geomorphology (4) Gradational processes operating on and near earth's surface, applications to erosion and deposition. Prereq: 1410 or equivalent. (Same as Geography 4510.) 3 hrs and 1 lab.

4520 Process Geomorphology (4) Gradational processes operating on and near earth's surface, applications to erosion and deposition. Prereq: 1430 and 4510. 3 hrs and 1 lab or field period.

4550 Optical Mineralogy (4) Identification of minerals on crystal chemistry and relation between basic atomic structure and distribution and behavior of elements in the earth's crust. Prereq: Chemistry 1110-20 or equivalent. Recommended: 3310.


4710 Exploration of Oceans and Continents (4) Introduction to study of origins and changes that have occurred in earth's crust with emphasis on modern concepts of continental drift and plate tectonics. Prereq: 1420.

4780 World Geology of Petroleum (4) Geologic habitat of petroleum deposits, methods of exploration and reserve assessment, geology and global distribution of known and potential resources. Prereq: 1410 or equivalent and 3350 or equivalent.

4790 Uranium Deposits (4) Distribution, characteristics, and origin of different types of uranium deposits. Prospecting and evaluation of uranium deposits; special emphasis on uranium deposits of economic importance. Prereq: 4110 or consent of instructor. 3 hrs and 1 lab/field/seminar period.

4810 Special Problems in Geology (1-4) Prereq: Consent of instructor. May be repeated. Maximum 4 hrs.

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

5050 Geochemistry of Ore Mineral Deposits (3) Study of ore deposits based on experimental, empirical, and theoretical geochemical considerations. Prereq: 4650 and 4110 or consent of instructor.

5090 Experimental Geochemistry Laboratory (1-3) Independent lab study of problem in geochemistry using lab techniques. Prereq: Consent of instructor.

5210 Special Problems in Geology (1-4) May be repeated. Maximum 12 hrs.

5290 Quaternary Problems (4) Interdisciplinary approach to interpretation of physical and biological phenomena directly or indirectly influenced by Pleistocene glaciation. Prereq: Elements of geology (3 quarters) or consent of instructor. (Same as Botany 5290 and Zoology 5290.)

5310 Depositional Environments and Models for Exploration (4) Modern depositional environments and recognition of ancient analogs; facies applications to exploration and production geology.

5340 Seminar in Local Stratigraphy (1) Stratigraphic mapping and analysis of sedimentary units in the field. Prereq: 3260. 1 hr and 1 2-hr seminar.

5350 Selected Topics in Geology (1) Presentation of graduate research, topics from current literature, and subjects of general interest. Registration required each quarter except summer for resident full- time graduate students. S/N only.

5370 Mesofabric Analysis (4) Techniques of gathering, processing, and interpreting tectonic mesoscopic fabric data. Prereq: 3370. 3 hrs and 1 lab or field period.

5460 Photogeologic Interpretation (4) Advanced photogrammetric techniques to obtain geological measurements from aerial photographs. Practice in photograph interpretation of selected and present selected geologic features. Prereq: Consent of instructor.

5470 Plate Tectonics and Orogeny (4) Geometry and kinematics of plate motion are used to devise models of geosynclines, fold belts, metamorphic and plutonic belts, and ancient and modern analogs. Prereq: 3370. 3 hrs and 1 seminar or lab.

5520 Igneous Petrology (4) Genesis and emplacement of magma, and mineralogical, chemical, and textural properties of igneous rocks. Laboratory emphasizes petrographic description and classification of rocks in thin section. Prereq: 3310 and 4650. 2 hrs and 2 labs.
5540 Terrigenous Clastic Sedimentary Petrology (4) Field and microscopic analysis of terrigenous clastic rock types, role of transport and depositional processes. Laboratory emphasis petrochemical characteristics of terrigenous clastic rock types, role of transport and depositional processes in thin section. Prereq: 3100 and 4550. 2 hrs and 1 lab.

5550 Carbonate Sedimentology (4) Environments of deposition of modern and ancient carbonates. Prereq: 4130 or consent of instructor. Recommended: 4500. 3 hrs and 1 lab.

5635 X-Ray Diffraction: Single Crystal Techniques (3) Single crystal diffraction techniques, emphasis on precision and Weissenberg photography. Crystal symmetry and diffraction, reciprocal lattice and Ewald sphere constructions, space group determination and application to geological problems. Prereq: Knowledge of introductory crystallography and consent of instructor.

5640 Clay Mineralogy (4) Origin of clay minerals; structural and physical properties, application of mineralogical techniques in clay mineral studies. Prereq: 3180 and 5630 or equivalent. 2 hrs and 2 labs. A

5650 Thermodynamics for Geologists (3) Principal thermodynamic concepts and principles governing geologic processes. Prereq: Chemistry 1110-20-30 and calculus of a single variable or equivalents.

5690 Cathodoluminescence Petrography (2) Application to geological problems. Prereq: 3180 and 4550 or consent of instructor. 1 hr and 1 lab.

5710 Advanced Paleontology (4) Fossil invertebrates.

5720 Paleontological Nomenclature and Techniques (4) Codification of biologic nomenclature as it applies to paleontology, basic techniques in preparation and illustration of paleontologic materials and manuscript preparation for publication. 3 hrs and 1 lab.

5820 Strata-bound and Stratiform Sulphide Deposits (4) Classification, distribution, characteristics and genesis of strata-bound and stratiform sulfide deposits. Maissappi Valley-type Pb-Zn deposits, strata-bound massive Cu-Zn-Pb deposits of volcanic and sedimentary associations, and stratiform Cu deposits. Prereq: 4110 or consent of instructor. 2 hrs and 2 labs and seminar periods.

5830 Magmatic Mineral Deposits (4) Classification, distribution, characteristics and genesis of magmatic mineral deposits related to magmatic processes. Magmatic segregation deposits of ultramafic-mafic association and porphyry Cu-Mo deposits. Prereq: 4110 or consent of instructor. 2 hrs and 2 lab/field/seminar periods.

5840 Ore Petrology (4) Ore mineral assemblages by reflected-light microscopy. Identification of ore minerals and interpretation of paragenesis from textures. Typical samples from different types of ore deposits, subject of choice. Prereq: 4110 and 4550, or consent of instructor. 2-2.5 hrs. Lab.

5850 Regional Studies in Geology (1-3) Literature study and seminars on specific regions of geologic interest supplemented by field trips. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs.

5860 Coal Depositional Environments (4) Coal stratigraphy and depositional environments, Carboniferous rocks of Appalachian region, problems of coal mining and coal quality. Prereq: 3360 or 4130.

5915 Regional Geomorphology (4) Selected geomorphologically-related areas, which have common elements such as history or development, related processes which have produced genetic, similar assemblages of landforms. May be repeated with consent of department. (Same as Geography 5915).

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

*6110 Seminar in Stratigraphic Geology (3)
*6210 Seminar in Paleontology (3)
*6310 Seminar in Structural Geology (3)
*6410 Seminar in Mineralogy (3)
*6510 Seminar in Petrology (3)
*6610 Seminar in Economic Geology (3)
*6710 Seminar in Geochemistry (3) Prereq: 4610 or consent of instructor.

NOTE: Registration for 6000-level courses may be repeated with consent of department. Maximum 9 hrs per course.

**Germanic and Slavic Languages**

**MAJORS**

**German**
- German Language and Literature
- Emeritus Professors: H. W. Fuller, Ph.D. Wisconsin; R. L. Hiller, Ph.D. Cornell.
- Professors: H. Kratz (Head), Ph.D. Ohio State; J. E. Falen, Ph.D. Pennsylvania; J. C. Osborne, Ph.D. Northwestern; M. P. Rice, Ph.D. Vanderbilt.
- Associate Professors: J. L. Elliott, Ph.D. Michigan; D. M. Flenn, Ph.D. Indiana; N. A. Luckner, Ph.D. Wisconsin; D. E. Lee, Ph.D. Stanford; C. J. Mellor, Ph.D. Chicago.
- Assistant Professors: C. Hughes, Ph.D. Chicago; U. Ritzenhoff, Ph.D. Connecticut.

The Department of Germanic and Slavic Languages offers three advanced degrees. They are the Master of Arts (M.A.) in German, the Master of Arts in College Teaching (M.A.T.C.) in German, and the Doctor of Philosophy (Ph.D.) in German Language and Literature.

**THE MASTER’S PROGRAM**

In addition to the general Graduate School requirements as stated on page 18, the department requires a minimum of 45 quarter hours including 21 hours of coursework above 5000 level and 9 hours of Thesis 5000.

**MASTER OF ARTS IN COLLEGE TEACHING PROGRAM**

The MACT program is essentially an expanded M.A. program. The minimum requirement is 80 hours of graduate study, including 9 hours of thesis and a 3-quarter-hour seminar in college teaching. The aim of this program is to prepare highly qualified college teachers. Students receiving the MACT degree will be well prepared to go to the Ph.D.

**THE DOCTORAL PROGRAM**

The student must fulfill the general requirements for the Ph.D. degree set by The Graduate School. The candidate for the doctoral degree must complete a minimum of 81 quarter hours of course work beyond the Bachelor's degree in addition to 36 hours of doctoral research and dissertation. At least 45 quarter hours of the minimum must be taken in 5000 or 6000 courses. Of these 45 hours, a minimum of 18 hours must be taken from the semiprocess (5200) and the literary or philosophic seminars (6210-20-30-40-50-60 and 6310-20-30). At least 9 hours must be taken in a cognate field. Students are encouraged to take additional work in allied fields. A minor in an allied field must consist of at least 18 hours of 5000 or 6000 courses. Students must show a familiarity with the major works of German, both oral and written, and a knowledge of two foreign languages, French and another language, such as Italian, Latin or Russian, appropriate to the field of research. A comprehensive examination, both written and oral, on German language and literature and the minor field or fields, must be passed before the student may be admitted to candidacy. The student will be examined on an extensive reading list which covers the whole range of German literature, and will be expected to show familiarity with major works of world literature. The candidate will be required to defend the dissertation in an oral examination, which will cover also the general area of the dissertation. Central emphasis is put on the doctoral dissertation as a final test of the candidate’s scholarly qualifications.

The field of study is divided into (1) German literature and (2) German (or Germanic) philology or linguistics. A student may concentrate on one or the other. Dissertation and seminar research topics will be chosen in accordance with the student's varying preferences and specific interests of the faculty. Detailed programs will be established in each case by the student's faculty committee.

3010-20-30 Elements of German for Upper Division and Graduate Students (3, 3, 3) Elements of language, elements of advanced readings. Open to graduate students preparing for language examinations, and upper division students desiring reading knowledge of the language. Undergraduate credit only. No credit for students having completed elementary German.

3210-20-30 German Literature in English Translation (3-4, 3-4, 3-4) No foreign language credit. No change in credit hours after add deadline. Students opting for 4 hrs credit will be expected to present an appropriate amount of extra work above that required for 3 hrs. F, W, Sp.

3240 Old Norse Literature in English Translation (3-4) Prose readings of sagas of Scandinavian kings, great Icelandic family sagas, and Viking sagas, narrating discovery of America around the year 1000. Mythological and heroic poems of the Eddas.

4110-20-30 Studies in Classical and Modern Writers (3, 3, 3) Content varies. Prereq: 9 hrs of 3000 courses (exclusive of 3010-20-30, or courses in English translation) or equivalent. May be repeated with consent of department.

4140-50 Selected Topics in German Literature from 1750 to the Present (3, 3) Prereq: 9 hrs of 3000 courses (exclusive of 3010-20-30, or courses in English translation) or equivalent. May be repeated with consent of department.

4145-50 Selected Topics in German Literature (3, 3, 3) Prereq: 9 hrs of 3000 courses (exclusive of 3010-20-30, or courses in English translation) or equivalent. May be repeated with consent of department.

4146 Studies in German Authors (3) Life and works of a single outstanding German literary figure. Content varies. Prereq: 9 hrs of 3000 courses (exclusive of 3010-20-30, or courses in English translation). May be repeated with consent of department.

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

4210-20-30 Studies in German Literary Types (3, 3, 3) 4210—Lyric poetry. 4220—Drama. 4230—Narrative prose. Prereq: 8 hrs of 3000 courses (exclusive of 3010-20-30, 3210-20-30, 3310) or equivalent.

4250 Introduction to Descriptive Linguistics (3) (Same as French, Russian, Spanish, and Linguistics 4250) F
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 must possess a reading knowledge of one foreign language and such additional languages as may be determined by the student's committee. Under normal circumstances, those specializing in European history will need two languages. The committee may also specify any other research tools, such as statistics, essential for the student's preparation. Upon student petition, the committee may accept in place of a language a B or better performance in appropriate statistical courses and History 5290.

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 contact with the appropriate forms and the time of the Graduate School.

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

4. Comprehensive Examination and Committee: Incoming students will be advised by the department head.

The comprehensive examination must be taken after all course work is completed, language requirements fulfilled, and at least nine months before the degree is expected. This exam should normally be taken before beginning the ninth quarter of work toward the doctorate. The candidate must present four fields, distributed as follows: one major field (history); two minor fields (history); and one minor field which may be either in history or outside the department. In any case, the student is required to have 9 hours of graduate work outside the History Department. Three of the four areas must be represented by a major or a minor field, or both.

I. Ancient and Medieval

1. Ancient Near East
2. Greece
3. Rome
4. Early Middle Ages, 375-1122
5. Late Middle Ages, 1095-1450

II. Early Modern

1. Renaissance and Reformation
2. Europe, 1559-1815
3. American History to 1815
4. Latin America 1492-1825

III. Modern

1. Europe, 1815-1914
2. European World Since 1914
3. United States, 1815-present
4. Latin America, 1789-present
5. East Asia, 1641-present
6. Middle East, 1798-present

IV. National, Sectional and Topical

1. England, 1485-1783
2. The Great War 1914-1918
3. France, 1559-1815
4. France, 1789-present
5. Germany, 1555-1806
6. Germany, 1866-present
7. Russia, 1600-1800
8. Russia, 1800-present
9. Colonialism and Imperialism
10. Diplomatic History of the States
11. Social and Cultural History of the United States
12. The South
13. Contact and Westward Movement
14. Afro-American

The comprehensive examination will be both written and oral.

5. Dissertation and Final Examination: Original research forms the basis for the dissertation. After the dissertation has been completed, a final oral examination will be given on the dissertation in its historical context.

3060-70-80 History of Western Religious Thought and Institutions (3, 3, 3) (Same as Religious Studies 3060)

3140-50-60 History of England (3, 3, 3) 3140—To 1688. 3160—1689 through the Reform Bill of 1832. 3180—1832 to present. Medieval state, church, and society; origins of Anglo-American law; monarchy, parliamentary government, Reformation, seventeenth century revolutions, commercial, agricultural and industrial growth, social and political change, empire, welfare state, world wars, economic crisis.

3311-21 History of Tennessee (3, 3) 3311—Eighteenth Century to Civil War Era. 3321—1865 to present.

3411-12 The Reformation (3, 3) 3411—Reformation, Counter Reformation, and Wars of Religion, 1517-1618. (Same as Religious Studies 3411-12.)


3431-32 Nineteenth Century Europe (3, 3) 3431—French and industrial revolutions to 1848. The milieu for conflicting economic, social and political ideas, culminating in massive revolutionary upheaval. 3432—Maturity and challenge (1848-1890). Industrial and capitalist maturity in era of intense national rivalry; triumph of bourgeoisie, intellectual climate of realism, socialism, and materialism.

3445-46 History of France (4, 4) 3445—Emergence of Modern France (1715-1875). Social, intellectual and economic pressures in French regime; era of experimentation as revolutionary and traditional France confront one another. 3446—Since 1871.

3470-80-90 History of Russia (3, 3, 3) 3470—To 1801. 3480—Nineteenth Century. 3490—Twentieth Century.


3710-30-30 History of Germany (3, 3, 3) 3710—Germany to 1700: First Reich's fortune and failure. Development of an imperial state from medi eval greatness to baroque age weakness, disastrous dynastic and religious struggles, rise of powerful principalities, economic and cultural growth and decline. 3720—Germany 1700-1900: quest for nationhood. Austrian-Prussian rivalry in times of nationalism, rise of imperialism, 1870-1914. 3730—Germany since 1919: Barbarism of the Third Reich to defeat and partition, role of military, political impact of economic crises, Hitler and Nazi. 3810-20 History of East Asia (3, 3) 3810—East Asia: history and culture to 1600. 3820—From the Enlightenment to the Age of Realism, 1700-1870. 3830—Reformation, Counter Reformation, and Wars of Religion, 1517-1618. (Same as Religious Studies 3411-12.)

3870-80 History of Latin America (3, 3) 3870—Colonial and independence studies. 3880—Nationaland Development, 1825 to present.

3911-21-21 United States, 1877 to the Present (3, 4, 3) 3911—Gilded Age and Progressive Era, 1877-1914. 3912—1914-1945. American experience during World War I, Great Depression, New Deal, and World War II. Domestic history including military and foreign policy. 3931—1945 to present. Demobilization and Cold War after World War II followed by wars in Korea and Vietnam; attempts to find labor peace, national prosperity, and full equality for minorities. From Truman's administration to present.

4015 Studies in History (3-4) Variable content course offering opportunity to subject matter not covered in an existing course. May be repeated.

4130 History of Colonialism and Imperialism (3) Nineteenth century to present.

4250-60-70 European Intellectual and Cultural History (3, 3, 3) 4250—From Reformation to the scientific revolution, 1500-1700. 4260—From the Enlightenment to the Age of Realism, 1700-1870. 4270—From Subjectivism to Realism, 1870-present.

4280 Women in European History (4) Comparative analysis of role and image of women in Medieval, Renaissance, and Victorian periods. Attention given to parallel changes in structure of family as well as relationship between Western Culture and women's protest movements.

4290 Women in American History (4) Approaches of 4280 applied to American Society.


4370 U.S. Military History, 1784 to the Present (4) Examination of nation's broad strategic aims and means used to attain them, shifting strategy, tactics
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<td>4300</td>
<td>Civilian-Military Relationships in the Modern Western World (3)</td>
</tr>
<tr>
<td>4350</td>
<td>Revolutionary and Reformation in England, Thomas More, Elizabeth I, and Mary, Queen of Scots (4)</td>
</tr>
<tr>
<td>4400</td>
<td>Soviet Foreign Policy (3)</td>
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<tr>
<td>4500</td>
<td>History of Medieval England (3) From Anglo-Saxons to coming of Tudors; relation between legal and institutional development and structure of society</td>
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<td>4510-20</td>
<td>Tudor-Stuart England (3, 3)</td>
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<td>4551</td>
<td>British Society and the Industrial Revolution, 1760-1848 (3)</td>
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<tr>
<td>4610-20-30</td>
<td>The American Frontier and Westward Movement I, II, III (3, 3, 3) Settlement and development of the &quot;West&quot; throughout American history, 4610—From the Atlantic to the Mississippi (4620-30—The Trans-Mississippi West) (3)</td>
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<tr>
<td>4641-51</td>
<td>America: Mind, Mood and Society (3, 3)</td>
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<tr>
<td>4650</td>
<td>History of Medieval England (3) From Anglo-Saxons to coming of Tudors; relation between legal and institutional development and structure of society</td>
</tr>
<tr>
<td>4670</td>
<td>Twentieth Century Britain (3) Emergence of welfare state, political impact of Labour movement, World War and Depression, chronic economic crisis, persistence of class</td>
</tr>
<tr>
<td>4690-20-30</td>
<td>The American Frontier and Westward Movement I, II, III (3, 3, 3) Settlement and development of the &quot;West&quot; throughout American history, 4610—From the Atlantic to the Mississippi (4620-30—The Trans-Mississippi West) (3)</td>
</tr>
<tr>
<td>4661</td>
<td>Studies in American Social and Cultural History and Thought (3) Intensive examination of specific themes, problems, or ideas</td>
</tr>
<tr>
<td>4670</td>
<td>Cities and Urbanization in American History (4) Origins, growth and influence of American cities in development of the nation, from colonial era to present</td>
</tr>
<tr>
<td>4710-20</td>
<td>Medieval History, (3, 3) Age of Heroes, 500-1000, Pattern of early medieval heroism, its social and intellectual aspects, individuals who exemplify it, continuing harsh environment of early Middle Ages, 4720—Age of Chivalry, 1000-1300, Emergence of chivalry from heroes of feudal epics of eleventh century to questing knights of thirteenth century, Shakespearean romance</td>
</tr>
<tr>
<td>4741</td>
<td>Italian City-States, 1250-1500 (3) Evolution of urban civilization in northern and central Italy in medieval and Renaissance periods. Architectural and townscapes forms studied in socioeconomic as well as cultural contexts. Florence is primary focus, but other major city-states also included</td>
</tr>
<tr>
<td>4770</td>
<td>Austria and Central Europe (3) To 1867.</td>
</tr>
<tr>
<td>4791</td>
<td>Modernization of the Middle East (3) Advanced reading and discussion course which examines key facets of political, economic, and social dynamics in the Middle East with emphasis on institution building, elites, and ideology. Prerequisite: 3795 or consent of instructor.</td>
</tr>
<tr>
<td>4811-21</td>
<td>History of Japan (4, 4)</td>
</tr>
<tr>
<td>4840</td>
<td>History of Mexico (3)</td>
</tr>
<tr>
<td>4850</td>
<td>History of the Caribbean (3) Caribbean region from discovery and colonization to contemporary times</td>
</tr>
<tr>
<td>4870-90</td>
<td>China, (3, 3, 4) Chinese high culture from Confucius to Mao Tse-tung. Tradition, religion, philosophy, fine arts, literature, cultural legacy under communism; similarities and differences between Chinese and Western cultures. 4880—To 1850, Uniqueness of Chinese experience, influence on Japan and West, relevance in today's world. 4890—Modern China since 1850. Chinese Revolution in context: Imperialism, reform, nationalism, communist movement, Mao Tse-tung; China in today's world. No previous knowledge of China required.</td>
</tr>
<tr>
<td>5000</td>
<td>Thesis (1-15) P/NP only.</td>
</tr>
<tr>
<td>5002</td>
<td>Non-Thesis Graduation Completion (3-15) Required for the non-thesis student not otherwise registered during any quarter when such a student uses university facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. S/NC only. E</td>
</tr>
<tr>
<td>5015</td>
<td>Periods in European History (3) May be repeated. Maximum 9 hrs.</td>
</tr>
<tr>
<td>5016</td>
<td>Periods in American History (3) May be repeated. Maximum 9 hrs.</td>
</tr>
<tr>
<td>5010</td>
<td>Foreign Study (1-12) See page 96. E</td>
</tr>
<tr>
<td>5012</td>
<td>Off-campus Study (1-12) See page 96. E</td>
</tr>
<tr>
<td>5013</td>
<td>Independent Study (1-12) See page 96. E</td>
</tr>
<tr>
<td>5211-5252</td>
<td>M.A. Reading Courses (3 hrs each) Directed reading courses in preparation for fields required for Master's oral examination. 5211, Ancient; 5212, Medieval; 5213, Early Modern Europe; 5214, Europe Since 1769; 5215, American History to 1815; 5216, American History Since 1769; 5217, Latin America; 5218, Far East; 5219, Colonialism and imperialism; 5221, England; 5222, Russia; 5223, Germany; 5224, France; 5225, Middle East. Open only to Master's candidates in history. S/NC only. E</td>
</tr>
<tr>
<td>5240</td>
<td>Introduction to Historical Research (3) Principles and techniques of research in the study of history. Required of all candidates for advanced degree who do not present evidence of similar training elsewhere. F</td>
</tr>
<tr>
<td>5250</td>
<td>European Historiography (3) Introduces the student to the historical literature of leading European nations. W</td>
</tr>
<tr>
<td>5250</td>
<td>American Historiography (3) Like 5250 in the American field. W</td>
</tr>
<tr>
<td>5271-73</td>
<td>The Teaching of College History (5, 0, 3) Introduction to problems of teaching at college level. Place of history in curriculum, types and levels of courses, and techniques of teaching. Prerequisite: Consent of instructor. Required of candidates for the M.A.C.T. Credit will be withheld until the completion of 5273, with grades of &quot;S&quot; or &quot;NC&quot; submitted at end of each of first two quarters. E</td>
</tr>
<tr>
<td>5280</td>
<td>Philosophy and Methodology (3) Philosophies of history and their relationship to milieux from which they emerge; modern trends in historical methodology. Sp</td>
</tr>
<tr>
<td>5290</td>
<td>Quantitative Analysis of Historical Data (3) Prerequisite: Sociology 5330 and 5330, or consent of instructor. Sp</td>
</tr>
<tr>
<td>5300</td>
<td>Topics in History (3)</td>
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<tr>
<td>5310</td>
<td>Topics in Women's History (3)</td>
</tr>
<tr>
<td>5320</td>
<td>Topics in Historical Editing (3) Principles and practice of editing documents.</td>
</tr>
<tr>
<td>5340</td>
<td>Topics in American Foreign Relations (3)</td>
</tr>
<tr>
<td>5410</td>
<td>Topics in Early Modern European History (3)</td>
</tr>
<tr>
<td>5440</td>
<td>Revolution and Restoration in Central Europe, 1780-1850 (3) Reform, resistance, and the advent of Liberalism and Nationalism.</td>
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<tr>
<td>5444</td>
<td>Topics in French History (3)</td>
</tr>
<tr>
<td>5445</td>
<td>Topics in Nineteenth-century European History (3)</td>
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<tr>
<td>5450</td>
<td>Topics in Twentieth-century European History (3)</td>
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<tr>
<td>5480</td>
<td>Topics in Russian History (3)</td>
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<tr>
<td>5510</td>
<td>Topics in Tudor-Stuart England (3)</td>
</tr>
<tr>
<td>5520</td>
<td>Topics in Modern English History (3)</td>
</tr>
<tr>
<td>5530</td>
<td>Reformation and Reform in England, 1789-1848 (3)</td>
</tr>
<tr>
<td>5560</td>
<td>Anglo-Irish Relations (3)</td>
</tr>
<tr>
<td>5640</td>
<td>Topics in American Social and Cultural History (3)</td>
</tr>
<tr>
<td>5645</td>
<td>Topics in American Urban History (3)</td>
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<tr>
<td>5650</td>
<td>Topics in the American Westward Movement (3)</td>
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<tr>
<td>5660</td>
<td>Topics in Negro History (3)</td>
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<tr>
<td>5670</td>
<td>Topics in American Colonial History (3)</td>
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<tr>
<td>5675</td>
<td>Topics in the Early National Period of American History (3)</td>
</tr>
<tr>
<td>5680</td>
<td>Topics in Nineteenth-century American History (3)</td>
</tr>
<tr>
<td>5690</td>
<td>Topics in Twentieth-century American History (3)</td>
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<tr>
<td>5720</td>
<td>Topics in Medieval History (3)</td>
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<tr>
<td>5740</td>
<td>Topics in European Urban History (3)</td>
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<tr>
<td>5750</td>
<td>Topics in Ancient History (3)</td>
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<tr>
<td>5780</td>
<td>Topics in German National Socialism (3)</td>
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<tr>
<td>5790</td>
<td>Topics in Middle Eastern History (3)</td>
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<tr>
<td>5810</td>
<td>Topics in Andean History (3)</td>
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<tr>
<td>5820</td>
<td>Topics in Mexican History (3)</td>
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<tr>
<td>5850</td>
<td>Topics in Chinese History (3)</td>
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<tr>
<td>5860</td>
<td>Topics in Japanese History (3)</td>
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<tr>
<td>5910-20</td>
<td>Topics in Southern History (3, 3, 3) 5910—Old South. 5920—New South.</td>
</tr>
<tr>
<td>6000</td>
<td>Doctoral Research and Dissertation (3-15) P/NP only. E</td>
</tr>
<tr>
<td>6210-20-30</td>
<td>Directed Readings (3, 3, 3, 3) Individually directed toward preparation for preliminary examination fields. Open only to candidates for Ph.D. degree who are in residence and who have been in residence at least two quarters. Only one course may be taken in preparation for each of four fields. Depending on field in which he/she is reading, student will be assigned to appropriate member of department. S/NC only. E</td>
</tr>
<tr>
<td>6300</td>
<td>Seminar in Special Studies (3)</td>
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<tr>
<td>6310</td>
<td>Seminar in Tennessee History (3)</td>
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<tr>
<td>6330</td>
<td>Seminar in American Diplomatic History (3)</td>
</tr>
<tr>
<td>6410</td>
<td>Seminar in European History (3)</td>
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<tr>
<td>6444</td>
<td>Seminar in French History (3)</td>
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<tr>
<td>6480</td>
<td>Seminar in Russian History (3)</td>
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<td>6510</td>
<td>Seminar in English History (3)</td>
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<tr>
<td>6610</td>
<td>Seminar in American Colonial History (3)</td>
</tr>
<tr>
<td>6620</td>
<td>Seminar in the Era of the American Revolution (3)</td>
</tr>
</tbody>
</table>
6630 Seminar in Early National Period of American History (3)
6635 Seminar in Jacksonian Period (3)
6640 Seminar in Social and Cultural History of the United States (3)
6650 Seminar in the American Westward Movement (3)
6710 Seminar in Medieval Institutions (3)
6770 Seminar in Central European History (3)
6810 Seminar in Latin American History (3)
6910 Seminar in the Civil War Era (3)
6930 Seminar in Twentieth-century America (3)
6940 Seminar in the History of the South (3)
6960 Seminar in Negro History (3)

NOTE: Registration in topics and seminar courses may be repeated for credit with consent of department.

Latin

See Classics

Mathematics

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

Professors:
G. E. Albert (Emeritus), Ph.D. Wisconsin;
J. S. Bradley (Head), Ph.D. Iowa; J. H. Carruth,
Ph.D. Lansing; C. E. Clark, Ph.D. Louisiana State;
R. E. Cline, Ph.D. Purdue; R. J. Davenport,
Ph.D. Wisconsin; J. D. Dessart, Ph.D. Maryland;
D. E. Dobbs, Ph.D. Cornell; E. D. Eaves (Emeritus),
Ph.D. Texas; H. Frandsen, Ph.D. Illinois;
D. A. Gardiner, Ph.D. North Carolina State;
T. R. Gregory, Ph.D. Illinois; G. Hallam, Ph.D.
Wisconsin; D. B. Hinton, Ph.D. Tennessee;
A. S. Householder (Emeritus), Ph.D. Chicago;
L. S. Husch, Ph.D. Florida State; R. M. Mcconnel,
Ph.D. Duke; T. H. Mathews, Ph.D. Tulane;
D. D. Miller (Emeritus), Ph.D. Michigan;
B. S. Rajput, Ph.D. Illinois; K. C. Reddy*;
Ph.D. Indian Institute of Technology (India);
P. W. Schafer, Ph.D. Maryland; F. W. Stallmann,
Ph.D. Giessen (Germany); W. R. Wade, Ph.D.
California (Riverside); C. G. Wagner, Ph.D. Duke.

Associate Professors:
D. F. Anderson, Ph.D. Chicago; V. A. Dougallis,
Ph.D. Harvard; G. S. Jordan, Ph.D. Wisconsin;
K. R. Kimble,* Ph.D. Ohio State; G. A. Klaassen,
Ph.D. Nebraska; Y. Kuo, Ph.D. Cincinnati;
H. L. Lee (Emeritus), Ph.D. Duke; W. H. Row, Jr., Ph.D.
Wisconsin; N. Rowell, Ph.D. Wisconsin; J. Sarbin,
Ph.D. Cornell; J. Smith, Ph.D. California (Berkeley);
K. Soni, Ph.D. Oregon State; R. P. Soni, Ph.D.
Oregon State; K. R. Stephenson, Ph.D. Wisconsin;
J. A. Wash, Ph.D. SUNY (Binghampton)

Assistant Professors:
V. A. Laxiades, Ph.D. Delaware; L. Bales, Ph.D.
Delaware; L. Barker, Ph.D. Florida State; J. Cohen,
Ph.D. Washington; S. Elpher, Ph.D. Cornell;
L. L. Gross, Ph.D. Maryland; O. Karakashan, Ph.D.
Harvard; S. I nawet, Ph.D. Kentucky; M. Miller,
Ph.D. Illinois; S. Mulay, Ph.D. Purdue; H. Simpson,
Ph.D. California Institute of Technology;
C. Sundeberg, Ph.D. Wisconsin.

MASTERS 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 one of the states of the United States, or (b) three years of successful elementary or secondary school teaching experience. Evidence of the requirement being met must be supplied by the student.

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

The following requirements must be met:
1. Completing 45 hours of course work, of which at least 9 must be at the 5000 level. The course work must include:
   a. 36 hours of mathematics courses numbered 3050 or above;
   b. 9 hours of additional work from mathematics courses numbered 3050 or above or from courses in other departments selected in consultation with the advisor.
2. Passing a comprehensive examination upon completion of all course work.

THE MASTER'S PROGRAMS

The Master of Arts degree and the Master of Science degree are designed to prepare students for industrial employment and for teaching at the high school and junior college level.

The department offers two options for these degrees. The first option requires a thesis for which 45 hours must be earned along with 36 additional hours of work in acceptable courses numbered above 4000. Of the additional hours, 9 may be in an area outside the department and 21 must be in courses in mathematics numbered above 5000.

After two quarters of graduate study, a student whose supervisory committee gives its approval may choose the non-thesis option, for which 45 hours of work in courses numbered above 4000 are required. Of these, 30 hours (at least 24 of which are in mathematics) must be in courses numbered above 5000. Of the 45 hours, 15 in courses approved by the supervisory committee may be taken in fields other than mathematics. For this option it is also required that a written comprehensive examination be passed, and that credit be received for a 3-hour seminar or reading course (5990-5995) in which a term paper or project is required. A student offering mathematics as a minor for the Master's degree is required to obtain at least 9 hours of resident graduate credit in courses numbered above 4000 and approved by both the major department and the Department of Mathematics.

THE DOCTORAL PROGRAM

For the Ph.D. in Mathematics, the student must meet the following departmental requirements:
1. Pass written examinations covering four subjects, at least three of which must be from the following list:
   a. Algebra 5510-20-30
   b. Functions of a Complex Variable 5110-20-30
   c. Topology 5910-20-30
   d. Functions of a Real Variable 5210-20-30
   e. Linear Analysis 5250-60
   f. Partial Differential Equations 5450-60-70
   g. Ordinary Differential Equations 5870-90-90
   h. Numerical Mathematics 5655-65-75
   i. Mathematical Statistics 5750-60-70

Students may not take examinations in both d. and e. nor may they take examinations in both f. and g. as their comprehensive examination subjects. Those students who choose four courses from this list must choose one from a, through e. and the students who choose only three from this list must choose one from a to e.

A student selecting only three from the above list will take a one-year, 6000-level Ph.D. course pass a written exam on an area of applied mathematics (e.g., Fluids, Elasticity, Mathematical Ecology) approved as an examination topic for that student by the Graduate Committee. For a given student and a given area, the Graduate Committee will appoint a section of faculty whose responsibility is to submit a list of topics and references to the Graduate Committee and the Applied Mathematics Committee for its approval.

A student may take as many of the written examinations as desired at any time these exams are given subject to the following conditions:
1. The exams to be taken must be approved in advance by the student's supervisory committee.
2. At most 4-n exams may be taken at any one time, where n denotes the number of exams previously passed by the student.
3. A student may take a collection of written examinations a maximum of four times, but no one failing five exams, counting possible repetitions, will be permitted to take another round of exams.

2. Pass an intensive exam in the field of specialization. This exam will be given by a committee appointed by the department head at some time after the requirements in 1. have been met. A student may take this specialty exam only twice.

3. The conditions for the doctoral degree are to include a demonstrated proficiency in one foreign language, normally from among French, German, or Russian; this requirement is the last exam prior to the examination in the area of specialization. The student's doctoral committee may require that the student pass a second language exam.

In addition, the department requires that each student take a one-year, 6000-level course in mathematics outside of his/her area of concentration. The use of the course selected to fulfill this requirement must be approved by the department head and the student's Doctoral Committee. (Such approval may occur after completion of the course.)

The written exams mentioned in 1. are normally given twice each year, once in the fall and once in the winter. The fall exams usually begin after the fall quarter breaks, and the winter exams are given early in January. Note: Math 3050, 3060, 3090, 3100, 3110, 3310, 3320, 3330, 3510, and 3720, are intended primarily for students preparing to teach in elementary or secondary schools. Any 3000 or 4000 course in the department whose course number ends in "zero" may be offered as an honors version. In this case, the last digit will appear as an "8" and the title will be preceded by the word "Honors" both in the timetable and on the student's transcript.

Honors versions of courses listed in the Graduate Catalog are acceptable for graduate credit. Such courses may be offered upon the
initiative of interested faculty, students, or the department head (though in all cases subject to the approval of the department head).

3050 Elementary Probability and Statistical Analysis (3) Combinatorial problems; sample spaces, sets, and events; statistical independence; axiomatic probability theory; random variables and their distributions; simple random processes. Does not satisfy requirements of major or minor in mathematics. Prereq: 1550-60 or equivalent. W, Sp

3060 Elementary Statistical Analysis (3) Elementary probability distributions used in statistics: binomial, Poisson, and normal and their properties; sampling theory; confidence intervals and statistical tests of hypotheses; least squares and linear regression. Does not satisfy requirements of major or minor in mathematics. Prereq: 3050 or consent of instructor. Sp, Su

3090 Polynomials and Rings (3) An introduction to abstract algebra, beginning with study of integers followed by more general notion of rings, integral domains, and fields. Emphasis is given to certain ring theoretic properties shared by integers and polynomials over certain fields. Prereq or coreq: 3100 or consent of instructor. F, W

3100 Logic and Sets (3) Elements of mathematical logic; Elementary algebra of sets. Primarily for students in the College of Education. Does not satisfy requirements of major or minor in mathematics. Prereq: 2860 or consent of instructor. F, W

3110 Real Number System (3) Laws of arithmetic; rational and irrational numbers; fields. Prereq: 1 yr of college mathematics. Primarily for students in the College of Education. Does not satisfy requirements of major or minor in mathematics. Su

3140 Mathematical Modeling (3) Survey of construction and development of mathematical models used in science and industry. Markov chains, linear optimization, graph theory, and differential and integral equations, understanding of model and associated solutions. Emphasis is given to certain standard topics such as elementary set theory, relations, and functions, and mathematical induction. Coreqs: 2850 or 2560. E

3170 Elementary Math Models (3) Introduction to difference equations and differential equations. Mathematical modeling techniques applied to biological phenomena. Does not satisfy requirements of major or minor in mathematics. Prereq: 1841-51 or consent of instructor. F

3290-30 Topology of Euclidean Spaces (3, 3) Topics will include topology of line and plane, separation properties, compactness, connectedness, continuity of functions, homeomorphisms, and topological invariants. Must be taken in sequence. Prereq: 3810. 2860, or consent of instructor. W

3960 Studies in Mathematics (1-4) Credit determined at registration. Prereq: Consent of instructor. May be repeated with consent of department. Max. 4 hrs.

4050-60 Matrix Algebra and Applications (3, 3) Vector spaces, linear transformations, eigenvalues and eigenvectors, similarity and unitary transformations, singular value decomposition and least square problem, vector and matrix norms. Jordan canonical form, evolution of discrete and continuous systems, quadratic forms and variational principles, related topics. Must be taken in sequence. Prereq: 2860 or 4500. F

4070 Matrix Algebra and Applications (3) Topics to be chosen at discretion of instructor.

4120 Linear Algebra (3) Abstract vector spaces, linear transformations, and their matrices, systems of linear equations and determinants, inner products, and diagonalization of symmetric matrices. Prereq: 2860 or 4500. F

4150-60 Abstract Algebra (3, 3) Equivalence relations and partitions, properties of integers, elementary theory of rings, polynomial rings, integral domains, divisibility, unique factorization domains, fields. Must be taken in sequence. Prereq: 2860. W

4225 Numerical Solution to Equations and Numerical Approximations (3) Numerical solution to equations and numerical approximations. Introduction to computation, instabilities, rounding errors. Solution of a single nonlinear equation; introduction to iterative methods for linear and nonlinear systems. Polynomial approximations; convergence of power methods for eigenvalues. Approximation by polynomials, piecewise polynomials, trigonometric and rational polynomials. Prereq: 3150 or 3155. (Same as Computer Science 4225.) F, W

4235 Numerical Methods for Ordinary Differential Equations (3) Interpolation by polynomials and piecewise polynomials; quadrature; single-step and multistep methods for differential equations; Stability, consistency and convergence. Current algorithms, variable step and order; stiff systems. Boundary value problems. Prereq: 4225. (Same as Computer Science 4235.) W, Sp


4250-60 Introduction to Complex Analysis (3, 3) Complex numbers, Cauchy-Reimann equations, Cauchy's theorem, Taylor and Laurent series, residue theory and their applications. 4250-Complex mapping, Schwarz-Christoffel transformations; Dirichlet problem, applications (steady temperature, electric potential, electrostatics). 4260-Complex function theory. Must be taken in sequence. Prereq: 2860; 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 theory. Multiple integrals, infinite series, sequences and series of functions, uniform convergence, Taylor series. Should be taken in sequence. Prereq: 2860. F, Su, W, Sp

4540 Infinite Series and Functions of Several Variables (3) General theory, power series and Taylor's formula, uniform convergence. Partial differentiation and multiple integrals. Prereq: 2860 or consent of instructor. F


4640 Calculus of Finite Differences (3) Real difference equations, application to problems in engineering and physics. Prereq or coreq: 4610.

4650-60-70 Introduction to Mathematical Statistics (3, 3, 3) Introduction to probability; discrete and continuous distributions; correlation, regression, and statistical independence; probability distribution; characteristic function of random variables; significance tests. Must be taken in sequence. Prereq: 2860. F, W, Sp

4710 Vector Analysis (3) Fundamental operations, basis vectors, dot and cross products, directional derivatives, divergence and curl of vector fields, line and surface integrals, divergence theorem, Green's functions, and Stokes theorem. Does not satisfy requirements of major or minor in mathematics. Prereq: 2860. E

4750-60-70 Introductory Probability Theory (3, 3, 3) Probability spaces and independence; probability and stochastic independence, binomial, Poisson, hypergeometric and normal distributions. 4760-Binomial, Poisson, and normal distribution; characteristics of random variables, mean, and variance; independence and stochastic independence, binomials, Poisson, normal distributions. Prereq: 2860 or consent of instructor. Su

4980 Readings in Mathematics (1-3) Open to superior students with consent of department head. Independent study with faculty guidance. May be repeated with consent of instructor. F, W

4990 Studies in Mathematics (1-4) Credit determined at registration. Prereq: Consent of instructor. May be repeated with consent of department. Max. 4 hrs.
**5002 Non-Thesis Graduation Completion (3-15)**
Required for the non-thesis student not otherwise registered during any quarter when such a student uses university facilities and/or faculty time before the degree is completed. May not be used toward degree requirements. May be repeated. S/NC only. E

**5011 Elementary Functions from an Advanced Standpoint for Teachers (3-4)**
Order and completeness axioms of real numbers; limits of sequences, derivatives of functions; definitions and derivatives of exponential, logarithmic and trigonometric functions; implicit and explicit definitions; Taylor's and Maclaurin's series; applications to construction of logarithmic and trigonometric tables. Prereq: 3510 or 3110 or consent of instructor.

**5012 Differential Geometry for Teachers (3-4)**
Advanced techniques applied to graphing functions, curves, surfaces, parametrizations, singular points, tangent lines and tangent planes, osculating planes, arc length of curves in plane and curves on surface, curvature, torsion, asymptotes, local coordinates, Riemannian formulas. Prereq: 1 yr of calculus, or consent of instructor.

**5013 Geometry for Teachers (3-4)**
Primarily for high school teachers of geometry. Historical and modern presentations of topics encountered in a high school geometry class: axioms, synthetic and metric; models; betweenness; congruence of segments and triangles; parallel postulate; similarity area; ruler and compass constructions; Klein's Erlangen Program. Prereq: Consent of instructor.

**5014 Analysis for Teachers (3-4)**
Functions of several variables, vectors, limits and continuity, partial derivatives, directional derivatives and gradient, implicit function theorem, maxima and minima, transformations. Prereq: 3510 or consent of instructor.

**5015 Probability and Statistical Inference for Teachers (3-4)**
Probabilistic distributions including binomial, hypergeometric, and Poisson; moment generating functions; expectation of continuous random variables; moment-generating functions; central limit theorem; probability distributions; conics and quadrics. Prereq: 3510 or 3520 or consent of instructor.

**5020-30 Theory of Functions of a Complex Variable (3, 3, 3)**
Complex numbers; infinite series; analytic functions; power series; conformal mapping; analytic continuation; special functions; Riemann surfaces. Prereq: 4510-20 or 5110; 4530 or 5120. Must be taken in sequence. F, W, Sp.

**5150 Foundations of Analysis (3)**
Development of the integral, real, and complex number system from Peano axioms. Prereq: 4510-20.

**5160 Foundations of Analysis (3)**
Propositional functions and classes; Boolean algebra. Cardinal and ordinal arithmetic. Prereq: 4510-20.

**5170 Foundations of Analysis (3)**

**5210-20-30 Theory of Functions of a Real Variable (3, 3, 3)**

**5250-60 Applied Linear Algebra (3, 3)**

**5270 Stability Theory and Liapunov's Direct Method (3)**

**5310-20-30 Introduction to Higher Geometry (3, 3, 3)**
Projective spaces; coordinates and transformations; conics and quadrics. Elliptic and hyperbolic geometry from viewpoint of projective geometry. Prereq: 4510-20. Must be taken in sequence.

**5370-80-90 Mathematical Principles of Fluid Mechanics (3, 3, 3)**
Equations of motion, incompressible and compressible perfect gable, shock waves in perfect fluids, viscous flows and boundary layer phenomena, additional special topics. Prereq: 4530 or 4710 or consent of instructor. A

**5430 Integral Equations (3)**

**5440 Calculus of Variations (3)**

**5450-60-70 Introduction to Partial Differential Equations (3, 3, 3)**
Uniform convergence; calculus of variations in two variables; properties of elliptic, hyperbolic and parabolic equations, separation of variables, Fourier series and Fourier transform. Prereq: 4510-30 or consent of instructor. F, W, Sp

**5456 Finite Difference Methods for Partial Differential Equations (3)**
Finite difference techniques for solution of parabolic, elliptic, and hyperbolic equations. Computer implementation, stability, consistency and convergence; nonlinear problems; curved boundaries; solution of linear systems. Prereq: 3150 or 3155, and 4625 or consent of instructor. (Same as Computer Science 5456.) F

**5465 Finite Element Methods (3)**

**5480-90 Mathematical Programming (3, 3)**
Optimization of functions or variables subject to constraints. Prereq: 3150, 4560 and 4530. W, Sp

**5510-20-30 Introduction to Higher Algebra (3, 3, 3)**
Algebraic systems; groups, rings, integral domains, fields. Must be taken in sequence. F, W, Sp.

**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.

**5550-70-80 Theory of Matrices in Numerical Analysis (3, 3, 3)**
Fundamental matrix identities; algebraic expressions; similarity transformations; conics and quadrics. Prereq: 3155, 4225 or consent of instructor. F, W, Sp.

**5565 Finite Element Methods (3)**

**5600-20-30 Numerical Methods in Physics (3, 3, 3)**
(Same as Physics 5610-20-30.) F, W, Sp

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

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

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

**5750-60-70 Advanced Mathematical Statistics (3, 3, 3)**

**5775 Computational Algorithms (3)**
(Same as Computer Science 5775.)

**5810-20-30 Number Theory (3, 3, 3)**
Arithmetic functions, distribution of primes, Diophantine equations, approximation theory, distribution density and

**5890-90 Mathematical Programming (3, 3)**
Optimization of functions or variables subject to constraints. Prereq: 3150, 4560 and 4530. W, Sp.
MAN's theorem, quadratic forms, Dirichlet's theorem, prime number theorem. Prereq or coreq: 5510 for 5810; 5520 for 5820.

5840-50-60 Mathematical Ecology (3, 3, 3) Discrete and continuous models in ecology. Population, community, and ecosystem models from qualitative, modeling perspective. Physical environmental modeling effects in ecosystems. Specific ecosystem models: predator-prey, competition, parasite-host, food chains, and food webs. Stochastic growth models, random model effects. Comparison of stochastic with deterministic models. Distribution of 5850-50-60: 4610. 4505 or consent of instructor; prereq for 5860: 4750 or 4650 or consent of instructor.

5870-90 Introduction to Ordinary Differential Equations (3, 3, 3) Existence, uniqueness, extendability, continuity of solutions; linear equations, power series, Frobenius methods for regular singular equations; Poincare-Bendixson theory, stability of critical points; boundary value problems for linear systems; regular and singular perturbation theory for nonlinear systems. Prereq: 4610, 4050, 4510-50-60. F, W, Sp, A


5940-50-60 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. F

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

6810-20-30 Advanced Ordinary Differential Equations (3, 3, 3) Theory of ordinary differential equations from advanced viewpoint. Topics from current literature. Subject matter varies according to interests and preparations of students. Prereq or coreq: 5110-20-30 or 5210-20-30 or consent of instructor.


6910-20-30 Topological Algebra (3, 3, 3) Topics chosen from topological semigroups, topological groups. Lie groups; transformation groups; topological lattices; relations in topological spaces; topological rings, fields, algebras. Prereq or coreq: 5910-20-30. F

6910-20-30 Modern Topology (3, 3, 3) Technical background to current literature in topology. Topics vary from year to year.

6940-50-60 Introduction to Algebraic Topology (4, 4, 4) Homotopy, homology, and homotopy theories. Homology and cohomology groups, the Eilenberg-Steenrod axioms, cup product, cap product, duality theorem, topology of Euclidean spaces, higher homotopy groups, fiber spaces, spectral sequences. Prereq: 4160 and 5920.

6991 Seminar Analysis (1-3)
6992 Seminar Topology (1-3)
6993 Seminar Algebra (1-3)
6994 Seminar Foundations (1-3)
6995 Seminar Applied Mathematics (1-3) May be taken for S/NC or letter grade.

NOTES: Registration for seminars may be repeated with consent of department.

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


6540-60-70 Probability Theory for Semigroups (3, 3, 3) Convergence and homomorphisms; ideal theory; representations, decompositions, and extensions; free, regular, inverse, simple, and completely simple semigroups. Prereq: 5550.

6750 Probability and its Applications (3) Topics from概率论 in applications, including the law of large numbers and the central limit theorem. Prereq: 5230-60-70.


8710-20-30 Mathematical Logic (3, 3, 3) Advanced topics in mathematical logic, including model theory, proof theory, and recursion theory. Prereq: 6910-20-30. F

9300 Doctoral Research and Dissertation (3-15) P/NP only: E

9400-50-60 Mathematical Logic (3, 3, 3) Advanced topics in mathematical logic, including model theory, proof theory, and recursion theory. Prereq: 6910-20-30. F

5819 Molecular Genetics Laboratory (3) Principles and methods of research in molecular genetics. Fundamental genetic concepts (mutation, complementation, recombination) at molecular level. Studies of lac operon of Escherichia coli. Prereq: 4140 and Biochemistry 4110-20 or consent of instructor. S/NC only. E

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

5850 Seminar in History of Microbiology (1) Microbiologists and their achievements from Pasteur to present. S/NC only.

5910-20-30 General Seminar (1, 1, 1) Reviews of current literature. May be repeated with consent of department. S/NC only. E

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

6130 Seminar in Immunology (1) Readings and discussions based on current literature. May be repeated. S/NC only. E

6320 Seminar in Microbial Pathogenesis (1) Readings and discussions based on current literature. May be repeated. S/NC only. F, W, Sp

6320 Seminar in Microbial Pathogenesis (1) Readings and discussions based on current literature. May be repeated. S/NC only. F, W, Sp

6330 Seminar in Microbial Physiology (1) Readings and discussions based on current literature. May be repeated. S/NC only. E

6340 Seminar in Molecular Genetics (1) Readings and discussions based on current literature. May be repeated. S/NC only. E

6350 Seminar in Virology (1) Readings and discussions of current literature. May be repeated with consent of department. S/NC only. E

6360 Seminar in Filamentous Fungi (1) Readings and discussions based on current literature. May be repeated. Maximum 8 hrs. S/NC only. F

6410 Concepts of Immunity (3) Discussion and readings of recent advances in immunobiology and immunopathology. S/NC only. E

6420 Seminar in Molecular Biology (2) Reading, discussions, and critical evaluation of current literature. May be repeated. Maximum 8 hrs. S/NC only. F

6430 Seminar in Environmental Microbiology (2) Reading, discussions and critical evaluation of current literature. May be repeated. S/NC only. F

6720 Advanced Topics in Microbial Physiology (3) Prereq: 5720. May be repeated with consent of department. S/NC only. E

6730 Advanced Topics in Microbial Pathogenesis (3) Prereq: 5730. May be repeated with consent of department. S/NC only. E

6740 Advanced Topics in Virology (3) Prereq: 4420 or 4430. May be repeated with consent of department. S/NC only. E

6760 Advanced Topics in Microbial Genetics (3) Prereq: 6340. May be repeated with consent of department. S/NC only. E

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

Music

DEGREES

M.M., M.A.

Professors:

J. J. Meacham (Acting Head), M.M. Northwestern; J. Coker, M.A. Sam Houston; G. F. DeVine, Diploma, Schurz (Chicago); W. Dorn, M.A. Columbia; W. W. Fred, Ph.D. North Carolina; R. C. Huber, Ph.D. North Carolina; D. M. Pederson, Ph.D. Iowa; E. H. Zambrana, M.M. New England Conservatory.

Associate Professors:


Assistant Professors:


The Department of Music offers the degrees of Master of Music with concentrations in instrumental music, composition, theory, choral conducting, instrumental conducting, Suzuki string techniques, and piano pedagogy and literature, and the Master of Arts with a major in music with concentrations in theory and musicology.

Applicants for these degree programs must have completed an undergraduate degree approximately equivalent in music requirements to those required in degrees conferred by The University of Tennessee, Knoxville, appropriate to the prospective area of concentration on the Master's level.

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

General requirements for the Master's degree begin on page 18 of this catalog.

THE MASTER OF MUSIC PROGRAM

The department requires a minimum of 45 quarter hours of coursework for the Master of Music degree. These hours are specifically distributed according to the area of concentration. All areas require coursework in music history/literature and/or theory and allow for elective courses. Music theory and composition requirements will be established by the student's faculty committee.

THE MASTER OF ARTS PROGRAM

The department requires a minimum of 45 quarter hours including 21 hours of coursework above the 5000 level and 9 hours of thesis.

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

Specific course requirements will be prescribed by the department for all degree programs and elective courses must have the approval of the student's advisor.

3122 Orchestration (3) Advanced techniques in instrumental writing with emphasis on scoring for the concert orchestra. Prereq: 3112 or consent of instructor.

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

3260 Chamber Music (3) Survey of chamber music from 1750 to present.
College of Liberal Arts/Music

4055 Harpsichord Techniques (1) Techniques literature, performance practice, and performance of the harpsichord. Prereq: Consent of instructor.

4056 Piano (1-4)

4058 Harpsichord (1-4)

4059 Organ (1-4)

4059 Guitar (1-4)

4059 Composition with Electronic Media (1-3) Prereq: Consent of instructor.

4060 Advanced Improvisation (2) Emphasis on further development of individual skills and solving individual problems in jazz improvisation. Prereq: 3052-53.

4060 Composition (3) Prereq: Consent of instructor.

4060 Advanced Improvisation (2) Emphasis on further development of individual skills and solving individual problems in jazz improvisation. Prereq: 3052-53.

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5080 Instrumental Conducting Performances (1) Jury performance, conducting band or orchestra in public.

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

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

5114 History of Music Theory (3) Work and contributions of theorists from ancient Greece to present. Emphasis on 1600 to present. Prereq: Consent of instructor.

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

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

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

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

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

5210 Introduction to Music Research (3) Principles and techniques of research. Required of all candidates with concentrations in musicology or in music theory; recommended for all music students who intend to enroll in a doctoral program.

5220 Music Bibliography (3) Bibliographic methods; illustrative projects in information retrieval and problem solving in music.

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

5353 Music in the Baroque Period (3) From 1600 to 1750; rise of opera and oratorio, church and secular cantata, instrumental forms, performance practice.

5354 Music in the Classic Period (3) Preclassic music (Rococo) and music of Haydn, Mozart and early Beethoven. Includes background of other cultural and artful activities.

5355 Music in the Romantic Period (3) From 1800 to 1900; Mass, motet, chanson, madrigal, and other vocal and instrumental forms and genre.

5400 Musical Aesthetics (3) Nature of music and musical experience, sense perception and emotions, value in music, and role of artist in society. Aesthetic viewpoint of individuals and historical eras through selected writings.

*5500 Flute (1-4)

*5505 Oboe (1-4)

*5510 Bassoon (1-4)

*5515 Clarinet (1-4)

*5520 Saxophone (1-4)

*5525 Horn (1-4)

*5530 Trumpet (1-4)

*5535 Trombone (1-4)

*5540 Baritone (1-4)

*5545 Tuba (1-4)

*5550 Percussion (1-4)

*5555 Voice (1-4)

*5560 Violin (1-4)

*5565 Viola (1-4)

*5570 Cello (1-4)

*5575 String Bass (1-4)

*5580 Piano (1-4)

*5585 Harpsichord (1-4)

*5590 Organ (1-4)

*5595 Guitar (1-4)

5597 Composition with Electronic Media (1-3) Prereq: Consent of instructor. May be repeated. Maximum 9 hrs.

*5599 Composition (1-3) Prereq: Consent of instructor.

**5600 Small Ensemble (1)

**5601 Woodwind Ensemble (1)

**5602 Brass Ensemble (1)

**5604 Jazz Ensemble (1)

**5606 Trombone Ensemble (1)

**5610 Percussion Ensemble (1)

**5611 Marimba 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 Marching Band (1)

**5656 Laboratorio Band (1)

**5657 Marching Band (1)

**5670 Symphony Orchestra (1)

**5680 Concert Choir (1)

**5682 University Choir (1)

**5687 Women's Choral (1)

**5689 Accompanying (1)

*May be repeated.

**May be repeated. Maximum 6 hrs.

Philosophy

MAJOR

Philosophy

DEGREES

M.A., Ph.D.

Professors:

J. W. Davis (Head), Ph.D. Emory; R. E. Aquila, Ph.D. Northwestern; L. B. Cebul, Ph.D. Nebraska;

R. B. Edwards, Ph.D. Emory; G. C. Graber, Ph.D. Michigan; M. H. Moore (Emeritus), Ph.D. Chicago; D. Van de Vate, Jr., Ph.D. Yale.

Associate Professors:


Assistant Professors:

H. P. Hamlin, Ph.D. Georgia; R. Jones, Ph.D. Chicago; J. E. Nott, Ph.D. Ohio State; S. Reaven, Ph.D. California (Berkeley).

THE MASTER'S PROGRAM

The department offers both an M.A. with a thesis and a non-thesis M.A. The latter is available only to students who have passed the doctoral comprehensives and are ready to begin writing a dissertation, but who have not written a Master's thesis. See general requirements on page 18. Courses below 4000 may not be taken for graduate credit by philosophy majors except with special permission.

THE DOCTORAL PROGRAM

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

Two foreign languages, normally French and German, are required. As an alternative to the two-language requirement, candidates for the Ph.D. may elect to demonstrate a substantially more advanced proficiency in reading knowledge of one language. Requirements for this option may be obtained in the department office.

Registration in any course in the 5000 or 6000 series (except 5050) may be repeated for credit with the consent of the department. That is, courses having the same number, but with different subject matter, may be taken with each separate subject description.

MEDICAL ETHICS

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

RELIGIOUS STUDIES

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

3111 Ancient Western Philosophy (4) F, W

3121 Medieval Philosophy (4) F, Sp

3131 Seventeenth- and Eighteenth-century Philosophy (4) E

3141 Nineteenth-century Philosophy (4) F, Sp

3151 Contemporary Philosophy (4) Survey of recent movements in philosophy. F

3270 Russian Philosophical and Theological Thought (4) (Same as Religious Studies 3270 and Russian 3270.)
4200 Classical Indian Systems of Philosophy (4) Speculative and critical aspects of the history of philosophy. A

4240 Ethics (4) Axiomatic development of propositional calculus and first-order functional calculus. Prerequisites: 3810 or equivalent.

4260 Logic (4) Axiomatic development of propositional calculus and first-order functional calculus. Prerequisites: 3810 or equivalent.

Frees

4270 Philosophy of Science (4) Nature of logic of science; the development of science, and the nature of scientific activity. F, W

4330 History of Philosophy (4) Philosophical and critical aspects of the history of philosophy. A

4370 Topics in Medical Ethics (4) Prerequisites: 3310 or equivalent. A

4420 Aristotle (4) 8 hrs philosophy or consent of instructor. A

4450 Continental Rationalism (4) Prerequisites: 8 hrs philosophy or consent of instructor. A

4460 Classical Indian Systems of Philosophy (4) Speculative and critical aspects of the history of philosophy. A

4470 Kant (4) Prerequisites: 8 hrs philosophy or consent of instructor. A

4480 Advanced Topics in Existentialism and Phenomenology (4) Prerequisites: 8 hrs philosophy or consent of instructor.

4510 Intermediate Symbolic Logic (4) Axiomatic development of propositional calculus and first-order functional calculus. Prerequisites: 3810 or equivalent.

4511 Advanced Topics in Logic (4) Prerequisites: 8 hrs philosophy or consent of instructor.

4620 Philosophy of Mind (4) Prerequisites: 8 hrs philosophy or consent of instructor. A

4630 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. Prerequisites: 3770 or 2 yrs natural science.

4720 Philosophy of Social Science (4) Examination of methods of inquiry and modes of explanation in social sciences. Prerequisites: 3770 or 2 yrs social science.

4810 Metaphysics (4) Prerequisites: 8 hrs philosophy or consent of instructor.

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

5002 Non-Thesis Graduation Completion (3-15) Prerequisites: 3810 or equivalent. F

5010 Foreign Study (1-12) Prerequisites: 3810 or equivalent. F

5020-50 Advanced Topics in Medical Ethics (4) Prerequisites: 3310 or equivalent. A

5050 Symbolic Logic (4) Prerequisites: 3810 or equivalent. A

5070 Philosophy of Science (4) Nature of logic of science; the development of science, and the nature of scientific activity. A

5100 Philosophy of Mind (4) Prerequisites: 8 hrs philosophy or consent of instructor.

5101 Philosophy of History (4) Theories of history including reduction of theories and teleological explanation. Familiarity with symbolic logic is recommended. Prerequisites: 3770 or 2 yrs natural science.

5102 Independent Study (1-12) Prerequisites: 3770 or 2 yrs natural science.

5103 Independent Study (1-12) Prerequisites: 3770 or 2 yrs natural science.

5104 Philosophy of Science (4) Nature of logic of science; the development of science, and the nature of scientific activity. A

5110-20 20-30 Advanced Topics in Medical Ethics (4) Prerequisites: 3310 or equivalent. A

5120 Philosophy of Science (4) Nature of logic of science; the development of science, and the nature of scientific activity. A

5150 Philosophy of Science (4) Nature of logic of science; the development of science, and the nature of scientific activity. A

5160 Philosophy of Science (4) Nature of logic of science; the development of science, and the nature of scientific activity. A

5200 Philosophy of Science (4) Nature of logic of science; the development of science, and the nature of scientific activity. A

5201 Philosophy of Science (4) Nature of logic of science; the development of science, and the nature of scientific activity. A

5202 Philosophy of Science (4) Nature of logic of science; the development of science, and the nature of scientific activity. A

5203 Philosophy of Science (4) Nature of logic of science; the development of science, and the nature of scientific activity. A

5204 Philosophy of Science (4) Nature of logic of science; the development of science, and the nature of scientific activity. A

5205 Philosophy of Science (4) Nature of logic of science; the development of science, and the nature of scientific activity. A

5206 Philosophy of Science (4) Nature of logic of science; the development of science, and the nature of scientific activity. A

5207 Philosophy of Science (4) Nature of logic of science; the development of science, and the nature of scientific activity. A

5208 Philosophy of Science (4) Nature of logic of science; the development of science, and the nature of scientific activity. A

5209 Philosophy of Science (4) Nature of logic of science; the development of science, and the nature of scientific activity. A

5210 Philosophy of Science (4) Nature of logic of science; the development of science, and the nature of scientific activity. A

5211 Philosophy of Science (4) Nature of logic of science; the development of science, and the nature of scientific activity. A

5212 Philosophy of Science (4) Nature of logic of science; the development of science, and the nature of scientific activity. A

5213 Philosophy of Science (4) Nature of logic of science; the development of science, and the nature of scientific activity. A

5214 Philosophy of Science (4) Nature of logic of science; the development of science, and the nature of scientific activity. A

5215 Philosophy of Science (4) Nature of logic of science; the development of science, and the nature of scientific activity. A

5216 Philosophy of Science (4) Nature of logic of science; the development of science, and the nature of scientific activity. A

5217 Philosophy of Science (4) Nature of logic of science; the development of science, and the nature of scientific activity. A

5218 Philosophy of Science (4) Nature of logic of science; the development of science, and the nature of scientific activity. A

5219 Philosophy of Science (4) Nature of logic of science; the development of science, and the nature of scientific activity. A

5220 Philosophy of Science (4) Nature of logic of science; the development of science, and the nature of scientific activity. A

5221 Philosophy of Science (4) Nature of logic of science; the development of science, and the nature of scientific activity. A

5222 Philosophy of Science (4) Nature of logic of science; the development of science, and the nature of scientific activity. A

5223 Philosophy of Science (4) Nature of logic of science; the development of science, and the nature of scientific activity. A

5224 Philosophy of Science (4) Nature of logic of science; the development of science, and the nature of scientific activity. A

5225 Philosophy of Science (4) Nature of logic of science; the development of science, and the nature of scientific activity. A

5226 Philosophy of Science (4) Nature of logic of science; the development of science, and the nature of scientific activity. A

5227 Philosophy of Science (4) Nature of logic of science; the development of science, and the nature of scientific activity. A

5228 Philosophy of Science (4) Nature of logic of science; the development of science, and the nature of scientific activity. A

5229 Philosophy of Science (4) Nature of logic of science; the development of science, and the nature of scientific activity. A

5230 Philosophy of Science (4) Nature of logic of science; the development of science, and the nature of scientific activity. A
A student who enrolls in The Graduate School with the intention of attaining an advanced degree in Physics shall, in general, have completed an undergraduate major in physics or its equivalent. Physics 3210-20-30, 3710-20-30, 4240, 4220-20, 4230 or 4240 constitute the minimum courses prerequisite to graduate study.

A student who intends to present Physics as a graduate field shall, in general, have completed an undergraduate minor in Physics or its equivalent. Physics 3210-20, 4210-20 constitute the minimum course work prerequisite to graduate study.

The thesis program is primarily designed for students intending to go into industrial or governmental laboratories as physicists. The thesis topic will be chosen with the student's interests in mind, and interstellar matter, planets and interplanetary matter; atmospheres, interiors, and evolution; nebula, quasars, pulsars. Observational data and their determination. From these data, conclusions must be interdisciplinary. Acceptable for major credit in physics. PreReq: Physics 2330 and consent of instructor.

**Physics**


3230 Heat and Thermodynamics (3) Concepts of temperature and heat; laws of thermodynamics; applications of laws to simple physical and chemical problems. PreReq: 2320 or 2330 and calculus. 3210-20 or consent of instructor. Sp, Su


3630 Nuclear Electronics Laboratory (3) Elements of circuitry of interest in nuclear instrumentation are designed and built, and their characteristics are tested as a function of various parameters. Pre Req: 3165 or equivalent. F, W, Sp.


4160 Physical Acoustics (4) Considerations fundamental to detailed investigation of any branch of acoustics; propagation of acoustic waves in the infrasonic, the audible, the ultrasonic, and the hypersonic ranges of frequencies. PreReq: 3210-20, 3230. 3 hrs and 1 lab. Sp.

4210-20-50 Electricity and Magnetism (3, 3, 3) Intermediate level electrostatics; steady and alternating currents; laws of electric circuits; Ohm's law; potential and its equations; radiation of electromagnetic waves; reflection and refraction; electromagnetic fields of moving charges. Must be taken in sequence. PreReq: 2320 or 2220 and Mathematics 2850. F, W, Sp, or W, Sp.

4230-40 Modern Optics (4, 4) 4230—Geometrical Optics: Reflection and refraction of light at a dielectric interface, paraxial theory of interfaces, lenses, and mirrors; thick lenses, lens systems, ray tracing; polarization; imagery, 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 hrs lab. W, F.


4540-50 Experimental Nuclear and Radiation Physics (4, 4) Interaction of charged particles and electromagnetic radiation with matter; theory and characteristics of various detectors; statistics of counting; nuclear and radioactivity. Experiments counting recent techniques for investigating the nucleus and nuclear radiation. PreReq: 2330. 1 hr and 6 hrs lab. F, Su

**Astronomy**

4110-20-30 Astrophysics (3, 3, 3) Physics of stars and interstellar matter, planets and interplanetary...
5480 Principles of Nondestructive Testing (3) Detection and characterization of discontinuities in materials by nondestructive physical measurements. Ultrasonic, eddy current, magnetic, holographic and x-ray techniques are discussed. Prereq: 3210-20 or consent of instructor. (Same as Engineering Science 4580). W
4710-20-30 Introduction to Health Physics (3, 3, 3) Radioactivity, interaction of electromagnetic radiation with matter, radiation quantities and units, point kernel and extended sources, x-rays and gamma rays, neutron activation, interaction of charged particles with matter, stopping power, range-energy relations, counting statistics, shielding, dosimetry, waste disposal, criticality prevention, radiation biology and ecology. Prereq: 3730. F, W, Sp, A
5000 Thesis (1-15) P/NP only. E
5002 Non-Thesis Graduation Completion (3-15) Required for the non-thesis student not otherwise registered during the quarter in which such a student uses university facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. S/NC only. E
5080 Graduate Research Participation (3) Advanced research techniques under supervision of staff research director whose research area coincides with interests of student. Open to all graduate students. Prereq: Consent of department and research director. May be repeated with consent of department. S/NC only. E
5110-20-30 Introduction to Theoretical Physics (3, 3, 3) Classical theoretical physics, with limited use of mathematics. Prereq: 3210-20; 4210-20; advanced calculus, differential equations, and vector analysis. F, W, Sp
5210-20-30 Advanced Modern Physics (3, 3, 3) Basic principles of wave mechanics; one-electron atom; vector model; atomic and molecular spectroscopy; molecular binding; relativity; properties of nuclear spin, magnetic moments, etc.; scattering phenomena; nuclear models and forces; high-energy physics. Prereq: 3210-20; 3710-20-30, 4210-20, differential equations. Must be taken in sequence. F, W, Sp
5440 Experimental Methods of Infrared and Ramanscopes (3) Experimental equipment, instrumental optics; detection systems; analytical methods. Applications to determining diatomic molecule. Prereq: 3710-20 or equivalent.
5510-20 Advanced Thermodynamics and Statistical Mechanics (3, 3, 3) Statistical derivation of thermodynamic formalism, third law; low temperature physics; phase rule; free energy and chemical equilibrium. Maxwell-Boltzmann, Bose-Einstein, and Fermi-Dirac statistics; partition functions; introduction of statistical mechanics to thermodynamics; distribution functions and partition functions. Applications to gases, liquids and solids, including cluster theory of imperfect gases. Prereq: 3230. Prereq or coreq: 5510-20, 5610-20-30. F, W, Sp
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 second-order partial differential equations and their associated boundary value problems; Variational calculus; Green's functions; integral transform methods. Special attention to problems arising in physics involving potential fields. Prereq: Advanced calculus. Prereq or coreq: 5610-20-30. (Same as Mathematics 5610-20-30.) F, W, Sp
5640 Numerical Methods in Physics (3) Numerical methods available for solution of physical problems, pointed toward use of automatic computing machinery; analysis of errors. Prereq: 5610-20-30, or consent of instructor. (Same as Mathematics 5640.)
5720 Physics of Polyatomic Molecules (3) Introduction to electronic structure of molecules and physical processes of luminescence of these molecules; theoretical and experimental aspects of intermolecular and intramolecular electron excitation energy transfer and charge transfer; application of excitation energy transfer and charge transfer in such field as organic molecular reactivity and organic optoelectronics. Prereq: 5210-20 or consent of instructor. F
5610-20-30 Special Problems (3, 3, 3) Specially assigned theoretical or experimental work on problems not covered in other courses. E
5991 Special Problems in the Teaching of Physics (1, 1) Design of physics experiments and laboratory investigations; presentation 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 (3-15) P/NP only. E
6110-20-30 Quantum Mechanics (3, 3, 3) Fundamental principles of quantum mechanics and principal approximation methods. Applications to atomic, molecular and nuclear physics. Dirac equation; quantum electrodynamics. Prereq: 4130 or 5210; 5310-20-30 or 5410-20-30. Whichever of latter series more suitable for student is considered corequisite. F, W, Sp
6210-20-30 Nuclear Structure (3, 3, 3) General properties of nucleus; two body scattering problems; interaction and symmetry properties of nuclear forces; theory of light nuclei; nuclear spectroscopy; special nuclear models; theory of nuclear reactions; theory of beta-decay. Prereq: 6110-20-30. F, W, Sp
6210 Electromagnetic Theory of Light (3) Classical electromagnetic theory including theories of the breadth, dispersion and absorption; scattering of light and x-rays; dielectric and magnetic properties of gases and solids. Optical properties of electromagnetic waves in isotropic media including reflection, refraction and polarization and also theory of diffraction. Prereq: 5410-20-30. Su
6320 Special Relativity (3) Lorentz transformation; Einstein's postulates; relativistic kinematics; relativistic mechanics; relativistic electrodynamics. Prereq: 5310-20-30, 5410-20-30, 5610. F
6360 General Relativity (3) Tensor calculus; general theory of relativity; gravitational field equations. Prereq: 6320. W
6420 Advanced Topics in Classical Theory (3) To meet special needs of students. Possible topics: advanced dynamics and hydrodynamics, electromagnetic theory, statistical mechanics, including theory of nonequilibrium processes. Prereq: 5310-20-30, 5410-20-30, 5610-20-30. May be repeated with consent of department.
6500-10 Electrical Conduction In Gases and Plasmas (3, 3, 3) Optical properties of gases and liquids at high and low pressures. Characteristics of spark, arc and glow discharge. Collective phenomena in a plasma, plasma oscillation; magnetohydrodynamics; instabilities. Topics of current interest in astrophysics; geophysics and thermonuclear research. Prereq: 3710-20-30 and either 5410-20-30 or Electrical Engineering 5310-20-30. (Same as Electrical Engineering 6440-10.) F; W
6610 Interaction of Radiation with Gases (3) Interaction of electromagnetic radiation with atoms and molecules; oscillator strength, interaction of charged particles with atoms and molecules; ionization; transmutation and light emission. Electron interaction, transport and capture; electron swarm and electron beam experiments. Prereq or coreq: 6110-20-30. F
6620 Interaction of Electrons with Solids (3) Collision processes; stopping power; slowing down spectra; energy straggling; nuclear scattering; electron diffusion; plasmon effects in irradiated solids; collective processes in solids. Scattering; electron-atom and electron-molecule collisions, dielectric theory, stopping power, collective excitations in electronic systems, Chernov-Khodas radiation, electron transport in gases and solids. Prereq or coreq: 6110-20-30. W
6810 Vibrational Problems in Molecular Spectra (3) Infrared and Raman spectroscopy; the normal modes and potential functions; group theoretical methods and selection rules in gases and condensed phases. Lasersamran spectroscopy: applications to molecular structure and vibrational spectroscopy. Prereq: 6110-20-30. May be repeated with consent of instructor. Prereq or coreq: 5420 or equivalent. (Same as Chemistry 6810.)
6820 Molecular Vibration-Rotation Theory (3) Molecules as vibrating and rotating systems possessing specific symmetric and antisymmetric modes. Theoretical methods and selection rules in gases and condensed phases. Lasersamran spectroscopy: applications to molecular structure and vibrational spectroscopy. Prereq: 6110-20-30. May be repeated with consent of instructor. Prereq or coreq: 5420 or equivalent. (Same as Chemistry 6820.)
A. H. Hopkins, Ph.D. Oklahoma; Associate Professor.

ADMINISTRATION

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. The staff is as follows: Professor Unger (director), Professor Fitzgerald (associate director), and Professors Freeman and Olshfski (assistant professors).

THE MASTERS' PROGRAM

See general requirements on page 18.

MASTER'S IN PUBLIC ADMINISTRATION

Specific requirements for graduation include:

1. The completion of 54 quarter hours of approved graduate courses.
2. At least two-thirds of the credit hours must be in approved courses numbered 5000 and above.
3. Demonstration of command of the material covered in course work through a written comprehensive examination which may be followed by an oral examination.

The 54 quarter hours of graduate courses comprise 30 quarter hours of core courses which focus upon general perspectives, analytical skills, and management skills, a recommended internship arranged with a cooperating public agency (9 quarter hours), and 15 quarter hours in an elective specialized track developed by the student with the approval of the coordinator of the M.P.A. program. The specialized track will often contain a mix of courses from political science and one or more outside fields; examples include general government, public health administration, fiscal administration, social services administration, administration of criminal justice, urban administration, environmental and natural resources administration.

Inquiries concerning all programs should be directed to the Department of Political Science, Knoxville, Tennessee 37996-0410.

THE DOCTORAL PROGRAM

Specific requirements for the degree of Doctor of Philosophy in Political Science include:

1. A minimum of 117 quarter hours, following the Bachelor's degree, is required. At least 93 hours shall be in political science. At least 72 hours in political science shall be graduate level hours (i.e. earned in 5000- or 6000-level courses). At least 45 of these graduate level hours shall be at the 6000 level. This figure includes 36 hours of credit for the dissertation.
2. Each Ph.D. candidate must pass an examination in one foreign language.

Students specializing in some areas may be required to demonstrate knowledge of a second language or appropriate research tools or both.

3. Admission to candidacy shall be based on a written and oral comprehensive examination which must be passed not later than three quarters before the date on which the degree is granted.
4. The candidate must pass a final oral examination on the doctoral dissertation.
5. Successful completion of the degree also depends on course performance and other evidence of professional interest and conduct.

Note: Registration in any courses in the 5000-6000 series may be repeated for credit with consent of the department.

United States Constitutional Law: Sources of Power and Restraint (4) Analysis of judicial review, constitutional powers of President and Congress, federalism, sources of regulatory authority, and constitutional protection of political rights. Recommended prerequisite: 2510-20. F, W


Minority Group Politics in the United States (4) Content varies from quarter to quarter. May be repeated with consent of department. Maximum 8 hrs. W

Introduction to Public Administrative Organization and Management (4) Organization and decision-making theory, line and staff services, politics of organization, leadership, personnel and financial management, administrative responsibility. Recommended prerequisite: 2510-20. F, W, Sp


Political Change in Developing Areas (4) Characteristics and problems of political changes with primary focus on developing areas. F, W, Sp

Dynamics of Black African Politics (4) F; W

Comparative China and Japan (4) F, W

Latin American Government and Politics (4, 4) F, W

Government and Governments of the Soviet Union (4, 4) F, W

Politics in Western Democracies (4) Political culture, patterns, and institutions of Western democratic systems. F, Sp, A; W

State Politics (4) F, W, Sp

Political Parties and Elections (4) Analysis of party systems and electoral process. F, W

Political Campaigns (4) All aspects of campaign process. F, W

Politics and the Environment (4) Examination of formulation and implementation of public policies relating to physical environment with emphasis upon water and air pollution control. Sp

Thesis (1-12) E

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

Foreign Study (1-12) See page 96. E

Off-Campus Study (1-12) See page 96. E

From Augustine to Luther: emphasis on problems and theories of religion and politics. W or Sp

Studies in Early Modern Political Thought (4) Machiavelli through the Enlightenment. W

Studies in Nineteenth- and Twentieth-century Political Thought (4) Political theories of industrial and technological societies, nineteenth and twentieth centuries. F or W

American Political Thought (4) Examination of role of selected political ideas, doctrines, and themes in America, emphasizing their development and relationships to diverse political interests. F

Revolutionary Characteristics, Theories, and consequences of revolution, with particular focus on left-wing revolutions and movements. Sp

Law and the Administrative Process (4) Powers of, procedures of, controls over administrators. Sp

Political Attitudes, Opinions and Communication (4, 4) Nature, development, distribution of politically relevant attitudes and opinions; role of leadership, persuasion, and communication in opinion-policy process. F, W


Congress (4) Nature, functions, and processes of U.S. Congress. Sp

Special Topics in United States Government and Politics (4) May be repeated with consent of department. Maximum 8 hrs.

Budgetary Process (4) Fiscal planning, budget and expenditure processes in government, their policy and administrative implications. W or Sp

Public Personnel Administration (4) Development of the merit system in government, career systems, public personnel management functions, organization for personnel management. F or W

Policy Making in Democracies (4) Comparative approach to theory and process of making public policies. F or Sp; W

Special Topics in Comparative Government and Politics (4) May be repeated with consent of department. Maximum 8 hrs.


International Law (4)

Politics of Inter-American Relations (4) Analysis of selected theoretical and policy issues concerning international relations in the Americas with emphasis upon imperialism, intervention, and the Cuban Revolution, nationalism, foreign assistance, trade and economic integration. Sp, A

Political Parties and Elections (4) Analysis of party systems and electoral process. F, W

Political Campaigns (4) All aspects of campaign process. F, W

Politics and the Environment (4) Examination of formulation and implementation of public policies relating to physical environment with emphasis upon water and air pollution control. Sp

Thesis (1-12) P/NP only. E

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

Foreign Study (1-12) See page 96. E

Off-Campus Study (1-12) See page 96. E
Selected political thinkers, schools, historical periods. F; W, Sp

5140 Politics, Administration and Community in Nonmetropolitan Areas (3) Analysis of problems and processes associated with community development. F; W

5150 Internship in Political Science (2-9) Open to students participating in approved internship programs. May be repeated with consent of instructor. Maximum 9 hrs. S/NC only. E

5210-20-30 Seminar in World Politics (3, 3) Research in world problems and organization. F; W

5211 Directed Readings in Political Science (3) May be repeated with consent of instructor and student's advisor. Maximum 9 hrs. May be taken for letter grade or S/NC. E

5250 Seminar in African Politics (3) Selected topics in African politics. F

5270 Seminar in the Politics of Development (3) Selected topics dealing with political problems of less developed countries. F

5310-20 Seminar in Comparative Government (3, 3) Selected topics in modern governments. F

5340-50 Seminar in Latin American Government (3, 3)

5370-80 Seminar in Soviet Politics and Government (3, 3) Intensive readings in comparative state politics and processes associated with community development. F; W

5410-20 Seminar in Public Law (3, 3) Special problems in constitutional and administrative law. F

5440-50 Theory and Analysis of U.S. Foreign Policy Processes (4, 4) Theoretical approaches to decision making in foreign policy area and analysis of policy-making process. W

5510-20 Seminar in International Organization (3, 3) 5510-Introduction to regional international organizations; political integration at international level. F; W; Sp

5520-Functional international organizations. F; W

5540 Seminar in Comparative Public Administration (3) Approaches to and methods used in comparative analysis. F

5550 Seminar in Administration in Developing Countries (3)

5600 Public Administration (3) Public administration theory and functions, approaches to public management of contemporary problems in public administration. F

5605 Research and Methodology in Public Administration (3) Basic assumptions and techniques of research in public administration; measurement, analysis, and reporting of data. W

5610-20 Seminar in Organization Theory (3, 3) Appraisal of major theories of organization and their applicability to public sector. F

5611-21-31 Seminar in State-Local Administration (3, 3, 3)

5630 Seminar in Technology and Public Policy (3) Technological change and policy process, government interactions with scientific community, political characteristics of scientific enterprise. F

5635-45 Operations Research for Public Administrators (3, 3) Operations research methodology, applications and limitations in public sector; linear programming, transportation and assignment problems, network analysis, and PERT, dynamic programming and other methods. F

5640-50-60 Seminar in Metropolitan Areas (3, 3, 3)

5641 Seminar in Contemporary Public Policies (3) Problems in one or more public policy areas from political and administrative perspectives. Topics selected by instructor. W

5670-80 Seminar in Policy Analysis (3, 3) Role of administrators in policy analysis and decision making with special attention to historical and current issues. Sp

5710 Seminar in the Politics of Administration (3) Examination of public administration in context of American political system with emphasis upon policy making and political roles of public administrators and agencies. F

5730 Seminar: Public Budgeting (3) Technical and political aspects of planning, preparing, and adopting government budgets. F

5735 Seminar: Public Financial Management (3) Management of public expenditures and management implications of revenue collection, debt management, treasury function, accounting, internal auditing, purchasing, risk management, post-auditing. F

5740 Seminar in Organizational Analysis (3) Organization theory applications in public management; field analysis of public organizations. W

5750-55 Seminar in Public Management (3, 3) Selected problems. F; W

5765-75 Law and the Administrative Process (3, 3) Constitutional position; decisional processes, regulation and management; limitations on government action; questions of structure, role, and administrative choice. W

5770 Practicum in Public Administration (3) Sp

5785-95 Seminar in Staff Functions (3, 3) Functions of administrative staff personnel serving political, public bureaucracies, legislative bodies, and advisory and community groups in public sector. Selected topics include budgeting, personnel, evaluation, and other staff functions. W

5790 Seminar in Public Personnel Management (3) Functions and organizations of personnel administration in public service. Sp

5810 The American Political Process (4) Principal patterns of political activity linking citizens and political institutions. Sp

5820 The American Political Process (4) Selected problems in American politics. Sp

5831-32 The Systematic Study of Politics (3, 3) Scope, methods and procedures of analysis in political science. Sp

5840 Ethics, Values, and Morality in Public Administration (3) Moral-ethical-value dilemmas confronting administrators in American political system. W

5850 Seminar in Comparative State Politics (3) Intensive readings in comparative state politics focusing on environment of state politics, institutions and policy making. Sp

5910-20 Quantitative Political Analysis (3, 3) Methods and techniques in quantitative political analysis. F; W

5930 Topics in Quantitative Political Analysis (3) Selected topics in quantitative methods. W

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

6210 Advanced Studies in International Politics (3)

6310 Advanced Studies in Political Theory (4) Research into selected topics. F

6410 Advanced Studies in International Organization (3) Research in selected topics. Sp

6440 Advanced Studies in Comparative Politics (3) Research into selected topics. Sp

6510-20 Advanced Studies in American Constitutional Law (3, 3) Systematic investigation of federal relationships, civil liberties, courts in political setting, judicial institutions, personnel, and public policy content. W

6610-20 Advanced Studies in Public Administration (3, 3) Research into selected topics. W; Sp

6710 Directed Research in Political Science (3) May be repeated with consent of instructor and student's advisor. Maximum 9 hrs. May be taken for letter grade or S/NC.

Psychology

MAJOR

DEGREES

Psychology

M.A., Ph.D.

Professors:

W. H. Calhoun (Head), Ph.D. California (Berkeley); C. M. Burghardt, Ph.D. Chicago; A. G. Burstein, Ph.D. Chicago; J. F. Byrne, Ph.D. Tennessee; C. P. Cohen, Ph.D. Kansas; H. L. Fine, Ph.D. Syracuse; S. J. Handler, Ph.D. Johns Hopkins; L. Handler, Ph.D. Michigan State; R. L. Lovin, Ph.D. Rochester; J. F. Lilic, Ph.D. Chicago; J. C. Malone, Ph.D. Duke; K. R. Newton, Ph.D. Tennessee; H. R. Politi,** Ph.D. Michigan; N. L. Rasch,* Ph.D. Pennsylvania; F. Samejima, Ph.D. Keio (Japan); R. R. Shadar, Ph.D. Tennessee; W. S. Verplanck (Emeritus); R. Brown; R. G. Winter, Ph.D. Washington; J. A. Wilberney, Ph.D. Syracuse.

Associate Professors:


Assistant Professors:


The Psychology Department emphasizes the Master's degree and doctoral program in specialized areas in clinical, school, community, social, developmental, experimental, cognitive, physiological, and comparative psychology, psycholinguistics, psychometrics, and learning. Some students complete a Master's degree as part of their doctoral program.

For detailed information on graduate programs and admissions requirements write: Graduate Secretary, Department of Psychology, University of Tennessee, Knoxville, Tennessee 37996-0900.

THE PSYCHOLOGICAL CLINIC

The Psychological Clinic supports graduate training in clinical psychology. Psychological diagnosis and psychotherapy are offered on an outpatient basis, with medical consultants, to the general public as well as to University students, on referral by a physician.

3720 Ethology and Sociobiology (3) Evolutionary approach to behavior with special reference to controversial issues in applications to psychology, social sciences, and arts.

4107 Experience in Individual Instruction (1-4) Experience as proctor in individualized instruction. Prereq: Consent of instructor. May be repeated. Maximum 8 hrs. S/NC only. E

4230 Sensory Processes and Perception (4) Survey of sensory and perceptual processes with emphasis on audition and vision. Prereq: 3150. Recommended: 2520. F
4239 Laboratory in Sensory Processes and Perception (2) Prereq or coreq: 4230.

4460 Organizational-Industrial Psychology (3) Cannot be taken for credit by students who have credit for Management 3460. E

4510 Personality Theories (4) Prereq: 3650 or consent of instructor: F, Su

4520 Personality and Social Systems (4) Prereq: 2520.

4610 Group Processes (3) Study and experience of theory and techniques of group processing and facilitation. Those participating in 4610 are expected to continue in 4620 or 4630. Prereq: 3616-26 and consent of instructor: F

4620-30 Seminar in Group Processes (3, 3) Didactic and laboratory experience for those qualified for further training as group facilitators. Prereq: 4610 and consent of instructor: W, Sp

4640 Psychological Tests and Measures (4) Theory and construction of individual and group measures; survey of various methods of assessment of personality, special abilities, and educational achievement. Prereq: 3150. F, Su

4650 Symbolic Processes (4) Logic of signs and symbols; directed and associative thinking; memory, problem solving, and concept formation; nature, use, and development of language. Prereq: 3210 or consent of instructor.

4660 The Psychology of Language (4) Theories and descriptions of phonology, syntax, and semantics as applied to psychology and related disciplines. Recommended: 4650 or linguistics background.

4700 Cognitive Development (4) Theory and research on development of language and thinking in children and adolescents. Prereq: 3210 or 3550.

4710 Physiological Psychology (4) Nervous system and physiological correlates of behavior. Prereq: 1 yr of biology or zoology and 2320. W

4719 Physiological Psychology Laboratory (4) Laboratory studies of nervous system and physiological correlates of behavior. Coreq: 4716. W

4720 Comparative Animal Behavior (4) Methods and principles. (Same as Zoology 4720.) F

4729 Comparative Animal Behavior Laboratory (4) Laboratory and field studies. Coreq: 4720. (Same as Zoology 4729.) F

4750 Evolution and Ontogeny of Social Behavior (4) Genetic, evolutionary, ecological, and developmental perspectives on how they apply to social organization and dynamics of vertebrates. Prereq: Consent of instructor.

4770 Psychology and the Law (4) Psychological aspects of the legal system. Prereq: Junior standing.

4830 History and Systems of Psychology (4) Prereq: 9 hrs of upper division psychology.

4850 Learning Theories (4) Historical and theoretical development of learning models. Prereq: 3210.

4860 Programmed Learning (3) (Same as Curriculum and Instruction 4860.)

4870 Contemporary Research in Behavior of Women (4) Study of interaction of culture and biological factors in determining the behavior of women, with emphasis on physiological mechanisms involved. Sp

4880 Afro-American Psychology (4) Review and analysis of psychological literature on Afro-Americans. Prereq: Consent of instructor. (Same as Black Studies 4880.)

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

5020 Non-thesis Graduation Completion (3-15) Required for the non-thesis student not otherwise required during any quarter when such a student uses university facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. S/NC only. E

5017 Colloquium in Ethnology (1) May be repeated. Maximum 9 hrs. (Same as Zoology 5017.) S/NC only.

5019 Research Practicum (1-3) Required of all first-year students in field of experimental, physiological, and comparative psychology. May be repeated. Maximum 9 hrs. S/NC only.

5050 Methods of Research in Applied Psychology (3) Techniques and principles for designing and conducting psychological research in natural settings.

5070 Seminar in College Teaching (2) Concepts, methods, and materials in introduction of psychology at college level. Prereq: Consent of all Ph.D. candidates. S/NC only.

5079 Practicum in College Teaching (2) Supervised participation in college teaching. S/NC only. Sp

5100 Developmental Psychology (3) Prereq: 3550 or Educational Psychology 2430. (Same as Educational Psychology 5130.) F, Sp, Su

5105 Developmental Assessment (3) Techniques for assessing development in infants and children. Does not include practicum. Prereq: 5100 or equivalent and consent of instructor.

5110 Clinical Aspects of Human Sexuality (3) Nature of sexuality; societal perspectives, personal identity, application, intimacy and isolation including psychosocial and psychosexual identity and models for decision making. Prereq: 2540 for all practicum students in clinical psychology, social work and community mental health professions. Prereq: Consent of instructor.

5111 Seminar in Current Issues in School Psychology (3) Historical, legal, ethical and technological issues in practice of school psychology. Multiple instructors. (Same as Educational Psychology 5111.) S/NC only.

5140-50-60 Psychological Assessment (3, 3, 3) Naturalistic, psychometric, and sociometric assessment methods in school learning environments. Must be taken in sequence. Prereq: Admission to School Psychology program or consent of instructor. (Same as Educational Psychology 5140-50-60.) F; W; Sp

5149-59-69 Practicum in School Psychology I (2, 2, 2) First-year School Psychology Program practicum core sequence. Coreq: 5140-50-60. (Same as Educational Psychology 5149-59-69.) S/NC only. F, W; Sp

5170-80-90 Proseminar in Industrial and Organizational Psychology (3, 3, 3) (Same as Management 5170-80-90.) F; W; Sp

5200 Topics in Developmental Psychology (3) Prereq: 5100 or equivalent and consent of instructor. May be repeated. Maximum 6 hrs.

5300 Readings and Special Problems in Psychology (1-5) May be repeated. Maximum 20 hrs. S/NC only. E

5319 Field Work in School Psychology: Level I (2) Supervised on-the-job training in school psychology. Limited to students fully admitted to doctoral program in school psychology who are assigned to program approved field settings. Prereq: 5140-50-60 or equivalent. May be repeated. Maximum 6 hrs. (Same as Educational Psychology 5319.) S/NC only. F, W; Sp

5325 Behavioral Interventions (3) Principles and techniques for planning, implementing, and evaluating interventions derived from social learning theory. Focuses on interventions by people in community (teachers, etc.). Includes token economies and strategies for self-control.

5340 Group Dynamics (3) (Same as Educational Psychology 5340.)

5350-60-70 Seminar in Psychology (3, 3, 3) May be repeated. Maximum 18 hrs.

5400 Psychophysics and Scaling Methods (3) Prereq: One course in statistics.

5420-30-40 Advanced Psychological Statistics (3, 3, 3) Must be taken in sequence. W, Sp; Su; F

5450 Human Problems in Administration (3) (Same as Management 5230.)

5490 Continuing Education in Mental Health (1-4) Topics of interest to persons in mental health and allied fields. Workshops, seminars or lecture, topic and format to be announced. Prereq: Graduate standing or consent of instructor. May be repeated. Maximum 9 hrs.

5500 Fundamentals of Psychometrics (4) Basic ideas and orientation in psychometrics. All graduate students who plan to take one or more courses in psychometrics required to take course. Prereq 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: 5500 or equivalent and consent of instructor.

5530 Issues in Applied Psychological Measurement (3) Applications of measurement in community and organizational psychology. Prereq: 3150. May be used for credit in sociology.

5560 Seminar in Social Psychology (3) Prereq: 5550. May be used for credit in sociology. May be repeated. Maximum 9 hrs.

5580 Theories of Personality (3)

5581 Psychodynamic Approach to Clinical Psychology (3) Basic concepts. Selected theories with examples of work with patients. Prereq: Admission to doctoral program in Clinical Psychology or consent of instructor.

5582 Behavioral Approach to Clinical Psychology (3, 2, 2) First-year School Psychology Program practicum core sequence. Coreq: 5140-50-60. (Same as Educational Psychology 5149-59-69.) S/NC only. F, W; Sp

5590 Adult Psychological Assessment (3) Basic concepts and techniques of adult assessment, including intelligence tests and personality tests. Prereq: Admission to doctoral program in Clinical Psychology or consent of instructor.

5591 Seminar in Object Relations Theory (3) Development and psychopathology, emphasis on existential theory. Comparison of underlying assumptions of different theories. Prereq: Admission to doctoral program in Clinical Psychology or consent of instructor.

5592 Descriptive Psychopathology (2) Diagnostic criteria of the DSM-III. Examples from written case histories and recorded interviews. Prereq: Admission to doctoral program in Clinical Psychology or consent of instructor.

5593 Phenomenological Approach to Clinical Psychology (3) Normal development and psychopathology, emphasis on existential theory. Comparison of underlying assumptions of different theories. Prereq: Admission to doctoral program in Clinical Psychology or consent of instructor.

5594 Adult Psychological Assessment (3) Basic concepts and techniques of adult assessment, including intelligence tests and personality tests. Prereq: Admission to doctoral program in Clinical Psychology or consent of instructor.

5595 Seminar in Object Relations Theory (3) Development and psychopathology, emphasis on existential theory. Comparison of underlying assumptions of different theories. Prereq: Admission to doctoral program in Clinical Psychology or consent of instructor.

5596 Descriptive Psychopathology (2) Diagnostic criteria of the DSM-III. Examples from written case histories and recorded interviews. Prereq: Admission to doctoral program in Clinical Psychology or consent of instructor.

5597 Dynamics of Psychopathology (3) Psychopathology viewed as a reflection of major psychoses, neuroses and adjustment disorders. Prereq: Admission to doctoral program in Clinical Psychology or consent of instructor.
5610-20 Psychology of Learning (3, 3); Prereq: 3210 or Educational Psychology 3730; F, W
5650 Ethics in Professional Psychology (2); Review of ethical concerns in professional psychology. Multiple instructors. Meets 3 hrs per week; Sp
5670 Forensic Psychology (2); Psychological's role in the law. Focus on legal issues concerning the profession, including licensure requirements, legal restrictions, and testimony as expert witness. Offered in alternate years; Prereq: M.A. in psychology or equivalent.
5680 Neural Basis of Behavior (3); Neuroanatomy and symptomatology of neurological syndromes encountered in clinical psychology. Prereq: M.A. in psychology or equivalent.
5690 Psychopharmacology (3); Review of psychological research on drug use and drug abuse. Prereq: Consent of instructor. Sp, A
5702 Community Psychology (3); Psychological aspects of research, evaluation, intervention, and planning in communities. Community ecology, systems for primary and secondary prevention, planning of social systems, and relevance of federal policies. Prereq: Consent of instructor.
5712 Learning Modules for Techniques in Professional Psychology (1-4); Set of learning packages; each develops skill in assessment, technology, child education, or patient-care. Consent of instructor. May be repeated; S/NC only.
5750 Ethological Psychology (3); Evolutionary and physiological basis of comparative psychology and implications for human behavior. Prereq: Introduction to psychology or graduate level course in zoology. Prereq: Consent of instructor.
5760 General Vertebrate Neuroanatomy (3); Lecture and laboratory dealing with structure and function of central and peripheral nervous systems. Prereq: 4710 or 4719, or consent of instructor. (Same as Zoology 5760.)
579 Advanced Techniques in Physiological Psychology (3); Animal and human laboratory procedures central to research in physiological psychology. Prereq: 4710 or consent of instructor. May be repeated with consent of instructor.
5790 Seminar in Psycholinguistic Concepts in Speech Pathology (3); Same as Speech Pathology 5790.
5840 Student Appraisal (3); Same as Educational Psychology 5840.
5850 Child Psychological Assessment (3); Introduction to psychological assessment techniques. Prereq: 5100 and Admission to Clinical Training Program or consent of instructor.
5859 Practicum in Psychological Appraisals (2); Prereq: Consent of instructor.
5860 Interpersonal Assessment (3); Focus on objective tests such as MMPI and Leary System of interpersonal diagnosis. Prereq: 5580 or equivalent and admission to Clinical Training Program or consent of instructor.
5869 Practicum in Psychological Assessment (3); Prereq: Admission to doctoral program in Clinical Psychology or consent of instructor.
5870 Projective Techniques in Assessment (3); Diagnosis of psychological disorders using case history and mental status; projective techniques. Prereq: 5561 or equivalent and admission to Clinical Training Program or consent of instructor.
5879 Practicum in Psychological Assessment (3); Prereq: 5869.
5890 Counseling Theories and Techniques (3); Same as Educational Psychology 5890.
5950-60 Theory and Practice of Consultation (3, 2); Issues in consultation, models of consulting process, and situations of counseling techniques. Must be taken in sequence. Coreq: 5959-69 and consent of instructor. (Same as Educational Psychology 5950-60.) W, Sp
5959-69 Practicum in Psychological Appraisal (2, 2); Consistent of instructor. Must be taken in sequence. (Same as Educational Psychology 5959-69.) S/NC only. W, Sp
6000 Doctoral Research and Dissertation (3-15); P/NP only. E
6050 Seminar on Methods of Social Research (3); Same as Sociology 6050.
6088 Internship in Community Psychology (1-6); Supervised employment at departmentally approved internship sites. Prereq: Consent of instructor. May be repeated. Maximum 12 hrs; S/NC only.
6089 Internship in School Psychology (1-6); Supervised employment at departmentally approved internship sites. Prereq: Consent of instructor. May be repeated. Maximum 12 hrs; S/NC only.
6100 Seminar in Community Psychology (3); Evaluation, research, intervention, and systems for delivery of services in communities. Prereq: 5702.
6150 Seminar in Program Evaluation (3); Techniques for designing and conducting research to evaluate effectiveness of programs. Prereq: Statistics 4260-30-40; 5050-60-70 or equivalent and consent of instructor.
6159 Practicum in Program Evaluation (3); Designing, conducting, and analyzing results of program evaluation in school or community setting. Prereq: 5710 and 5890.
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 Industrial and Organizational Psychology (3, 3, 3); Same as Management 6250-60-70.
6280-90 Factor Analysis (3, 3); Factor analysis; component analysis; introduction to latent structure analysis. Prereq: 4640 and 5500.
6310 Seminar in Motivation and Emotion (3)
6319 Field Work in School Psychology; Level II (2); Supervised on-the-job training in school psychology. Limited to students fully admitted to doctoral program in School Psychology assigned to program approved field settings. Prereq: 5950-60. May be repeated. Maximum 6 hrs. (Same as Educational Psychology 6319); S/NC only, F, W, Sp
6320 Seminar in Research Methods (3)
6330 Seminar in Learning (3)
6340 Seminar in Developmental Psychology (3)
6350 Seminar in Thinking (3)
6360 Seminar in Sensation and Perception (3)
6370 Seminar in Theoretical Psychology (3)
6380 Seminar in Industrial and Organizational Psychology (3); Same as Management 6380.
6385 Hypnosis and Imagery (3); Demonstration and practice of hypnotic induction methods, survey of clinical applications of hypnosis and imagery. Prereq: Consent of instructor.
6390 Seminar in Psychotherapy (2); Treatment of current case, focusing upon psychodynamics, psychopathology, and therapeutic techniques employed. Prereq: Consent of instructor.
6395 Seminar in Assessment (3); Seminar for advanced graduate students in clinical psychology, to deal with current research on methods of evaluating the status of individuals seeking clinical aid.
6400 Seminar on Changing Concepts in Clinical Psychology (3); New developments in field in relation to their impact on experimentation and systems of thought. Prereq: M.A. in psychology or equivalent.
6405 Seminar in Psychopathology (3); Prereq: Consent of instructor.
6410-20-30 Psychotherapy (2, 2, 2); Theories and principles. Prereq: Consent of Instructor.
6411 Seminar in Group Processes (2); Theory and practice of group therapy; communication skills. Prereq: Admission to Clinical Training Program or consent of instructor.
6412 Seminar in Inference in Psychotherapy (3); Uses of actuarial and inferential data for assessment of strategies and tactics used in psychotherapy. Prereq: Admission to Clinical Training Program or consent of instructor.
6413 Seminar in Techniques of Behavior Modification (2); Practical applications of systematic desensitization, operant conditioning, aversive conditioning and related techniques for modification of behavior disorders. Prereq: Admission to the Clinical Psychology Program.
6414 Seminar in Marital and Family Therapy (2); Evaluating marital and family problems; methods of investigation. Psychodynamic, behavioral, and systems-theory concepts. Prereq: Admission to the Clinical Psychology Program.
6419-29-39 Psychotherapy Practicum (1, 1, 1); Coreq: 5410-20-30. May be repeated. Maximum 12 hrs.
6450-60 Advanced Psychometrics (3, 3); Construction and standardization of psychological tests, questions, and rating scales, theory of errors or measurements; item analysis, scaling, equating, and norms development. Prereq: 4650, 5440, and 5500. May be repeated. Maximum 9 hrs.
6459 Continuing Education in Professional Mental Health (1-4); Topics of interest to persons in mental health and allied fields. Workshop, seminar, or lecture, topic and format to be announced. Prereq: Professional degree. May be repeated. Maximum 24 hrs; S/NC only.
6481 Off-Campus Placement in Clinical Psychology (1-4); Required of all students on placement by Clinical Training Program. May be repeated. Maximum 24 hrs. S/NC only.
6492 Psychology Clinic Placement (1-4); Required of students assigned to Psychology Clinic. May be repeated. Maximum 24 hrs; S/NC only.
6493 Psychology Clinic Activity (1-4); Continuation beyond 6439. May be repeated. Maximum 12 hrs. S/NC only.
6494 Field Experience in Clinical Psychology (1-4) For students who have finished internship with placement in clinical psychology in local area. May be repeated. Maximum 12 hrs. S/NC only.
6500 Seminar in Psychometrics (3); Seminar for advanced graduate students in psychometrics or quantification of the psychological. Prereq. To deal with advanced theories, methodologies, and their applications. Prereq: 4640, 5500 or equivalent, and consent of instructor. May be repeated. Maximum 9 hrs.
6550 Seminar in Advanced Social Psychology (3)
6575 Seminar in Mental Health Administration (3); Theory and problems in organization and management of mental health administration.
6660 Organizational Development in Human Service Settings (4); Review of theoretics and practical approaches to organizational development in human service settings. Didactic material and exercises. Prereq: 6650. Recommended coreq: 6669.
6669 Practicum in Organizational Development in Human Service Settings (2); Recommended coreq: 6660. Prereq: Consent of Instructor. S/NC only.
6702 Social Ecology (3); Seminar on current topics: ecological psychology, quality-of-life, social impact assessment, and environmental classification. Prereq: Consent of instructor.
6710 Seminar in Physiological Psychology (3)

6720 Seminar in Comparative and Ethological Psychology (3)

6730 Methods of Ethological and Naturalistic Research (3) Current laboratory and field techniques. Prereq: 4729, 5750, 6720, or consent of instructor.

6780 Advanced Psycholinguistics (3) Language from psychological and associated points of view; methodological and theoretical problems.

6900 Field Work in Industrial and Organizational Psychology (1-15) (Same as Management 6900.)

*May be repeated for credit with the approval of the department.

Radiation Biology (Interdepartmental)

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

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

5610-20 Foundations of Radiation Biology (4, 4) (Same as Zoology 5610-20.)

5760 Radiation Physiology (4) (Same as Zoology 5760.)

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

6910 Seminar in Radiation Biology (2) (Same as Zoology 6910.)

Religious Studies

Professors: C. H. Reynolds (Head), Ph.D. Harvard; D. L. Dunigan, Ph.D. Harvard; W. L. Humphreys, Ph.D. Union; D. E. Linge, Ph.D. Vanderbilt; F. S. Lusby, B.D. Colgate Rochester; R. V. Norman, Jr., Ph.D. Yale.

Assistant Professors: J. L. Fitzgerald, Ph.D. Chicago; M. Harris, Ph.D. Harvard; M. Levinson, Ph.D. Harvard.

An M.A. in Philosophy with a concentration in religious studies is available for graduate work in these related fields. (Details of this program are available in the office of each department.) Graduate courses in religious studies further provide opportunity for students in a variety of disciplines to pursue work in religious studies as a graduate concentration.

3060-70-80 History of Western Religious Thought and Institutions (3, 3, 3) 3060 — First Century to Fifth Century 3070 — Sixth Century to Fifteenth Century. 3080 — Sixteenth Century to 1900. (Same as History 3060-70-80.) A

3210 Early Greek Mythology (3) (Same as Classics 3210.) F

3220 Early Greek Mythology in the Classical Period (3) (Same as Classics 3220.) W

3230 Roman Mythology (3) (Same as Classics 3230.) Sp

3370 Russian Philosophical and Theological Thought (4) (Same as Philosophy 3370 and Russian 3370.)

3411-12 The Reformation (3, 3) (Same as History 3411-12.)

3440 Religion of Primitive Peoples (3) (Same as Anthropology 3440.)

3650 Philosophy and Religion in India (4) (Same as Philosophy 3650.) F

3860 Buddhist Philosophy and Religion (4) (Same as Philosophy 3860.) W

3671 Religion and Philosophy in China (4) (Same as Philosophy 3671.)

3690 Philosophy of Religion (4) (Same as Philosophy 3690.)

4111-21 Modern Religious Philosophies (4, 4) Examination of the religious implications of major thinkers and movements. 4111—Nicolas of Cusa to Hume. 4121—Kant and the nineteenth century. Prereq: 9 hrs of philosophy other than logic. (Same as Philosophy 4111-12.)

4200 Classical Indian Systems of Philosophy: The Moksha Tradition (4) Basic writings and philosophic problems of the traditions of Samkhya, Yoga, and Vedanta. Prereq: 3650 or 3660. (Same as Philosophy 4200.)

4210 Topics in Ancient Israelite and Ancient Near Eastern Religions (4) Prereq: 3110-20 or consent of instructor. May be repeated. Maximum 8 hrs.

4310 Jesus and Paul Compared (4) Jesus' teaching and activity in the context of first-century Palestine Judaism: analysis of what the Apostle Paul made of the tradition of and about Jesus. Recommended prereq: 2610 or 2611.

4370 Theoretical Issues in Medical Ethics (4) (Same as Philosophy 4370.)

4410 American Religious Thought (4) Selected figures, movements, and problems in American religious thought from colonial period to present.

4450 Topics in American Religion (4) Prereq: One of the following: 3510, 3520, 4410, or consent of instructor. May be repeated. Maximum 8 hrs.

4540 Social and Religious Change (4) (Same as Sociology 4540.)

4610 Topics in Western Religious Thought and Institutions (4) Selected figures, issues, and institutions. Seniors and graduate students only, except by consent of department. Prereq: 3060-70-80. May be repeated. Maximum 12 hrs.

4640 Topics in Early Christianity and Hellenistic Religions (4) Selected figures, issues, and institutions. Seniors and graduate students only, except by consent of department. Prereq: Consent of instructor. May be repeated. Maximum 12 hrs.

4670 Topics in Eastern Religions (4) Selected figures, issues, and institutions. Seniors and graduate students only, except by consent of department. Prereq: 3650-60-71-72. May be repeated. Maximum 12 hrs.

4810-20-30 Readings and Research in Religious Studies (3-3, 3-4, 3-4)

4840 Readings in Selected Languages Related to Religious Studies (3-3) Prereq: Consent of instructor. May be repeated. Maximum 12 hrs.

4850 Sociology of Religion (4) (Same as Sociology 4850.)

4860 Theory of Religion (4) Elements for construction of a theory of religion drawing on resources from fields of psychology, social psychology, sociology of religion, cultural anthropology, theology and comparative religion.

4900 Tradition, Change and Modernity in Asia (4) Comparative study of processes of religious and social change seen in historical context in Asian societies. Comparative focus of course will vary each year (e.g., China and Japan, India and South Asia). May be repeated. Maximum 8 hrs.

5101 Foreign Study (1-12) See page 96.

5102 Off-Campus Study (1-12) See page 96.

5103 Independent Study (1-12) See page 96.

5310-20 Topics in Religion and Society (4, 4)

5355 Orientation to Medical Ethics (2) (Same as Philosophy 5355.)

5365 Applied Ethical Theory (4) (Same as Philosophy 5365.)

5510-20 Topics in the History of Religion (4, 4)

5710-20 Topics in Religious Thought (4, 4)

Romance Languages

MAJORS

DEGREES

French

M.A., Ph.D.

Spanish

M.A., Ph.D.

Professors:

W. H. Heflin (Head), Ph.D. Florida State; P. E. Barrette, Ph.D. California (Berkeley); C. W. Cobb, Ph.D. Tulane; J. C. Elliott, M.A. Illinois; T. B. Irving (Emeritus), Ph.D. Princeton; F. D. Maurino (Emeritus), Ph.D. Columbia; M. Petrovska, Ph.D. Kentucky; J. O. Swain (Emeritus), Ph.D. Illinois; A. M. Vazquez-Big, Ph.D. Minnesota; G. E. Wade (Emeritus), Ph.D. Ohio State; A. H. Wallace, Ph.D. North Carolina.

Associate Professors:

W. F. Byes (Emeritus), Ph.D. Wisconsin; R. M. DeRycke, Ph.D. Illinois; M. H. Handelman, Ph.D. Florida; K. D. Levy, Ph.D. Kentucky; C. Pinsky, Ph.D. California (Berkeley); Y. M. Washburn, Ph.D. North Carolina.

The Department of Romance Languages offers two advanced degrees: The Master of Arts (M.A.) in French and Spanish; and the Doctor of Philosophy (Ph.D.) in Spanish.

THE MASTER OF ARTS PROGRAM

The student may select either Plan A or B:

Plan A

1. Completion of a minimum of 36 quarter hours of which 24 must be taken in courses numbered above 5000, including 5011 (French or Spanish, as appropriate).


3. A written examination covering the course work and selected items from a master reading list.

4. A final oral examination covering the thesis.

Plan B

1. Completion of 45 quarter credits of which 33 must be in courses beyond 5000, including 5011 (French or Spanish, as appropriate).

2. Three term papers that have been accepted as satisfactory by the Advisory Committee.

3. A written examination covering the course work and selected items from a master reading list.

THE DOCTORAL PROGRAM

Residence and Course Work:

Completion of at least three consecutive quarters of full-time residence, a minimum of 81 credit hours in course work beyond the Bachelor's degree or its equivalent, and a dissertation (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 6000. 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 additional course work in the major field.

Examinations:

A comprehensive examination, both written and oral, covering the major and minor fields must be passed before a student can become an official candidate for the degree. This examination is to be held at the time deemed most appropriate by the student's major advisor and committee. The candidate is expected to defend the dissertation in a final oral examination.

For additional information on the doctorate, consult pages 19-20.

**French**

3010-20-30 Elements of French for Upper Division and Graduate Students (3, 3, 3) Elements of language, elementary and advanced readings. Open to graduate students preparing for language examinations, and upper division students desiring reading knowledge of the language. Undergraduate credit only. No credit for those having had Elementary French. No auditors. F; W; Sp; Su

4001-02-03 Introduction to Consecutive and Simultaneous French Translation (3, 3, 3, 3) 4001—Oral translation into English; 4002—Consecutive translation to and from English; 4003—Simultaneous translation to an from English. Training of students with intermediate or advanced knowledge of French for consecutive and simultaneous oral translation from French into English, and vice versa on variety of practical subjects such as business, economics, politics, and sciences. Given mainly in language lab with additional classroom supervision by instructor. Prereq: 3430 or equivalent. Must be taken in sequence.

4010 Masterpieces of French Literature in English Translation (3) No foreign language credit. A

4020 Masterpieces of French Drama in English Translation (3) No foreign language credit. A

4110-20-30 French Literature of the Seventeenth Century (3, 3, 3) Prereq: Intermediate French or equivalent. A

4150 Theatrical French (1-3) Performance in one or more French plays. Prereq: Intermediate French or equivalent and consent of instructor. May be repeated with consent of department. A

4160-70-80 Advanced Conversation (2, 2, 2) Intensive training in prepared and spontaneous conversations. Subjects range from travel and current events to literature and aspects of national culture. Prereq: Completion of 9 hrs of courses on 3000 level. F; W; Sp

4210 Phonetics (3) Prereq: 2130, 2520, or equivalent. F

4220-30 Advanced Grammar (3, 3) Prereq: 2130, 2520, or equivalent. W; Sp

4250 Introduction to Descriptive Linguistics (3) Prereq: Elementary morphology and syntax. Types of languages, linguistic groups, dialects and dialect geography. Application of descriptive linguistics—field linguistics, dialect study; its practical use in learning languages and in language teaching. Introduction to transformational grammar. Prereq: 9 hrs of upper division English 9 hrs of upper division courses in a modern or ancient language (exclusive of German and French 3010-20-30, courses in literature, in translation, and general courses in Latin and Greek requiring no knowledge of these languages), or consent of department. (Same as German, Russian, Spanish and Linguistics 4260.) F

4260 Introduction to Historical and Comparative Linguistics (3) (Same as German, Russian, Spanish and Linguistics 4260.) W

4270 Introduction to Romance Linguistics (3) Development of Classical Latin through Vulgar Latin into the major Romance languages. (Same as Spanish and Linguistics 4270.) Sp

4310-20-30 French Literature of the Eighteenth Century (3, 3, 3) Prereq: Intermediate French or equivalent. A

4350-60-70 Medieval French Literature (3, 3, 3) Medieval works in modern French texts. Prereq: Intermediate French or equivalent. A

4410-20-30 French Civilization (3, 3, 3) Prereq: Intermediate French or equivalent. A

4510-20-30 French Literature of the Sixteenth Century (3, 3, 3) Prereq: Intermediate French or equivalent. A

4710-20-30 French Literature of the Twentieth Century (3, 3, 3) Prereq: Intermediate French or equivalent. A

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

5020 Non-Thesis Graduation Completion (3-15) Required for the non-thesis student not otherwise registered during any quarter when such a student uses university facilities and/or facility time before degree is completed. May not be used toward degree requirements. May be repeated. S/NC only. E

5011 Techniques in Literary Analysis (3) Required for either Plan A or Plan B of M.A. program. Intensive course in explication de texte F

5101 Foreign Study (1-12) See page 96. E

5102 Off-campus Study (1-12) See page 96. E

5103 Independent Study (1-12) See page 96. E

5110-20-30 Old French (3, 3, 3) Medieval French language and literature. A

5121 College Teaching of Romance Languages (3) Seminars, demonstrations, and practical applications of techniques and procedures for teaching and evaluating basic language skills, cultural aspects and beginning literature. Required of all M.A. and Ph.D. students holding Graduate Teaching Assistantships except those whose previous training or experience warrants their being excused by department. F

5151-61-71 Bibliography and Methods of Research (1, 1, 1) (Same as Italian and Spanish 5151-61-71.) S/NC only. A

5210-20-30 French Literature of the Sixteenth Century (3, 3, 3) A


5241 French Theatre of the 18th and 19th Centuries (3) Development of new dramatic forms and evolution of traditional forms in serious and comic theatre of eighteenth and nineteenth century France.

5310-20-30 French Directed Readings (3, 3, 3) E

5350-60-70 The Philosophes (3, 3, 3) Textual analysis of the works of Voltaire, Diderot, Rousseau, and other eighteenth-century writers. A

5410-20-30 The French Novel (3, 3, 3) A

5450-60 Lyric Poetry of the Nineteenth Century (3, 3) (5450—German and English influences on French Romanticism and generation of the poets of "le mal du siecle." 5460—Victor Hugo; the Parnassians.) A

5470 Baudelaire and the Symbolists (3) Les Fleurs du mal and Petits poèmes en prose with emphasis on theories of color and "correspondances" and their influence on Symbolist school. A

5510-20-30 Trends in Contemporary French Literature (3, 3, 3) A

5560-60 Advanced Syntax and Stylistics (3, 3) Readings and written imitations of modern literary styles in form of compositions, sketches, and original stories.

5670 Problems in Linguistics: Romance Languages (3) Topics vary. Prereq: 4250 or consent of instructor. May be repeated. Maximum 6 hrs with consent of department. (Same as Spanish 5670.)

5710-20-30 Seminar in French Literature (3, 3, 3) Topics vary. May be repeated with consent of department. Su

5910 Literary Criticism: The Foundations of Romanic Criticism (3) (Same as Spanish 5910.) A

**Italian**

3310 Italian Literature in English Translation (3-4) Sicilian School. Dante, Petrarca, Boccaccio, Machiavelli, Ariosto, Tasso. No change in credit hours after add deadline. Option of 4 hrs credit must present appropriate amount of extra work above that required for 3 hrs. A

3510-20 Aspects of Italian Literature (4, 4) Prereq: Intermediate Italian or equivalent. Recommended for literature majors. F; W

4010-20 Italian Drama in English Translation (3-4, 3-4) 4010—La commedia dell'arte and major works of Machiavelli, Metastasio, Alfieri, Goldoni. 4020—Twentieth-century theatre; operatic drama, the Grottesco, Pirandello, De Filippo, Frati. No change in credit hours after add deadline. Option of 4 hrs credit must present appropriate amount of extra work above that required for 3 hrs. A

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

4220 Petrarch (3) Prereq: 3130, 3520 or equivalent. A

4230 Boccaccio (3) Prereq: 3130, 3520 or equivalent. A

4330 History of Italian Language (3) Prereq: 3130, 3520 or equivalent. A

4410-20-30 Literature of the Rinascimento (3, 3, 3) From Pulci to Tasso, the Quattrocento and the Cinquecento. Prereq: 3130, 3520 or equivalent. A

4530 The Modern Novel (3) Prereq: Intermediate Italian or equivalent. A

4540 The Modern Theatre (3) Prereq: Intermediate Italian or equivalent. A

4610 Contemporary Theatre (3) Prereq: Intermediate Italian or equivalent. A

4620 Contemporary Poetry (3) Prereq: Intermediate Italian or equivalent. A

4630 Contemporary Prose (3) Prereq: Intermediate Italian or equivalent. A

4780 Italian Folklore (3) Folk arts, music, traditions, rituals and lore of Italy from Middle Ages to present. (Same as Anthropology 4760.)
5011 Techniques in Literary Analysis (2) Intensive course in explicacion de texto. A
5101 Foreign Study (1-12) See page 96. E
5102 Off-campus Study (1-12) See page 96. E
5103 Independent Study (1-12) See page 96. E

Portuguese
3510-20 Aspects of Portuguese Literature (4, 4) Prereq. Intermediate Portuguese or equivalent. Recommended for literature majors. F, W
4310-20-30 Directed Readings in Brazilian and Portuguese Literature (3, 3, 3) May be repeated with consent of department. A
5101 Foreign Study (1-12) See page 96. E
5102 Off-campus Study (1-12) See page 96. E
5103 Independent Study (1-12) See page 96. E

Spanish
4030 Masterpieces of Spanish Literature In English Translation (3) No foreign language credit. A
4050-50-70 Hispano-Arabic Literature and Culture (3, 3, 3) A
4110-20-30 Spanish Literature of the Golden Age (3, 3, 3) The picaresque novel: Cervantes: the Comedia. A
4140 Theatrical Spanish (1-3) Performance in one or more Spanish plays. Prereq. Intermediate Spanish or equivalent and consent of instructor. May be repeated with consent of department. Maximum 6 hrs.
4160-70-80 Advanced Conversation (2, 2, 2) Intensive training in prepared and spontaneous conversations. Subjects range from travel and current events to literature and aspects of national culture. Prereq. Completion of 9 hrs of courses on 3000 level. F, W, Sp
4210 Phonetics (3) Prereq. 2130, 2520, or equivalent. F
4220-30 Advanced Grammar (3, 3) Prereq. 2130, 2520, or equivalent. W, Sp
4250 Introduction to Descriptive Linguistics (3) (Same as French, German, Russian, Linguistics 4250.)
4260 Introduction to Historical and Comparative Linguistics (3) (Same as French, German, Russian, and Linguistics 4280.) W
4270 Introduction to Romance Linguistics (3) (Same as French and Linguistics 4270.) Sp
4410 Spanish Civilization (3) Prereq. Intermediate Spanish or equivalent. F
4420-30 Latin American Civilization (3, 3) Prereq. Intermediate Spanish or equivalent. W, Sp
4456 Studies in Modern Spanish Style (3) Prereq. 3410-20-30 or consent of instructor. F
4510 Special Topics in Nineteenth Century Spanish Literature (3) Prose, poetry and theatre of Spain in the nineteenth century. Genre, movement, or combination of literary aspects. Prereq. Intermediate Spanish or equivalent. May be repeated with consent of department. Maximum 9 hrs. A
4710-20-30 Spanish Literature of the Twentieth Century (3, 3, 3) 4710—Non-dramatic prose fiction. 4720-30 Lyric poetry. Prereq. Intermediate Spanish or equivalent. A
4810-20-30 Topical Survey of Spanish American Literature (3, 3, 3) 4810—Prose fiction: major examples of the short story and novel. 4820—Poetry: landmark figures of past and present. 4830—Drama and essay: the modern period. A
5000 Thesis (1-15) F,P,N,P only. E
5002 Non-Thesis Graduation Completion (3-15) Required for the non-thesis student not otherwise registered during the quarter when such a student uses university facilities and faculty time before degree is completed. May not be used toward degree requirements. May be repeated. S/NCR only. E
5110 Techniques in Literary Analysis (3) Required for either Plan A or Plan B of M.A. program. An intensive course in explicacion de texto. F
5070-50-60 Hispano-Arabic Culture and Literature (3, 3, 3) 5070—General culture history, philosophy in Arab Spain. 5080—Development of traditional marketplace story, or episodic prose narrative, into modern novel of character after invention of printing. 5090—Mutual influence of traditional Arabic poetry and popular and native Spanish choral lyric; developmental of classical muwashshah, the coloquial zajal, and the later vilancico. Readings in Arabic and Spanish. A
5101 Foreign Study (1-12) See page 96. E
5102 Off-campus Study (1-12) See page 96. E
5103 Independent Study (1-12) See page 96. E
5110-20-30 Old Spanish (3, 3, 3) Medieval Spanish language and literature. A
5121 College Teaching of Romance Languages (3) Seminars, demonstrations, and practical applications of techniques and procedures for teaching and evaluating basic language skills, cultural aspects, and beginning literature. Required of all M.A. and Ph.D. students holding Graduate Teaching Assistantships except those whose previous training or experiences warrant their being excluded by department. F
5151-61-71 Bibliography and Methods of Research (1, 1, 1) (Same as French and Italian 5151-61-71.) S/NCR only. A
5211-20 Don Quixote (3, 3) Must be taken in sequence.
5212-32 Golden Age Prose (3, 3) 5212—La Celestina: critical study of Fernando de Rojas' life and work. Celestinesque genre: Feliciano de Silva's Segunda Celestina, 5232—Guzman de Alfarache and Spanish picaresque genre. A
5250-60 The Generation of '93 (3, 3) Angel Gavinet, Giner de los Rios, Baroja, Unamuno, Valle Inclan, Benavente, Azorin, Perez de Ayala. A
5270 The Contemporary Novel (3) Civil War and post-Civil War period. A
5310-30 Directed Readings (3, 3) E
5311-21 Special Topics in Spanish or Spanish American Literature (3, 3) May be repeated. A
5340 Problems in Hispanic Culture (3) Prevailing social, political, artistic, literary and ideological conditions and patterns of any area or period within Spanish or Latin American culture. May be repeated with consent of department. Maximum 6 hrs. A
5510 Special Topics in the Spanish Theatre after the Golden Age (3) Spanish theatre from nineteenth century to present. May be repeated with department consent. Maximum 9 hrs. A
5550-60 The Golden Age Theatre (3, 3) 5550—Introduction to Spanish Theatre. Lope and Tirso. 5560—Castron, Alarcn, Moreto and Calderon. A
5610 Latin American Prose to 1900 (3) Novel, chronicle, essay. A
5611-21 Spanish American Lyric Poetry (3, 3) A
5620-30 The Modern Novel in Spanish America (3, 3) A
5631 Spanish American Essay (3) A
5632 The Spanish American Short Story (3) Short story as major literary genre in Spanish America. Reading and criticism of works of authors such as Darío, Quiroga, Borges, Areola, and Rulfo. A
5633 Twentieth-century Latin American Theatre and Film (3) Readings from works of Carlos, Sororzo, Rodolfo Usigli, Conrado Nale Rixo, Roberto Coss, Rene Marques and Sebastian Salazar Bondy. Presentation of films as adaptations of classics such as Doña Bárbara, Los de abajo and Don Segundo Sombra as well as exponents of experimental cinema of today. A
5640 Latin American Women Writers (3) Feminine point of view, modern image of woman, female-male relationships and society as context for woman's destiny. Readings from poetry and fiction, including such authors as Alfonsina Storni, Delmira Agustini, Gabriela Mistral, Silvina Bullrich, Silvina Ocampo and Rosario Castellanos. A
5650-60 Advanced Syntax and Stylistics (3, 3) Readings and written imitations of modern literary styles in compositions, sketches, and original stories. A
5670 Problems in Linguistics: Romance Languages (3) (Same as French 5670.) A
5680-20-30 Spanish Lyric Poetry (3, 3, 3) A
5910 Literary Criticism: The Foundations of Romance Criticism (3) (Same as French 5910.) A
6000 Doctoral Research and Dissertation (3-15) Pr,P,N,P only. E
6210-20-30 Seminar in Spanish Literature (3, 3, 3) Topics vary in field of Peninsular Literature. May be repeated with consent of department. A
6310-20-30 Seminar in Latin American Literature (3, 3, 3) Topics vary. May be repeated with consent of department. A

Russian
See German

Sociology
MAJOR
DEGREES
Sociology
M.A., Ph.D.

Professors:
D. R. Floch (Head), Ph.D. North Carolina; J. A. Black, Ph.D. Iowa; J. D. Champion, Ph.D. Purdue; L. Berson, Ph.D. Pennsylvania; D. Hastings, Ph.D. Massachusetts; N. Shover, Ph.D. Illinois; S. Wallace, Ph.D. Minnesota.

Associate Professors:

Assistant Professors:
S. C. Fisher, Ph.D. California (San Diego); S. Kurth, Ph.D. Illinois; M. Phillips, Ph.D. Michigan; K. Ritter, Ph.D. Washington. A

For a full statement of departmental requirements, students are referred to the Departmental Graduate Manual. All registration for 3000- and 4000-level courses require the consent of the instructor.

THE MASTER'S PROGRAM
The department offers both a thesis and non-thesis option for a Master's degree. For information concerning the Master's degree, see the General Requirements on page 18. Those interested in the non-thesis option should obtain details from the

Assistants:
THE DOCTORAL PROGRAM

General requirements for the degree of Doctor of Philosophy in Sociology include:
1. A minimum of 108 credit hours following the Bachelor's degree, exclusive of 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 5000 or 6000.
2. A written comprehensive examination covering sociological theory, research methodology, and two other areas in sociology must be passed prior to admission to candidacy. This examination must be passed not later than one academic year before the date on which the degree is granted.
3. No later than one month before granting of the degree, the candidate will be required to pass an oral examination on the doctoral dissertation. At the oral examination the candidate will be expected to show a thorough knowledge of sociological theory and methodology related to the research.

4030 Society and Law (4) General treatment of social processes and changes of law and legal processes. Particular emphasis is placed on problems of law and social change, and on structure and functioning of legal sanctions. Some attention is paid to law and law-like phenomena in formal organizations and primitive societies.

4110 Population Problems (4) Demographic factors and social structure; trends in fertility, mortality, population growth, migration, distribution, and composition; population policy.

4120 Topics in Social Psychology (4) (Same as Psychology 4120.)

4130 Sociology of Punishment and Corrections (4) Traces development of corrective movement, develops a critical sociological perspective on contemporary correctional programs, and provides overview of evaluative research in corrections.

4150 Theory of Attitudes and Values (4) Organization, functions and measurement of attitudes and values; approaches to attitude change; and relationship to attitudes, values and behavior.

4310 Criminology (4)

4330 Urban Ecology (4) Examination of public, private, collective, and individual space. Classical school of ecology, its neoclassical revisers, social area analysis, and cognitive symbolic ecology emphasized.

4410 Educational Sociology (3) (Same as Curriculum and Instruction 4410.)

4530 Community Organization (4) Structure; functions; change; and development and important community studies are reviewed and discussed. Emphasis on sociological analysis, not on the implementation of change.

4540 Social and Religious Change (4) Critical review of historical and contemporary theories and methods employed in study of social change. Attention given to both macro and micro group change. (Sociology 4530.) A

4560 Formal Organization (4) Analysis of bureaucratization process, division of labor, delegation of authority, channeled communication under a system of rational norms.

4820 American Minority Groups (4) Minority groups and social structure in American society, analysis of intergroup relations with attention given to both past and present relationships of selected groups to broader society.

4930 Social Movements (4) Development, organization, and function of social movements; attention is given to the identification of leadership and organization of political, religious and other types of social movements.

4940 Sociology of Religion (4) Interrelationship of society, culture, and religion. (Same as Religious Studies 4840.) A

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

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

5100 Professional Seminar (1) Limited to sociology graduate teaching assistants to graduate assistants. May be repeated. Maximum 4 hrs. S/NC only. W, Sp

5210 Social Theory (3) F

5230 Seminar in Sociology of Medicine (3) May be repeated with consent of instructors. Maximum 3 hrs.

5300 Methods of Sociological Research I (3) Assumptions and foundations of sociological research strategies and techniques.

5410 Seminar in Methods of Sociological Research (3) Major methodological issues in sociology; scaling techniques; reliability, validity, sampling, and qualitative methodology.

5520-30 Social Statistics (3, 3) General survey of parametric and nonparametric procedures in analysis of sociological data and in constructions underlying procedures; advantages, disadvantages, and special applications. Must be taken in sequence. F; W

5550-55 Statistical Analysis in the Social Sciences I, II, III, Topics include multiple regression, correlation, analysis of variance, data mining, and measurement of association, sampling, significance tests, and confidence limits. Extensive use of social science computing packages.

5470 Foundations of Social Psychology (3) Current and classical theoretical perspective in social psychology. May be used for credit in psychology.

5480 Foundations of Social Conflict and Change (3)

5510 Delinquency and the Social Structure (3) Critical assessment of contemporary theories of delinquency, research findings related to them, and their implications for formal strategies of control and rehabilitation.

5520 Crime, Law, and Social Control (3)

5650 Demographic Techniques (3) Life, table, standard rates, and survey techniques of population analysis. A

5660 Seminar in Community (3)

5680 Historical Demography (3) Family reconstitution, aggregate analysis, strategies for examining documents containing information on population. Research findings on historical patterns of change in fertility, mortality, migration and different types of family structure. A

5710 Seminar in Collective Behavior and Social Movements (3)

5720 Social Interaction (3) Critical assessment, through reading and actual research, of contemporary theoretical orientations to study of small groups. Research designed to test selected theoretical problems. May be repeated. Maximum 6 hrs.

5740 Seminar in Social Attitudes (3)

5810 Seminar in Race and Culture (3) Critical examination of theoretical and conceptual approaches in study of intergroup relations. A

5830 Social Differentiation and Stratification (3) Various sources of differentiation in society, their relation to conflict in society, and their relationship to class structure in society.

5840 Seminar in Occupations (3) Occupations and their relation to intergroup and social stratification; technology and occupations; unequal rewards and occupations; social organization and occupations.

5850 Seminar in Occupations (3) Continuation of material in Sociology 5840; interface between occupations and settings in which they are performed.

5870 Social Organization (3) Structure and function of human groups, with special attention to voluntary associations and administrative organizations.

5880 Seminar in Research Problems in Inter-group Relations (3) Research techniques and problems as encountered in race and intergroup relations are explored; actual field research projects are performed.

5890 Sociology of Development and Modernization (3) Comparative approach to institutional and organizational correlates of modernization. Relations between urbanization, industrialization, and modernization.

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

6050 Seminar on Methods of Social Research (3) Experimental research projects. (Same as Psychology 6050.)

6220 Advanced Social Theory I (3) Prereq: 5410 or consent of instructor.

6230 Advanced Social Theory II (3) Prereq: 5410 or consent of instructor.


6350 Field Research (3) Prereq: 5300-10 or consent of instructor.

6360 Field Research Practicum (3)

6410 Tutorials in Advanced Topics (3) Individual instruction. Prereq: Consent of department. 6410 and 6420 may be repeated in any combination for a maximum of 18 hrs.

6420 Special Topics (3) Topic of special interest or student-initiated course which will not be regularly offered. Prereq: Consent of instructor. 6410 and 6420 may be repeated in any combination for a maximum of 18 hrs.

6520 Sociology of Deviance (3) Advanced studies in deviant behavior. Theories and findings regarding causes and procedures and programs for social control. Prereq: 4310 and 5520.

6530 Sociology of Law (3) Analysis of social and cultural factors influencing emergence and maintenance of law as social institution and affecting relationships between law and deviant behavior; appraisal of theoretical and methodological issues encountered in studying law. A

6640 Seminar in Environmental Sociology (3)

6650 Urban and Regional Sociology (3) Prereq: Consent of instructor.

6660 Human Fertility (3) Historical, topical, regional, and methodological approaches to human fertility and demographic problems. Consideration of relations between socioeconomic and demographic change in various parts of world; fertility rates and national power; controversies on control of vital rates of growth. Prereq: 5650 or consent of instructor.

6670 Theory and Methods of Human Ecology (3) Theoretical perspective and research techniques of
human ecology applied to selected research sites. Prereq: Consent of instructor.

6680 Theory and Research in Human Migration (3) Prereq: 5560 or consent of instructor.

6690 Population Theory (3) Malthus, Marx, optimum population, and selected variables. Prereq: 5650 or consent of instructor. A

6730 Advanced Studies in Social Psychology (3) Social interaction and personality; genetics and functioning of self; interplay of social structures and individual actions; theories of social psychology related to these problems and recent research are discussed. May be repeated. Prereq: 5470 or consent of instructor.

6740 Formal Organization (3) Major formal organizational theories; bureaucracy; functions of theoretical models of organizations; major organizational variables; organizational authority patterns; communication in formal organizations. Prereq: 5470 or consent of instructor. A

6750 Formal Organization (3) Organizations, organizational change and effect of technology; social consequences of automation; unionization and organizational change and effect of technology; socialization of self; interplay of social structures and individual actions; theories of social psychology related to these problems and recent research are discussed. May be repeated. Prereq: 5470 or consent of instructor.

6780 Mass Behavior (3) Prereq: 5470 or consent of instructor.

6790 Socialization (3) Process to learn cognitive systems and forms of behavior of social world. Examination of main currents in socialization theory and research. Prereq: 5470 or consent of instructor. May be repeated with different instructors. Maximum 6 hrs.

6820 Political Sociology (3) Political system from societal, organizational, and group perspectives.

6830 Seminar in Class and Status (3) Classic and recent studies of class and status. Methods used in research and current position of theory. Prereq: 5480 or consent of instructor.

6840-60 Social Change (3, 3) Major theories, methods and research.

6850 Seminar on Community Power (3) Analysis of theories and methods used in studying social power in communities. Prereq: 5480 or consent of instructor.

Spanish

See Romance Languages

Speech and Hearing Sciences

See Audiology and Speech Pathology

Speech and Theatre

DEGREES

M.A. M.F.A.

MAJOR

Speech and Theatre

Theatre

Assistant Professors:

R. S. Ambrose, Ph.D. Ohio State; B. V. Daniels, Ph.D. Cornell; L. J. DeCuir, M.F.A. Tulane; M. E. Hampton, Ph.D. International College (Los Angeles).

The Department of Speech and Theatre offers the Master of Arts degree in Speech and Theatre with area concentrations in speech communication and theatre and the Master of Fine Arts in Theatre with area concentrations in acting and directing, playwriting, and design and technical theatre.

In their prospective concentrations at the Master's level, i.e., speech or theatre, applicants must have completed undergraduate degrees approximately equivalent in requirements to those specified for degrees conferred by The University of Tennessee, Knoxville.

The Graduate Record Examination is required of all applicants. All M.F.A. applicants must submit two letters of recommendation. Auditions before appropriate faculty are required of M.F.A. acting/directing applicants. Applicants for admission to M.F.A. design/technical theatre and playwriting programs must submit samples of their work.

For detailed information about the graduate program, contact the Director of Graduate Studies, Department of Speech and Theatre.

MASTER OF ARTS DEGREE CURRICULUM

The departmental requirement for the M.A. degree in Speech and Theatre is 45 quarter hours (inclusive of hours taken toward a minor), at least 30 hours of which must be earned in courses numbered 5000 or above. Only 9 hours of thesis credit (Speech and Theatre 5000) may be included in the 45-hour minimum for the degree. Speech and Theatre 5110 is required of all M.A. students. Area concentration requirements are as follows:

Speech Communication

(1) Enrollment in Speech 4999 during each quarter of full-time graduate study.

(2) 12 hours in rhetorical and communication theory.

(3) 9 hours in public and interpersonal communication.

(4) 3 hours in one of the following: Speech Communication 5110, Theatre 5110, and Speech and Theatre 5175 in each of the three areas of study: theatre, communication, and speech.

(5) At least 9 hours (and no more than 12 hours) in performance and production courses may be included in the 45-hour minimum for the degree.

(6) More than 6 hours in projects courses.

MASTER OF FINE ARTS DEGREE CURRICULUM

At least 60 quarter hours, 40 of which must be at the 5000 level or above, are required for the Master of Fine Arts degree in Theatre. The number of hours each student will carry per quarter will vary with the student's concentration. The distribution of courses within the department may necessitate some students' accumulating more than 60 hours in order to earn the degree, but no student should require more than two years to finish the program. Ten to twelve hours of theatre history during the first year of residence are mandatory for all students unless appropriate undergraduate coursework is evidenced.

Theatre 5011-12-13 is required of all except acting students. Students will be admitted to the directing concentration only by petition after the first year of the acting/directing program is completed.

REQUIREMENTS FOR SECOND MASTER'S DEGREE

Students admitted to the MFA program who have already earned a Master's or a doctoral degree may apply up to 15 credit hours from the previous graduate program to the MFA degree, with approval of the student's committee, the Dean of the College of Liberal Arts, the Dean for Graduate Studies and/or the Vice Chancellor for Graduate Studies and Research.

Any such credits applied from a previous graduate program would be from courses that are directly relevant to the student's MFA curriculum, and must have been earned within the time limits (6 years) established for completion of the MFA degree.

Speech

4222 Advanced Argumentation and Debate (4) Prereq: 2331 or consent of instructor. Sp

4461 Quantitative Research Methods in Speech Communication (4) Designing experiments; planing field studies; using statistical analysis.

4541 Rhetorical Theory and Criticism (4) Survey of Western rhetorical theory; contemporary approaches to criticism of public address. Recommended: 1211.

4560 Rhetoric of the Women's Rights Movement (4) Historical and critical study of public addresses in campaign for women's rights from the 1830s to present.

4571 British Oratory (4) Historical and critical study of British public address. Sp. A

4591 Persuasive Uses of Imaginative Literature (4) Topics in social and political uses of novels, plays, and poems. W

4811 Advanced Phonetics (4) Phonetic aspects of contemporary dialects of the English language. Prereq: Consent of instructor. Sp. A

4930 Studies in American Public Address (4) May be repeated. Maximum 12 hrs.

4999 Colloquium in Speech Communication (1) May be repeated. E

5140 Communications Theory (3) Analysis of contemporary theories of human communication, emphasizing similarities and differences of communication processes in interpersonal, intergroup, and mass communications systems. F

5210 Topics in Group and Interpersonal Communication (3) May be repeated. Maximum 9 hrs. Sp

5220 Quantitative Projects in Speech Communications (3) May be repeated. Maximum 9 hrs. Sp

5440 Organizational Communication (3) May be repeated. Maximum 9 hrs. F

5550-60-70 Studies in Persuasion (3, 3) W

5750-60-70 Studies in Rhetoric (3, 3) F

5911 Directing the Forensic Program (4)Philosophy and methods of directing cocurricular and extracurricular forensic activities in high schools and colleges: competitive and noncompetitive approaches to directing debate, oral interpretation and public speaking events. (Same as Curriculum and Instruction 5911)
Speech and Theatre

4640 Group Performances of Literature (4) Oral interpretation and ensemble reading, theatre and chamber theatre. F, W

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

5002 Non-Thesis Graduation Completion (3-15) Required for the non-thesis student not otherwise registered during any quarter when such a student uses completion of a special research project of the student's major. Prereq: 2211-21, and/or faculty line. Degree is completed. May not be used toward degree requirements. May be repeated. S/NC only. E

5110 Introduction to Graduate Research in Speech and Theatre (3) F

5120 Directed Reading and Research (3) May be repeated. Maximum 8 hrs. E

5160 Theory and Technique in Oral Interpretation (4) The psychological, communicative, and aesthetic approaches to collection, adaptation, and oral presentation of literature. May be repeated. Maximum 8 hrs. W, Sp

Theatre

3214-15 Technical Theatre (4, 4) Special techniques in scenery and property construction; stage management; and problems in basic technical theatre practice. Prereq: 2211-21, or consent of instructor. Must be taken in sequence. Graduate credit available to Theatre MFA students only.

3211-22 Introduction to Scene Design (4, 4) Scene design and rendering of setting for the stage. Prereq: 3321-22, or consent of instructor. Prereq: 2211-21 and Consent of Instructor. Must be taken in sequence. Graduate credit available to Theatre MFA students only.

3252-53-54 History of the Theatre (4, 4, 4) Drama in performance with particular emphasis on theatre architecture, scenic and lighting design, and acting styles. 3252—Antiquity to the Renaissance. 3253—The European Theatre, 1650-1850. 3254—Modern Theatre. Graduate credit available to Theatre MFA students only.

3262-63 History of American Theatre (3, 3) Development of theatre as social institution in American life. 3262—from its beginnings to 1900. 3263—from 1900 to present. Graduate credit available to Theatre MFA students only.

3221-22 Introduction to Lighting Design (4, 4) Mechanics of stage lighting; elementary theory; principles and methods for directing high school dramatic programs. (Same as Curriculum and Informatics 4241) Prereq: 2211-21, or consent of instructor. Must be taken in sequence. Graduate credit available to Theatre MFA students only.

3511-12 Projects in Lieu of Thesis (3, 3) Available to Theatre M.F.A. students only. S/NC only.

5250 Seminar in Playwriting (3) Sp

5310 Studies in European Theatre History (3) May be repeated. Maximum 8 hrs. F, W

5320 Studies in American Theatre History (3) May be repeated. Maximum 9 hrs. F, W

5620 Projects in Lighting Design (3) May be repeated. Maximum 9 hrs. E

5630 Projects in Play Directing (3) May be repeated. Maximum 9 hrs. E

5640 Projects in Scene Design (3) May be repeated. Maximum 9 hrs. E

5650 Projects in Costume Design (3) Problems of play interpretation and theatrical costume design centralizing around individual projects. Students will design costumes for complex play for public performance. May be repeated. Maximum 9 hrs. E

5660 Projects in Technical Theatre (3) Projects of set design, interpretation, and execution. E

5670-71-72-73-74-75 Master Class in Acting (5, 5, 5, 5, 5, 5) Available to Theatre M.F.A. students only. Must be taken in sequence. Graduate credit available to Theatre MFA students only.

5680-81-82 Design and Technical Theatre Seminar (1-6, 1-6, 1-6) Available to Theatre M.F.A. students only. Must be repeated. Maximum 6 hrs.

5800 Studies in Theatrical Production (3) May be repeated. Maximum 9 hrs. Sp

5912 Play Production in Secondary Schools (4) Principles and methods for directing high school dramatic programs. (Same as Curriculum and Instruction 5912) Su

5920-50-70 Studies in Dramatic Theory and Criticism (3, 3, 3) F, W, Sp

Speech Pathology

See Audiology and Speech Pathology

University Studies

(Non-Departmental)

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

4100 Energy Needs and Our Environment (3) Problems of present and projected energy resources and demands; economic, behavioral, legal, technical and environmental opportunities and constraints; regional shifts in energy production and consumption. Topical focus will change from quarter to quarter. May be repeated with consent of instructor. Must be repeated for graduate credit by Ecology majors.

4441-42 Advanced Play Directing (4, 4) Problems of play interpretation; directing period plays; preparation of a play for public performance. Prereq: 3451-52 and consent of instructor. Must be taken in sequence. F, W

5441-42 Advanced Theatre Costume Design (4, 4) Advanced problems in costume design and construction of costume draftings; draping. Prereq: 3511 or 3512. W, Sp

4751-52 Dramatic Theory and Criticism (3, 3) W, Sp

4951-52 Playwriting (4, 4) Prereq: Consent of Instructor. F, W

5011-12-13 Projects in Lieu of Thesis (3, 3, 3) Available to Theatre M.F.A. students only. S/NC only.

5200 Directed Reading and Research (3) May be repeated. Maximum 8 hrs. E

Zoology

MAJOR DEGREES

M.S., Ph.D.

Professors:

J. H. Aber (Head), Ph.D. Brown; R. M. Bagby, Ph.D. Illinois; D. L. Bunting, Ph.D. Arizona; and/or faculty line. Degree is completed. May not be used toward degree requirements. May be repeated. S/NC only. E

J. G. Carlson (Emeritus), Ph.D. Pennsylvania; A. C. Cowe, Jr. (Emeritus), Ph.D. Ohio; J. C. Daniel, Ph.D. Colorado; D. A. Elmer, Ph.D. Minnesota; R. C. Fraser, Ph.D. Minnesota; B. Hochman, Ph.D. California (Berkeley); J. C. Howell (Emeritus), Ph.D. Cornell; E. T. Howley, Ph.D. Wisconsin; K. W. Keon, Ph.D. London (England); A. W. Jones (Emeritus), Ph.D. Iowa; J. R. Kennedy, Ph.D. Iowa; J. W. Lille, Ph.D. Ohio State; L. E. Roth, Ph.D. Chicago; C. A. Silvera, Ph.D.D. Michigan State; J. T. Tanner (Emeritus), Ph.D. Cornell; S. R. Tipton (Emeritus), Ph.D. Duke; H. G. Wilch, Ph.D. Florida; G. L. Whiston, Ph.D. Iowa

Associate Professors:

K. D. Burnham, Ph.D. Iowa; A. C. Echternacht, Ph.D. Kansas; A. A. El-Banna, Ph.D. Washington State; J. D. Fox, Ph.D. Johns Hopkins; M. A. Handel, Ph.D. Kansas State; J. A. MacCabe, Ph.D. California (Davis); M. L. Pan, Ph.D. Pennsylvania; S. L. Pimm, Ph.D. New Mexico State; S. E. Ricci, Ph.D. Wisconsin; G. A. Vaughan, Ph.D. Duke; M. C. Whitcomb, Ph.D. Indiana

Assistant Professors:

T. T. Chees, Ph.D. Alberta; D. L. Etkin, Ph.D. Indiana; N. Greenberg, Ph.D. Rutgers; G. F. McCracken, Ph.D. Cornell

The Department of Zoology offers the Master of Science and Doctor of Philosophy degrees with concentrations in aquatic zoology, invertebrates, vertebrates, zoology, biogeography, biometry, biochemistry, biogeography, bioethics, bioecology, ecology, cell biology and molecular biology, physiology, genetics, ethology, and reproductive and developmental biology.

Requirements for admission: Applicants for graduate study are expected to have a background no less extensive than that required of undergraduate majors in this department. This includes a knowledge of the basic principles of cell biology, genetics, and ecology. Other requirements for admission are: (1) general zoology or general biology, 12 quarter hours; (2) upper division zoology, 12 quarter hours; (3) chemistry, two years including 12 quarter hours of general inorganic; (4) mathematics, 9 quarter hours including differential and integral calculus; (5) physics, 12 quarter hours; (6) Graduate Record Examination scores (Verbal, Quantitative and Advanced Biology); and (7) a grade point average of 3.0 or out of 4.0. Otherwise superior students, deficient in one or more of the above requirements, may be admitted at the discretion of the Graduate Affairs Committee. A course in biostatistics is required of all candidates for an advanced degree in Zoology.

All aspirants for advanced degrees in Zoology must exhibit competency in six areas of zoology as determined by a qualifying examination. Students must take this examination during the fall quarter of the first year and may repeat the examination the following fall quarter if unsatisfactory scores are received. Competency must be exhibited within this two-year period for a student to continue in the program. Preparation for the qualifying examination includes coursework and a special research problem in each of two faculty members' laboratories which will determine the student's preparation for thesis or dissertation study.
THE DOCTORAL PROGRAM

Special requirements in Zoology are as follows: (1) course requirements shall be determined by the candidate's faculty committee; (2) the comprehensive examination will be oral and written examination in zoology and in allied fields in which the candidate has had training; (3) the candidate for the Ph. D. degree must possess a reading knowledge of at least one foreign language in which there exists a sizeable amount of literature that is a major field of study. The student has the option of demonstrating a reading knowledge of this foreign language by (a) passing the official reading examination given by the language department or (b) earning at least a B in the third quarter of a language course. This requirement for the first language must be fulfilled before the student can take the comprehensive examination.

The student's faculty committee may require of the student any level of training or proficiency in a second foreign language but may not require that the student take the official language examination in the second language.

3060 Comparative Vertebrate Embryology (5) Developmental morphology of selected vertebrates. 2 hrs and 3 labs. F, Sp

3060 Comparative Vertebrate Anatomy (5) Phylogeny and anatomy of organ systems. Dogfish shark and cat primarily used in laboratory. 3 hrs and 2 labs. W


3110 General Entomology (3) Introduction to insects: basic structure, development, behavior; classification of insect orders and representative families; interpretation and use of keys. Prereq.: Biology 3130 or consent of instructor. 3 hrs and 2 labs. F

3150 Invertebrate Zoology (5) Biology of invertebrates (except insects) with emphasis on ecology and behavior. Prereq.: Biology 3130. 3 hrs and 2 labs. W

3220 Physiology of Reproduction (3) (Same as Animal Science 3220) F, Sp

3320 Histology (4) Study of animal tissues. Prereq.: Biology 3120. 2 hrs and 2 labs. F, Sp

3410 Bioethics (3) Relationship between biological discoveries and human values. Open discussion of selected dilemmas arising from new knowledge about medicine, behavior, resources, and technology. Sp

4007-4017 Minicourse in Zoology (2 hrs each) Selected, advanced topics in zoology, concentrated in time and subject matter. Consult departmental listing for actual topics offered. Prereq.: As posted. May be repeated. E

4050 Developmental Biology (4) Experimental molecular biology, fertilization, cellular interactions, hormonal effects and related topics with examples drawn primarily from invertebrates and vertebrates. Prereq: 3320 or consent of instructor.

4120 Undergraduate Research Participation (2) Experience in active research projects under supervision of staff members. Prereq.: Consent of instructor. E

4140 Practicum in Zoology (1-3) Participation in practical application of zoology in community institutions, government organizations and industry. Approximately 5 hrs involvement per week. Prereq.: Biology 3110, 3120, 3 and senior standing. E

4190 Mammalogy (4) Classification, evolution, distribution, reproduction, populations, and behavior. 2 hrs and 2 labs or field periods. F

4200 Ichthyology (5) Classification, collection and identification, distribution, life histories, and economic importance of fishes. Prereq.: Consent of instructor. 2 hrs and 2 labs or field periods. F

4210 Cell Physiology (5) Development of modern concepts in cell physiology from point of view of information and control which examines kinetics and integration of cell biosynthesis and the effect of the cell on the body, any physiology, and organic chemistry. Recommended: Biochemistry. 3 hrs and 1 lab. Sp

4240 Animal Ecology (4) Environmental factors determining distribution and numbers of animals; interspecific relations; problems and methods. Prereq.: Biology 3130. 2 hrs and 2 labs. F

4250 Comparative Animal Physiology I (3) Environmental physiology. Survey of physiological mechanisms and their role in the survival of animals in diverse physical environments. Prereq.: Biology 3130-30 and 2 yrs chemistry. W

4259 Comparative Animal Physiology Laboratory I (1) Coreq.: 4250. W

4260 Comparative Animal Physiology II (3) Sensory, effector and integrative physiology. Prereq.: 3080. Sp

4295 Comparative Animal Physiology Laboratory II (1) Prereq.: 3080 and consent of instructor. Coreq.: 4290. Sp

4270 Immunology (3) (Same as Microbiology 4270.)

4280 Comparative Endocrinology (5) Comparative analysis of the physiology and morphology of endocrine glands in vertebrates and invertebrates. Their role and interaction in maintenance of the organism and species. Prereq.: 3080 or equivalent. W

4290 Herpetology (4) Classification, distribution, life histories, collection and identification of amphibians and reptiles, primarily of local species. 2 hrs and 2 labs or field periods. Sp

4300 Ornithology (4) Morphology, physiology, behavior, reproduction, populations, evolution, field identification, 2 hrs and 2 labs or field periods. F

4320 Microtechnique (4) Prereq.: 3320 recommended. 2 hrs and 2 labs.

4330 General Cytology (4) Study of cellular organelles at the light and electron microscope levels and the functioning of these organelles. Prereq.: Biology 3120. Sp

4369 General Genetic Laboratory (2) Mainly Drosophila experiments designed to illustrate basic principles of inheritance. Prereq.: Biology 3110. W

4380 Organic Evolution (3) Modern concepts of animal evolution. Prereq.: Biology 3110. F

4390 Human Genetics (3) Principles and problems of inheritance in humans. F

4410 General Parasitology (4) Morphology, taxonomy and ecology of parasitic worms and protozoa, with emphasis on host-parasite relationships. Prereq.: Biology 3130 or consent of instructor. 3 hrs and 1 lab. F

4460 Introduction to Aquatic Ecology (4) Physiochemical nature of inland waters. Biotic communities are described, interrelationships explored. Prereq.: Chemistry 1110-20-30, Biology 3130. 2 hrs and 2 labs. F

4700 Archrology (4) Biology of spiders, mites, scorpions, and relatives. Prereq.: 3110, or 3150. 2 hrs and 2 labs. F

4720 Comparative Animal Behavior (4) Methods and principles. (Same as Psychology 4720.) F

4729 Comparative Animal Behavior Laboratory (4) Laboratory and field studies. Coreq.: 4720. (Same as Psychology 4729.) F

4810-4830 Invertebrate Morphology and Taxonomy (4, 4, 4) 4810—Internal morphology of both generalized and specialized forms. 4820—taxonomy of major orders and immature forms. Prereq. for 4820-30: 3110 or consent of instructor. 2 hrs and 2 labs. F, Sp

4940 Physiology of Exercise (4) Functions of body in muscular work; physiological aspects of fatigue, training, and physical fitness. Prereq.: 2920-30 or 3080. 3 hrs and 1 lab. F, Sp

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

5017 Colloquium in Ethology (1) (Same as Psychology 5017.) S/NC only.

5050 Zoology Seminar (1) Advanced topics or controversial issues in zoology. May be repeated. Maximum 6 hrs. All senior Zoology majors encouraged. Required of all first- and second-year graduate students. S/NC only. F, W, Sp

5075 Zooplankton Ecology (4) Secondary productivity in aquatic systems. Prereq.: 4680 or equivalent. Su

5080 Graduate Research Participation (3) Adversarial techniques studied under supervision of staff research director whose research area coincides with interests of student. Open to all graduate students in good standing. Prereq.: Consent of department and research director. May be repeated with consent of department. S/NC only. E

5110-20-30 Special Problems (2, 2, 2) E

5150 Zoological Bibliography (1) Methods of locating and using zoological literature, bibliographies, and abstracts, and of preparing bibliographies and scientific papers.

5180 Fresh Water Invertebrate Zoology (4) Ecology and taxonomy of fresh water invertebrates exclusive of insects. Laboratory and field study. Prereq.: 3150.

5210 Plant Parasitic Nematoles (4) (Same as Entomology and Plant Pathology 5210.)


5270 Advanced Neuromuscular 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 interactions of systems with emphasis on metabolism, coordination, movement, and reproduction. Prereq.: 4810, 1 general chemistry or consent of instructor. 2 hrs and 2 labs. W, A

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

5310-20 Seminar in the Teaching of College Zoology (2, 2) Current concepts and principles in teaching of zoology: modern techniques and 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 qtr or statistics or consent of instructor. F

5358 Isotopic Methods and Techniques: Lecture (2) Theory of isotopic decay, measurement of isotopic decay by liquid scintillation counting, single and double isotope counting methods, use of Cerenkov radiation, radioimmunooassay, synthesis of metabolic intermediates, experimental design and data analysis. Coreq.: 5359. Prereq.: Upper division laboratory course or in either physiology, biochemistry, microbiology, or consent of instructor. F

5389 Isotopic Methods and Techniques: Laboratory (2) Use of liquid scintillation counter, optimization of counting parameters for single and double isotope counting, quenching and correction, measurement of Cerenkov radiation, procedures for measuring blood volume, solute uptake into cells, radioimmunooassay of steroid hormones, hormone synthesis, synthesis of metabolic intermediates and...
other topics. Coreq: 5380. Prereq: Graduate standing and one upper division laboratory course in either biochemistry, physiology, microbiology or consent of instructor. Chemistry 3810 highly recommended. F

5410 Advanced Parasitology (4) Life cycles, techniques of collection, preservation, and identification of parasitic worms and protozoa. Prereq: Consent of instructor.

5430 Advanced Medical Entomology (3) Prereq: 4430.

5510-20 Advanced Animal Physiology (5, 5) Prerequisites: mammalian physiology; 5510—membrane, neuron, central nervous system, muscle, cardiovascular system, and control mechanisms; 5520—respiratory, renal, gastrointestinal, and reproductive physiology, acid-base mechanisms, and metabolism. Should be taken in sequence if both courses are taken. Prereq: General undergraduate anatomy and physiology and Biochemistry 4110 or equivalent of consent of instructor. Biochemistry 4120 also recommended. (Same as Animal Science 5510-20.) 4 hrs and 1 lab. W; Sp

5550 Advanced Ornithology (4) Classification, distribution, and anatomy of birds. Prereq: 4300.

5570 Animal Populations (3) Characteristics and methods of study of animal populations.

5610-20 Foundations of Radiation Biology (4, 4) Physical, chemical, and biological mechanisms involved in actions of different kinds of radiations on living cell and its components. Recommended prereq: 1 yr biological science, general physics, biochemistry; calculus. (Same as Radiation Biology 5610-20.) 3 hrs and 1 lab.

5630 Methods of Experimentation with Laboratory Mammals (3) Designed to give competence in handling research mammals. Techniques of anesthesia, drug administration, radiography and surgery. Prereq: 4050, or 4410, or consent of instructor.

5650 Physiology of Development (3) Chemical aspects of growth, morphogenesis, and cytodifferentiation. Recommended prereq: Biochemistry 4110-20. F

5670 Cellular Immunology (4) Laboratory course with emphasis on immunological phenomena at cellular level. Preparation and use of immunofluorescent reagents, macrophage migration inhibition, skin allograft reactions, diffusion chamber cultures, and antibody formation at cellular level. 4 hrs and 2 labs.

5740 Physiological Ecology of Animals (2) Adaptive physiological responses of animals to natural changes in or extremes of physical and biotic environment. Emphasis on terrestrial vertebrates. Term paper including review of assigned topic with emphasis on creative development of special aspect. 1-2 hr. lec. W

5750 Physiological Ethology (3) Behavioral endocrinology and neurology from ethological perspective; reciprocal relationships of physiology and behavior in natural context. Prereq: Consent of instructor, or Psychology/Zoology 4720, or undergraduate course in physiology. W

5760 General Vertebrate Neuroanatomy (3) (Same as Psychology 5760.)

5780 Radiation Physiology (4) Effects of different kinds of radiations on functions of cells, tissues, and organ systems of animals. Recommended prereq: 5615. (Same as Radiation Biology 5780.)

5790 Transport of Ions Across Epithelia (4) Operational principles and methods needed to study electrical and kinetic properties of epithelia and electrically excitable tissues. Quantitative methods of measuring ion fluxes and flux ratios. Prereq: Two upper-division physiology courses, graduate standing, or consent of instructor. Recommended prereq: Chemistry 3810.

5820 Methods of Taxonomy (4) Classification of animals; rules of nomenclature; problems in priority; preparation of keys, descriptions, and figures. Prereq: Consent of instructor. W

5840 Aquatic Insects (4) Taxonomy and biology of aquatic insects, emphasis on immature forms. 2 hrs and 2 labs. Sp

5850 Geographic Distribution of Animals (4) Distribution patterns of vertebrate and invertebrate animals in all major habitats. Prereq: Consent of instructor.

5870 Insect Syneiology (4) Ecology of insect communities.

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

6110 Advanced Topics in Cell and Molecular Biology (1-3) Readings and discussions of recent advances in cell biology. Prereq: Biology 3120 and consent of instructor. May be repeated with consent of department. Maximum 12 hrs.

6149 Seminar in Immunobiology (2) Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.

6210 Seminar in Physiology (2) Prereq: Two physiology courses or consent of instructor. May be repeated. Maximum 6 hrs.

6310 Seminar in Cytology (2) May be repeated. Maximum 6 hrs.

6350 Seminar in Developmental Biology (2) Internal regulation in differentiating cell. Prereq: 3050, 4050; Biochemistry 4110-20. W

6410 Seminar in Parasitology (2) Prereq: 5410. May be repeated. Maximum 6 hrs.

6510 Seminar in Genetics (2) Prereq: General genetics. May be repeated. Maximum 6 hrs. F

6610 Seminar in Ornithology (2) Prereq: 4300. May be repeated. Maximum 6 hrs.

6650 Seminar in Aquatic Biology (2) Prereq: Any 2 of 4200, 4660, Botany 5061, or consent of instructor. May be repeated. Maximum 6 hrs. F, W, Sp

6710 Seminar in Ecology (2) Prereq: Consent of instructor. May be repeated. Maximum 6 hrs. W

6810 Seminar in Entomology (2) Prereq: Consent of instructor. May be repeated. Maximum 6 hrs. Sp

6910 Seminar in Radiation Biology (2) Prereq: 5610. Coreq: 5620. May be repeated. Maximum 6 hrs. (Same as Radiation Biology 6910.)
Robert L. Summitt, Dean
Joseph C. Parker, Jr., Associate Dean, Knoxville

The major campus of the College of Medicine is located in Memphis, Tennessee. The College, however, is a statewide organization with other units in Chattanooga, Jackson, and Knoxville.

In addition to Department of Medical Biology faculty listed here, the Knoxville campus has other College of Medicine faculty and students in undergraduate and graduate medical education.

The College of Medicine traces its origin to the establishment of the Medical Department of the University of Nashville in 1851. Later, through a merger of four medical schools, it became The University of Tennessee College of Medicine and moved to Memphis in 1911.

Department of Medical Biology/Memorial Research Center

Professors:
W. R. Farkas (Acting Chairman), Ph.D. Duke; J. E. Fuhr (Director), Ph.D. St. John's; C. C. Congdon, M.D. Michigan; J. B. Jones, D.V.M. Illinois; R. D. Lange, M.D. Washington (St. Louis); C. B. Lozzio, M.D. Buenos Aires (Argentina); T. P. McDonald, Ph.D. Tennessee; E. A. Machado, M.D. Buenos Aires (Argentina); P. W. Wigler, Ph.D. California (Berkeley).

Associate Professors:
J. P. Chen, Ph.D. Pennsylvania State;

Assistant Professors:
W. T. Hanna, M.D. Ain-Shams (Egypt); K. D. Lin, M.D. National Taiwan (Taiwan); F. J. Miller, A.B. Alabama.

The Department of Medical Biology of The University of Tennessee College of Medicine-Knoxville was formed from the faculty of The University of Tennessee Memorial Research Center and Hospital in 1978. The Research Center was established in 1956. Its faculty has education, research, and service interests in cancer, blood diseases, birth defects and clinical genetics, and biochemistry of disease. Courses in these areas are offered to students at the graduate and undergraduate levels. Elective courses are also available to students in the College of Medicine by special arrangement.

The faculty with the College of Veterinary Medicine participates in the graduate program leading to M.S. and Ph.D. degrees in Comparative and Experimental Medicine. Other advanced degree students can do thesis research in the department by arrangement with other life science departments at the University.

Courses
4210 Introduction to the Study of Cancer (3) Lectures, classroom discussion, and case reports surveying the major topics of oncology. Prereq: Biology 3110-20 or consent of instructor.
4310 Introduction to Hematology (4) Pathophysiology of blood and blood forming systems. Lectures, class discussions and demonstrations. Prereq: Upper division biology background to include histology and/or general anatomy.
4430 Clinical Genetics (3) Human genetic disorders, case presentations. Prereq: General biology and general genetics background or consent of instructor.
5000 Thesis (1-15) P/NP only. E
5080 Graduate Research Participation (3) Advanced research techniques studied while conducting individual biomedical research projects under supervision of faculty. Prereq: Consent of instructor. Open to all graduate students. May be repeated with consent. Maximum 9 hrs. S/NC only.
5220 Special Topics in Cancer (1-3) Special topics in oncology. Prereq: 4210 and consent of instructor. May be repeated. Maximum 9 hrs.
5320 Special Topics in Hematology (1-3) Special topics in clinical hematology. Prereq: 4310 and consent of instructor. May be repeated. Maximum 9 hrs.
5410 Molecular Basis for Metabolic Disease (5) Metabolic disorders of humans and animals. Emphasis on molecular mechanisms in inborn errors of metabolism, toxic reactions, and deficiency states. Clinical and pathologic correlations. Prereq: Biochemistry 4110-20 or equivalent.
5420 Special Topics in Metabolic Disease (1-3) Biochemical and physiological basis of selected diseases of humans and animals. Clinical-pathological correlations. Prereq: 5410 and consent of instructor. May be repeated. Maximum 9 hrs.
The Bachelor's degree is not in Nursing, the analysis, and by generating research topics by means of data collection, tabulation, and care; responsibilities; discharge of one's professional administrative and clinical practice skills in the groups in agency and community settings; and evaluation of health care delivery to large professionals in systematic implementation groups in a variety of settings; comprehensive nursing care to individuals and graduates will be able to:

1. Provide advanced high quality, comprehensive nursing care to individuals and groups in a variety of settings;
2. Collaborate with other health professionals in systematic implementation and evaluation of health care delivery to large groups in agency and community settings;
3. Utilize appropriate advanced teaching, administrative and clinical practice skills in the discharge of one's professional responsibilities;
4. Utilize appropriate research findings in the implementation and evaluation of nursing care;
5. Participate in clinical research activities by means of data collection, tabulation, and analysis, and by generating research topics for referral to nurse researchers.

GENERAL REQUIREMENTS FOR ADMISSION

1. Meet requirements for admission to The Graduate School.
2. Hold a Bachelor's degree in Nursing. If the Bachelor's degree is not in Nursing, the applicant must successfully complete the equivalent of an upper division major in Nursing as part of the M.S.N. program.
3. If the number of qualified applicants exceeds the number that can be accommodated, preference will be given to applicants:
   a. whose undergraduate GPA is 3.0 or higher;
   b. who have had at least two years of full-time clinical practice experience following completion of a baccalaureate nursing program;
   c. who are Tennessee residents;
   d. who are currently employed in underserved health service areas and who can demonstrate their commitment to return to those areas following completion of the program; or
   e. who are currently employed as nurse educators in programs preparing registered nurses; or
   f. who are currently employed as directors of nursing service.
4. Ordinarily one year of full-time clinical practice experience should be completed prior to applying for admission to the program.

DEGREE REQUIREMENTS

1. Students must complete 60 quarter hours of graduate level course work with a cumulative GPA of 3.0 or better.
2. The 60 credit hours must include the following components:
   - Core requirement: 23 hrs
   - Clinical concentration option: 20 hrs
   - Functional concentration option: 11 hrs
   - Role preparation option: 11 hrs
   - Electives: 6 hrs
3. A Master's thesis is not required, but those students who wish to complete a thesis as a part of their program may substitute the thesis for the 6 elective hours.
4. Those students who do not choose the thesis option must successfully complete a comprehensive final examination.
5. Students may choose either primary care nursing, secondary/tertiary care nursing or community mental health nursing as their clinical concentration option. Students selecting the primary care nursing option must complete 5450, 5460, 5550. Students selecting the secondary/tertiary care nursing or community mental health nursing as their clinical concentration option. Students selecting the primary care nursing option must complete 5450, 5460, 5550. Students selecting the second/tertiary care nursing or community mental health nursing as their clinical concentration option. Students selecting the primary care nursing option must complete 5450, 5460, 5550, 5560 and 5570, 5510, 5560 and a graduate level statistics course that must be approved in advance by the student's faculty advisor.
6. Students may select a role preparation option in teaching or advanced clinical practice. Students selecting the teaching option must complete 6 hours of graduate level courses in education and 5560. Students selecting the advanced clinical practice functional option must complete 5560 and 5560 if their clinical option is primary care, 5320 and 5340 if their clinical option is secondary care or 5520 and 5540 if their clinical option is community mental health. Except for electives, all courses taken in other colleges must be approved in advance by the student's faculty advisor.
7. Students whose baccalaureate degrees are not in nursing must complete the equivalent of a baccalaureate nursing major by taking or challenging a series of undergraduate nursing courses as determined by each student's major advisor.

DEGREE REQUIREMENTS FOR SECOND MASTER'S DEGREE

1. Students must complete 60 hours at the graduate level (with a cumulative GPA of 3.0) unless they already have Master's or doctoral degrees. For the latter up to 15 hours may be applied to the second Master's degree, with approval of the student's committee, Dean of the College, Dean for Graduate Studies and/or Vice Chancellor for Graduate Studies and Research.
2. Reduction of hour requirements, when appropriate, will not be used to reduce the residency requirements of the second Master's degree.
3. The 45 to 60 hours must include the following components:
Core requirement: 17 hrs
Clinical concentration option: 20-30 hrs
Functional concentration option: 11 hrs
Electives: 2-9 hrs
Total: 45-60 hrs

Faculty
Professor: S. E. Hart, Ph.D. New York.
Assistant Professors: K. P. Connelly, M.S.N. New York (Buffalo); P. G. Droppleman, Ph.D. Tennessee; M. Dannelle, M.S.N. New York (Buffalo); M. M. Fenske, M.N. Florida; M. F. Kellar, M.N. Vanderbilt.

Courses
4330 Nursing in the Specialties (2-4) Application of principles from behavioral, physical, social and nursing sciences to solution of nursing problems. Emphasis on planned intervention needed to maintain or restore homeostasis in clients experiencing situations marked by abnormal behavioral deviations. Specific topics to be determined by faculty and students. Prereq: Consent of instructor. May be repeated with consent of instructor. Maximum 12 hrs.

4350 Oncology Nursing (3) In-depth exploration of cancer systems, medical and nursing intervention. Relates cellular kinetics to theories of carcinogene-sis and metastasis, and examines treatment modalities and nursing intervention employed in all phases of the disease. Interdisciplinary approach analysed. Prereq: 4230, R.N. status, or consent of instructor.

5000 Thesis (1-15) P/NP only. E
5002 Non-Thesis Graduation Completion (3-15) Required for the non-thesis student not otherwise required during any quarter when such a student uses university facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. S/NC only. E

5010 Applied and Pathophysiology (5) Advanced physiological theories and principles related to normal and abnormal body function with particular emphasis on those processes which, when altered, are most commonly encountered in acute and chronic disease states. Prereq: 3210-20 or 4010 or consent of instructor. Su, Sp

5020 Current Health Issues (2) Weekly seminar dealing directly with contemporary social, legislative, political, and community issues, concerns, and actions that have direct or indirect implications for nursing and health care. E

5030 Behavioral Dynamics (3) Interviewing and communication theories utilized in nurse-client interactions and therapeutic intervention; assessment and treatment of anxiety, depression, psychosoma-tization and crisis states. Prereq: 16 hrs in undergraduate or graduate behavioral sciences. E

5070 Theories of Nursing (3) History of nursing theory; examination of selected nursing concepts, theories, conceptual frameworks and philosophies and their relationship to nursing education and nursing practices. F

5103 Independent Study in Nursing (1-4) In-depth exploration of nursing topic of special interest to student. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs. E

5120 Secondary/Tertiary Nursing of Adults I (6) Role of clinical nurse specialist in assisting adults and families in maintaining health; prevention of problems and situations. Prereq: 5010, 5030, 5070. 3 hrs and 3 labs. W

5130 Secondary/Tertiary Nursing of Adults II (6) Continuation of role function of clinical nurse specialist; application of theories and concepts to care of hospitalized adults with emphasis on family and client care; further analysis and utilization of health related research findings in delivery of health and nursing care. Prereq: 5020, 5120. Prereq or coreq: 5210. 3 hrs and 3 labs. Sp.

5170 Readings in Applied Physiology (5) Carefully planned library development and exploration of concepts in physiology and pathophysiology related to various body systems. Prereq: 5010. E

5210 Applied Nursing Research (4) Utilization of research process to identify and investigate common nursing problems; critical assessment of nursing research methods and literature; development and critique of nursing research proposals. Prereq: 4440 or equivalent, graduate level statistics course. W, Sp.

5310 Secondary/Tertiary Nursing Field Work I (8) Advanced clinical practice in acute care hospital settings with opportunities to apply newly acquired nursing knowledge to more complex clinical nursing situations. Prereq: 5120-30. Su

5520 Secondary/Tertiary Nursing Field Work II (9) Continuation of 5310 with emphasis on further acquisition and refinement of nursing skills needed to provide high quality nursing care to acutely ill patients. Prereq: 5310. F

5340 Secondary/Tertiary Nursing Seminar (2) Identification of issues and problems involved in delivery of secondary/tertiary nursing care; further analysis and exploration of theories and concepts included in 5680 as they affect role of nurse as secondary/tertiary clinical specialist. Coreq: 5320. Prereq: 5680. F

5410 Principles of Community Mental Health (3) Exploration of historical and legislative mandates that impact community mental health; discussion of roles and other mental health care provider roles within current mental health care delivery systems. W

5450 Family Centered Primary Care Nursing I (6) Primary care nursing and health care management of individuals and families in child bearing and child rearing stages of development; application of nursing process with emphasis on selected nursing, physiological and psychosocial theories. Prereq: 5010, 5030, 5070. 4 hrs and 2 labs. W

5460 Family Centered Primary Care Nursing II (6) Continuation of 5450 with further emphasis on management of selected chronic health problems. Prereq: 5020, 5450. Prereq or coreq: 5210. 4 hrs and 2 labs. Sp

5480 Community Mental Health Nursing: Individual (3) Application of nursing process within systems framework to therapeutic intervention with individuals experiencing mental health problems; study of psychosocial and biological issues; analysis of special clinical problems. Prereq: 5010, 5030, 5070, 2 hrs and 1 lab. W

5490 Community Mental Health Nursing: Family (3) Application of nursing process, utilizing communication and systems theories in therapeutic work with families experiencing mental health problems; current models of parent education. Prereq: 5020, 5480. Prereq or coreq: 5210. 2 hrs and 1 lab. Sp

5500 Community Mental Health Nursing: Group (3) Study of group leadership and group dynamic theory; utilization of leadership strategies in both structured and unstructured group processes. Prereq: 5480. 2 hrs and 1 lab. Sp

5510 Community Mental Health Nursing Field Work I (6) Clinical practicum in a community setting providing opportunities to apply mental health nursing knowledge in planned interactions with individuals and groups at primary, secondary and/or tertiary care levels. Community and mental health systems assessment. Su

5520 Community Mental Health Nursing Field Work II (9) Clinical practicum for graduate student choosing functional concentration of advanced clinical practice. Objectives identified by student to meet specific learning and practice needs. Prereq: 5510. F

5540 Community Mental Health Nursing Seminar (2) Identification of issues and problems involved in delivery of community mental health nursing care; further analysis and exploration of theories and concepts included in 5680 as they affect the role of nurse as community mental health clinical specialist. Prereq: 5540. Coreq: 5550. F

5550 Primary Care Nursing Field Work I (8) Placement in selected off-campus primary care health delivery site for purposes of applying newly acquired knowledge and developing clinical skills necessary to function as a nurse practitioner. Prereq: 5460. Coreq: 5560. Su

5560 Primary Care Nursing Field Work II (9) Continuation of 5550 with further emphasis on acquisition of nurse practitioner skills coupled with ability to function more autonomously. Prereq: 5550. F

5630 Teaching Strategies and Practicum (5) Analysis and application of curricular and teaching modalities; field placement with supervised opportunities to provide both classroom and clinical instruction to undergraduate nursing students. Prereq: 6 hrs approved education courses or consent of instructor. 2 hrs and 3 labs. F

5650 Primary Care Nursing Seminar (2) Issues and problems involved in delivery of primary nursing care; further analysis and exploration of theories and concepts included in 5680 as they affect role of nurse as primary care provider. Prereq: 5560. Coreq: 5550. F

5680 Advanced Nursing Seminar (3) Theories of leadership, motivation, power, conflict, authority, change and decision making and their application to advanced clinical nursing practice; examination and analysis of role of nurse as health care provider and client—family advocate. Prereq or coreq: 5310 or 5550 or 5510. Su

5730 Management Strategies and Practicum (6) Analysis and application of managerial and supervisory theories and strategies; field placement in nursing service facility with supervised practicum in nursing service administration. Prereq: 6 hrs approved education management courses or consent of instructor. 2 hrs and 3 labs. Sp

5770 Special Topics (3) In-depth study of selected nursing topics, problems, or issues not covered in other courses. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.

5900 Graduate Seminar in Public Health (1-2) (Same as Public Health 5900, Nutrition and Food Science 5910, Physical Education 5900, and Social Work 5900.) S/NC only.

5910 Graduate Seminar in Community Health (1-2) Advanced research techniques utilized in nurse-client interactions and therapeutic intervention; assessment and treatment of anxiety, depression, psychosomatization and crisis states. Prereq: 16 hrs in undergraduate or graduate behavioral sciences.
Roy F. Knight, Dean
William J. Lau, Associate Dean

Professors:
Graduate School of Biomedical Sciences

W. E. Barnett, Director

MAJOR
Biomedical Sciences

DEGREES
M.S., Ph.D.

The University of Tennessee-Oak Ridge Graduate School of Biomedical Sciences, located within the Biology Division of Oak Ridge National Laboratory, offers programs leading to the Master of Science and Doctor of Philosophy degrees. The National Laboratory, one of three installations operated at Oak Ridge by Union Carbide Corporation for the Department of Energy, is a well-known center of basic research. The school utilizes the staff and facilities of this laboratory, and thus brings directly into the mainstream of full-time graduate study in the life sciences the talent and experience of that staff, as well as the most advanced research methods and technology.

The program of study, which incorporates a high faculty-to-student ratio, is based on intensive graduate courses supplemented by tutorial instruction, participation in a wide variety of seminars, and a heavy emphasis on communication skills, research training and independent study. The program encourages students to pursue graduate studies to the limits of their abilities.

The School is not departmentalized, and, apart from certain basic requirements, each student's curriculum is planned to meet individual needs, with the aim of giving: (1) strength in the basic sciences; (2) perception of the biomedical sciences as a whole; and (3) experience and training in a chosen specialty.

The research areas available for Master's thesis and Ph.D. dissertation work are biochemistry, biophysics, carcinogenesis, genetics, cellular, developmental and mammalian biology, and radiation biology. Included are such subjects as immunology, protein and enzyme chemistry, nucleic acid chemistry, cytology, radiation and environmental biology, virology, developmental biology, experimental pathology, microbial and mammalian genetics, mutagenesis, and problems of aging.

ADMISSION REQUIREMENTS

A Bachelor's degree or its equivalent is required. Students with M.S., D.V.M., or M.D. degrees are also encouraged to apply. Completed applications, Graduate Record Examination scores and letters of reference should be sent to the address below. The student will need previous training in biology, calculus, physics, and organic and physical chemistry. However, a course in physical chemistry is offered by the School in order to meet this requirement. It is recommended that deficiencies in meeting entrance requirements be eliminated prior to entrance.

Requests for application forms, information on admission, financial support, and housing should be sent to:
Director, University of Tennessee-Oak Ridge Graduate School of Biomedical Sciences, Biology Division, ORNL, Box Y, Oak Ridge, Tennessee 37830.

THE DOCTORAL PROGRAM

Requirements for the Ph.D. degree are:
1. Satisfactory (B grade or better) completion of the following core courses or their equivalent: Biochemistry (5110-20); Biophysics (5140); Genetics (5160); Molecular Genetics (5170); and Statistics for Biologists (5740).
2. Three quarters of Biomedical Sciences Laboratory (5310-20-30-40).
3. Participation in at least one of the seminars during each quarter of residence after the first year is strongly recommended.
4. Satisfactory completion of formal advanced courses in the areas of the student's interests. The number and nature of the required advanced courses will vary depending upon the student's background and area of specialization.
5. Pass both written and oral comprehensive examinations.
6. A dissertation reporting the results of original and significant scientific research. A minimum of 36 quarter hours of course 6000 is required.
7. A final oral examination on the dissertation.
8. A formal seminar presentation of the dissertation research.

SPECIAL MASTER OF SCIENCE DEGREE PROGRAM

The graduate faculty has designed a Master of Science program in Biomedical Sciences primarily to fill the need for such a degree within the Oak Ridge National Laboratories; however, a limited number of students from other institutions may be accepted if qualified and space is available.

Requirements for the M.S. degree are:
1. Graduate credit or a proficiency in the following core courses: Biochemistry (5110-20); Cell Biology I (5180); Cell Biology II (5190); plus any three of the following four courses: Biophysics (5140); Genetics (5160); Molecular Genetics (5170); and Mammalian Physiology (5200). Additional credits may be obtained (6 to 15 credit hours) with electives.
2. Forty-five credit hours of approved graduate courses including a minimum of 9 quarter hours for thesis (maximum 18 quarter hours of credit for course 5000).
3. For admission to candidacy:
   Completion of any required prerequisite courses and one quarter of graduate course work with a B average. Admission to candidacy forms must be filed at least one full quarter prior to receipt of degree.
4. A Master's Committee of three approved faculty members upon admission to candidacy.
5. A thesis reporting results of original and significant scientific research.
6. Pass a final oral (or oral and written) examination as determined by the student's committee.
Full-Time Faculty

Professors:

Assistant Professor:
M. D. Mamrack, Ph.D. Baylor.

Research Associate Professors:

Research Assistant Professor:
E. A. Hiss, Ph.D. Notre Dame.

Shared Faculty

all faculty listed are necessarily available in teaching and/or research roles in every academic year.

The courses below are not necessarily taught every year. Graduate School of Biomedical Sciences 147

5140 Biophysics (3) Energy levels and excited states of large molecules; optical instrumentation; adaptations to system perturbations; properties of macromolecules in solutions; molecular conformations; inter- and intramolecular forces; physical principles of microscopy. Prereq: 5070-80.

5150 General Genetics (3) Mendelian genetics, mitosis, and meiosis. Transmission genetics, mapping, and linkage.


5170 Molecular Genetics (3) Molecular biology of genetic processes. Gene regulation; coding; protein synthesis; suppression of missense and nonsense mutations; mutagen mechanisms; complementation; recombination. Prereq: 5110-20, 5160.

5180 Cell Biology I (3) Structure and composition of major nuclear and cytoplasmic organelles of eukaryotic cells. Pertinent instruments and techniques; meiosis and mitosis; cell cycle; chromosome structure; nuclear RNA metabolism; nucleoli and ribosomes; cellular differentiation. Structure of genetic transcription and translation in bacteria. Coreq: 5110.

5190 Cell Biology II (3) Comparative biochemical approaches to cell structure and function. Membrane systems and metabolism; development and function of mitochondria, chloroplasts, peroxisomes and other organelles; metabolism; and replication; transport phenomena; cell cycle. Prereq: 5110, 5180. Coreq: 5120.

5200 Mammalian Physiology (4) Mammalian organ systems and their functions. Nervous, muscular, endocrine, respiratory, circulatory, reproductive, and excretory systems. Interrelationships of these systems and fundamental importance of interrelations in contemporary biological research. Prereq: 5190.

5230 Biochemical Concepts in Medical Sciences (3) Biochemical mechanisms involved in physiological conditions and pathological processes of human body. Dynamic functions of organ systems; biochemical pharmacology; hormone actions; neurobio-chemistry. Current biochemical advances in basic and clinical medicine. Prereq: 5200, 5110-20.

5310-30-40 Biomedical Sciences Laboratory (1, 3, 3, 3, 3, 3, 3) To acquaint students with both approaches and technologies in various areas of modern biology. Students spend a quarter in each of three or four laboratories conducting research in different areas of biomedical science. Required of all first-year students.

5350-60 Biomedical Sciences Seminar (1, 1) Critical analyses of current journal publications in selected area of modern biology. Written evaluation of papers and weekly oral presentations by each student.

5370 Biomedical Sciences Seminar (1) Basic principles of scientific writing. Research articles, grant and thesis proposals, abstracts, review articles, progress reports.

5430-60-90 Advanced Graduate Research Participation (3, 6, 9) Special advanced research project covering area not related to dissertation research. Topics chosen with consent of instructor. May be repeated.

5510-20-30-40 Special Topics in Biomedical Sciences (1, 3, 3, 3, 3, 3, 3, 3) Tutorial or formal lectures. Potential topics include x-ray diffraction and crystallography; genetics; biochemical properties of macromolecules; computer science; pathology; cytology and cytochemistry; mammalian genetics; human genetics; cancer research; plant physiology; radiation biology; aging research. Additional courses developed on subject of mutual interest to individual students and staff members. May be repeated.

5700 Developmental Biology (3) Principles of early embryogenesis and tissue interactions that initiate cellular differentiation. Mechanisms of differential gene action and regulation of protein synthesis perti-
nent to cellular differentiation. Prereq: 5120, 5170, 5200.

5740 Statistics for Biologists (3) Application and interpretation of statistical methods in data analysis. Random variations; normal, binomial, and Poisson distributions, statistical presentation of data; estimating means and variance; confidence intervals; tests of significance for comparing samples; analysis of variance; contingency tables; chi-square tests; correlation and association; linear regression. Prereq: introductory statistics or consent of instructor.

5840 Bioorganic Reaction Mechanisms (3) Nature of chemical bonds; valence, reaction order, reaction model reactions, molecular rearrangements, oxidation-reduction, solvolysis, protein and nucleic acid modification reactions, 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 processes to permeability, structure of semipermeable membranes, conformation of macromolecules, and nature and state of water in cells; and how they bear on other fields of biology and medicine—including elec- tron microscopy, photobiology, cell physiology, ex- ogenous states; genetics; induction; transforma- tion; natural history.

5940 Classic Experiments in Genetics (3) Original papers presenting new and lasting concepts in genet- ics. Prereq: 5170.

6000 Doctoral Research and Dissertations (3-15) P/NP


6210 Protein Chemistry and Enzyme Mechanisms (3) Theoretical and practical aspects of protein chemistry including chemical and physical charac- terization of proteins, chemical modification of pro- teins, and structure-function relationships. Latter emphasizes enzymes, includes approximation of substrates, covariant catalysis, general acid-base catalysis, and strain and distortion of substrates. Prereq: 5110-20.

6220 Enzyme Regulation and Kinetics (3) Kinetics of catalysis; inhibition by product, substrate and deadend inhibitors; stimulation and inhibition of allosteric enzymes, types of feedback regulation; role of auxabins in enzyme regulation; multifunctional enzyme systems. Prereq: 5110-20.

6340 Chemistry and Metabolism of Lipids (3) Nomenclature, chromatographic isolation, chemis- try, physical properties, and enzymology of lipids. Hormonal action of prostaglandins and role of lipids in membranes, enzyme expression, and nervous tis- sue. Lipid biochemistry of mammals; comparative aspects, particularly lipid pathways in bacteria and yeast. Prereq: 5110-20.

6251 Molecular Biology of RNA (3) RNA synthesis and metabolism in prokaryotes, eukaryotes, and their viruses. Prereq: 5110-20 or consent of instructor.

6252 Molecular Biology of DNA (3) DNA replication, repair, and recombination. Recent advances in mechanisms at molecular level using biochemical and genetic techniques. Prereq: 5110-20 or consent of instructor.

6270 Viral Carcinogenesis (3) History of viral oncology and descriptive catalog of tumor viruses. Biology of normal, oncogenic, and tumor viruses; replication cycle; transformation; genetics; natural history. RNA tumor viruses; endogenous and exogenous states; genetics; induction; transforma- tion; natural history.

6290 Cancer Biology and Biochemistry (3) Pathology and nomenclature of cancer. Tumor immunology and immunotherapy. Biochemistry of tumor cells; enzymology, metabolism, membranes, DNA repair; regulation; strategies in chemotherapy.

6300 Mutagenesis (3) Basic mechanisms in chemical and radiation mutagenesis and dosimetry in variety of systems including bacteria, fungi, Drosophila, and mice.

6400 Membrane Biology (3) Transport kinetics, membrane biogenesis and turnover, endocytosis and exocytosis, receptor regulation, hormone-membrane biogenesis interactions. Prereq: 5110-20 and 5180-90 or consent of instructor.

6410 Techniques in Cell Biology (3) Application to specific research problems, kind of data they yield, and cautions in data interpretation. Laboratory demonstrations may be arranged where appropriate. Prereq: 5180-90 or consent of instructor.

6450 Immunology (3) Structured lectures in modern immunology and emphasis on concepts and mechanisms at the cellular level. Topics: T-B cell interaction, soluble mediators, tolerance, surveillance, transportation genetics, immunoglobulin structure. Selected laboratory exercises. Prereq: 5180-90 or consent of instructor.

6510-20-30-40 Advanced Topics in Biomedical Sciences (3, 3, 3, 3) Current and future research developments. Topics listed under Special Topics Courses, can be taken either as tutorials or as literature survey courses requiring substantial student participation. May be repeated.

6600 Mammalian Genetics (3) Orderly presentation of known genetics variants affecting each organ system of experimental mammals, especially laboratory mouse. Prereq: 5160.

6610 Mammalian Biochemical Genetics (3) Combined biochemical and genetic approaches to problems of immunology, globin synthesis, and control of enzyme synthesis. Prereq: 5110-20 and 5160 or consent of instructor.

6650 Microbial Genetics (3) Basic phenomena in microbial genetics: transduction, transformation, conjugation, and mutation. Genetics of bacteriophage. Prereq: 5160 or consent of instructor.

6750 Regulation of Intermediary Metabolism (3) Pathways involved in intermediary metabolism. Steady-state processes, "nonequilibrium" reactions, first enzymes, feedback inhibition, isozymes, multienzyme systems and compartmentation, covalent modification, positive and negative control, catabolite, repression, autoregulation, stringent control, attenuation, hormonal control, other selected topics. Prereq: 5110-20 or consent of instructor.
Ann E. Prentice, Director

MAJOR
Library Science

DEGREE
M.S.L.S.

The Graduate School of Library and Information Science provides a program leading to the preparation of librarians and information scientists for work in all types of libraries and information centers. The program of study includes a graduate curriculum leading to the degree of Master of Science in Library Science.

MASTER OF SCIENCE IN LIBRARY SCIENCE

The goal of the program is to prepare graduates to function effectively in libraries and information centers. The program is designed to enable students to:

1. Examine critically the role and function of libraries and information centers in our society, and to define and redefine that role as the needs of society demand;
2. Understand and use the concepts and procedures related to the selection, acquisition, organization, and dissemination of knowledge;
3. Understand and apply the principles of management to the library and information center;
4. Assume individual and collective responsibility for the well-being and development of their profession and of professional service.

PROGRAMS OF INSTRUCTION

The program leading to the degree of Master of Science in Library Science involves a total of 51 quarter hours of graduate courses, 24 hours of which form a core curriculum required of all students. Either a thesis or a non-thesis option is available, with 9 hours allowed for thesis credit. At least 36 quarter hours must be taken in the Graduate School.

A defense of the thesis. Students who elect the non-thesis option will be given a written comprehensive examination. Programs are designed for persons interested in school libraries, public libraries, academic libraries, special libraries and information centers as well as a variety of library and information related activities.

The SREB Academic Common Market applies to applicants from Arkansas, Georgia, West Virginia, and Virginia.

ADMISSION REQUIREMENTS

The minimum grade point average for admission to The Graduate School is 2.5. Candidates who have at least a 3.0 average in the junior and senior years will receive first consideration. Applicants are required to take the aptitude test of the Graduate Record Examination. The test should be taken at least one quarter in advance of application for admission to The Graduate School.

Foreign applicants are required to take the Test of English as a Foreign Language.

APPLICATION PROCEDURE

Admission to the program in The Graduate School of Library and Information Science should be made in advance of the quarter for which admission is requested. Applicants should submit the "Application for Admission" form (printed as the first page of The Graduate School Catalog) and should request the registrars of all colleges and universities attended to send two official transcripts to The Graduate School. In addition, each applicant should make arrangements to take the GRE and TOEFL exams, if applicable. A personal data sheet and three recommendations (obtained from The Graduate School of Library and Information Science) should be returned to the Director of the School.

FINANCIAL ASSISTANCE OPPORTUNITIES

Employment with the University of Tennessee Libraries may provide a work-study opportunity for selected students who wish to obtain experience in academic librarianship while pursuing the degree. Such students usually work at least 20 hours each week and thus extend the period required for the degree up to two years.

Similar opportunities exist with some other libraries and information agencies in the Knoxville area.

A limited number of graduate assistantships are available through the School for the degree. Assistantships of this type carry a waiver of tuition and fees as well as a stipend, and require that recipients work 10 hours per week in the School.

Information on financial assistance is available from the Director of the Graduate School of Library and Information Science.

Faculty

Professors:

Associate Professors:
A. Prentice, D.L.S., Columbia; W. Robinson, Ph.D., Illinois; G. M. Sankankas, Ph.D., Pittsburgh; P. Wilson, Ph.D., Michigan.

Assistant Professors:
M. H. Karrinbrock, M.L.S., South Carolina; J. M. Pemberton, Ph.D., Tennessee; M. S. Stephenson, M.L.S., North Texas State.

Courses

4140 Librarianship and Librarianship as an occupation: its organization, responsibilities, problems and prospects.

4150 School Library Administration (3) Objectives, functions, and place of school library; relationship to local and state services; cooperative planning for quarters and materials; evaluation. (Same as Curriculum and Instruction 4150.)

4270 Organization of Library Collections (1) Acquisitions, cataloging and maintenance of library collections.

4330 Introduction to Reference Materials (3) Basic information sources and services for all libraries.

4750 Utilization of Instructional Media (3) (Same as Curriculum and Instruction 4750 and Vocational-Technical Education 4750.)
5000 Thesis (1-15) Pr/NC only. E

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

5110-20-30 Problems in Library Science (3, 3, 3) May be repeated with consent of school.


5200 Subject Reference and Bibliography (3) General patterns of bibliographical organization and basic information sources in subject fields including non-English materials; experiences in bibliographic methods and search techniques. Prereq: 4330.

5210 Sources and Services for the Social Sciences (3) English and non-English literature and bibliographical sources in education, economics, political science, history, geography, anthropology, and sociological research; bibliographical tools. Prereq: 5200, or consent of instructor.

5220 Sources and Services for the Natural Sciences (3) English and non-English literature and bibliographical sources in mathematics, physics, astronomy, chemistry, biology, and medicine; organization of collections for optimum use. Prereq: 5200.

5230 Sources and Services for the Humanities (3) English and non-English literature and bibliographical sources in literature and language, fine arts, music, philosophy and religion; organization of collections for optimum use. Prereq: 5200.

5240 Organization of Library Collections II (3) Construction and maintenance of library catalog as retrieval instrument; indexing and subject analysis theory, comparative classification with emphasis on Library of Congress system, and problems in reclassification. Prereq: 5200.

5250 Government Publications I (3) Acquisition, organization, and utilization of U.S. federal government publications; legislative, executive, and judicial branches. Prereq: 4330, 5200, or consent of instructor.


5270 Legal Bibliography (3) Introduction to literature of Anglo-American jurisprudence. Use of library facilities; sources; methodology; organization of collections for optimum use. Prereq: 4270.

5290 Library Management (3) Management and organization concepts applicable to libraries and librarians.

5310 Multitype Networks (3) Organization, structure, governance, planning, evaluation, and services in state, regional, national, and international networking of information.

5330 Academic Libraries (3) Persistent and current problems. Topics vary depending upon needs and interests of group. Prereq: 4150 or consent of instructor.

5350 School Libraries (3) Persistent and current problems. Topics vary depending upon needs and interests of group. Prereq: 4150 or consent of instructor.

5360 Special Libraries and Information Centers (3) Development and present status, scope and objectives, administration and organizational issues, acquisition, organization, and use of information.

5370 The Library in the Community (3) Public libraries as social agency; role in education and communication systems of community.

5380 Seminar in Library and Information Science (1, 2, 3) Advanced study of varying topics. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.

5400 Library Facilities (3) Problems inherent in planning and construction of library quarters. Interrelationships of staff, materials, and user space requirements.


5510 Nonbook Resources (3) Selection, processing, storage and utilization: films, video technology, bound recordings and microforms as information media. Prereq: 5500 or consent of instructor.

5515 Serials (3) Serials collections: selection, acquisition, bibliographic control, process, storage, maintenance, and public service. Prereq: 5500 or consent of instructor.

5520 History of the Book (3) History of writing and various methods of bookmaking from earliest times through 19th century. Prereq: Consent of Instructor.

5530 Contemporary Publishing (3) Creation, production, marketing, and distribution of materials acquired by libraries, with special attention to various types of publishers.

5540 Archives and Manuscripts (3) Problems involved in acquisition, organization, description, storage, preservation, and utilization. Prereq: Consent of instructor.

5550 Records Management for Information Professionals (3) Functional elements and objectives of records management within organizations, emphasizing control of creation, distribution, retention, storage, retrieval, protection, and disposition regardless of medium. Prereq: 4330, 4270, or consent of instructor.

5600 Reading Guidance for Children and Young People (3) Organization to meet needs, interests, abilities of different age and socioeconomic groups. Prereq: 5640 or consent of instructor.

5610 Mass Communications and the Library (3) Mass media of communication in terms of their relation to modern library service, considered as forces that influence what people read, see, and hear.

5620 Traditional Literature and Oral Narrative (3) Fundamental principles of art storytelling; techniques of adaptation and presentation for various age groups; instruction and practice in oral techniques.

5630 Critical History of Children's Literature I (3) Development of literature for children noting influence of changing social and cultural factors; attention to emerging genres through primary sources. Fifteenth century to 1920.

5640 Critical History of Children's Literature II (3) Development of literature for children noting influence of changing social and cultural factors; attention to emerging genres through primary sources. 1920 to present.

5691 Advanced Production of Audiovisual Software (3) (Same as Curriculum and Instruction 5691.)

5700 Automation of Library Processes (3) Computer concepts and operations; applications to basic library operations: acquisitions, cataloging, circulation and serials. Coreq: 4270, 5500, or consent of instructor.

5710 Introduction to Information Science (3) Content and method of information science; application of research findings to general library practice.

5720 Information Systems Analysis and Design (3) Examination and evaluation of tools and methodologies in library/information center systems planning and implementation. Role and training of systems analyst, systems study from planning through implementation and evaluation, and related topics. Prereq: 5700.

5725 Organization of Materials for Information Storage and Retrieval (3) Principles and techniques in organization and description of materials for input to information storage and retrieval systems: indexing, abstracting, document representation, thesaurus construction and maintenance, related topics. Prereq: 5710 or consent of instructor.

5730 Information Retrieval Systems Laboratory (3) Comparative capabilities of various types of information retrieval systems; analyzing performance of systems to arrive at generalizations with respect to theory, design and operation of information retrieval systems.

5750 Information Technologies (3) Computer-based and non-computer related media and methods for information storage, retrieval, and transfer within and external to library environment; existing and prototype hardware and software and interfacing of these technologies. Prereq: 5700 or consent of instructor.

5999 Practicum (5 or 9 or 12) Opportunity to translate late library theory into practice under guidance of qualified librarians. Prereq: Completion of 21-14 core curriculum plus approval of director.
D. A. Johnson, Director

MAJOR
Planning

DEGREE
M.S.P.

The Graduate School of Planning offers a program of studies leading to the professional degree of Master of Science in Planning (M.S.P.). Students may elect concentrations in land use planning, community development, energy planning, environmental planning, quantitative methods, housing, historic preservation, or transportation planning.

MASTER OF SCIENCE IN PLANNING

The M.S.P. degree program prepares planners for a diversity of career opportunities in both the public and private sectors. Graduates are candidates for professional positions in regional, city, county, and metropolitan planning agencies; in state and federal agencies concerned with physical, economic, and administrative planning; in private businesses and organizations dealing with development problems; and in private consulting practice.

The degree program typically requires a minimum of six quarters, or 72 credit hours. A core curriculum of 40 hours is required of all candidates. Twenty-three or more additional hours of elective course work and 9 hours for the required thesis or major paper enable the student to pursue special interest areas or topics in the field of urban and regional planning. Elective courses may be selected from courses offered by the School of Planning or by related University departments and programs such as geography, civil engineering, environmental engineering, ecology, real estate and urban development, public administration, and public health. Elective courses are chosen with the advice and approval of the student’s faculty advisor.

A work internship is recommended, but not required, during the summer between the first and second year of the program. Students who do not have prior experience in comprehensive plan preparation are advised to enroll in an intensive credit-hour synthesis project course. The required thesis or major paper option provides the student an opportunity to develop and apply research and analytical skills to a particular planning problem or topic.

Core planning courses are taught by the faculty of the Graduate School of Planning. Related courses are taught by other specialists drawn from the University faculty. In addition, experienced professional planners in TVA and other public and professional organizations frequently teach courses on a visiting basis. Each year a guest lecture series brings to the University and the School outstanding leaders in the fields of planning and development.

The Graduate School of Planning is accredited by the American Planning Association.

ADMISSION PROCEDURES

All applicants should submit two letters of recommendation with their applications. Reference letters should be from teachers familiar with the applicant’s undergraduate or, where applicable, graduate academic record. If the applicant has had prior planning experience, a letter from a supervisor or other person familiar with the work of the applicant should also be provided.

Graduate Record Examination scores are not required but, if available, may be provided at the option of the applicant. All applicants are also requested to submit a statement of career goals.

The M.S.P. degree is approved for SREB Academic Common Market participation in Arkansas, Georgia, Kentucky, and West Virginia.

All inquiries concerning admission should be addressed to: Director, Graduate School of Planning, The University of Tennessee, Knoxville, Tennessee 37996-1700.

FINANCIAL ASSISTANCE OPPORTUNITIES

Employment at the Graduate School of Planning Research Center, at local planning agencies, the Tennessee Valley Authority and Oak Ridge National Laboratory may provide an opportunity for selected students to obtain part-time experience while pursuing the degree. Such employment, however, usually extends the period required to complete the degree.

A limited number of graduate assistantships are available through the School. Assistantships carry a waiver of tuition and fees as well as a stipend, and require that recipients work 10 hours per week in School of Planning assignments. Applicants interested in being considered for assistantships and other forms of financial assistance available through the School should submit an application for financial aid to the Director.

DEGREE REQUIREMENTS

Each student will be required to complete a minimum of 72 hours credit of which 46 hours must be in courses offered in planning. The following courses are the required core curriculum for the M.S.P. degree: 5100, 5110, 5130, 5141, 5180, 5230, 5270, 5280, 5340, 5440, 5465. Students who have had previous academic work equivalent to any required core course may petition for a waiver, which can be granted upon demonstration of competence. A proficiency examination will be arranged for students wishing to receive academic credit for previous work. Each student will be required to demonstrate competence in individual research. This may take either of two forms:

Plan I—Complete a thesis for 9 hours credit; Plan II—Complete a major study with acceptable documentation. In order to be eligible for the major study plan the student must have completed at least 48 hours of graduate course work and have attained at least a 3.5 cumulative grade point average (at the time of approval of the major study proposal) in at least 24 hours of planning core curriculum courses. The student meeting these criteria may present a proposal to his/her committee for a major study which will include at least 9 hours of subsequent elective course work related to the study topic. The proposal shall justify the selection of topic, problem or issue and the approach to the study.

Students in the Graduate School of Planning must pass a comprehensive written examination after approximately five quarters of course work.

Faculty

Professors:
D. A. Johnson, Ph.D. Cornell; K. B. Kenney, Ph.D.
COURSES

4100 Survey of Planning (3) History of city development and of planning with special attention to the U.S. experience in urban and other levels of planning. State and local government role in preservation, designations of historic buildings, areas and sites as related to area development, and problems of utility service against each other or written regulations. Extensive laboratory experience. F, Sp, Su

5235 Advanced Urban and Site Design (3-6) Review of principles of urban and site design and laboratory application to selected project or projects involving three-dimensional integrated planning of movement systems, activity patterns and land use. Prereq: 5230 or consent of instructor.

5270 Planning and Transportation (3) (Same as Civil Engineering 5270.) W

5280 Planning Methods (3) Tooling up studies; methods for preparation of land use and public facility elements of comprehensive development plans, including visual aspects. Prereq: 5180. Sp

5300 Regional Planning (3) Making planning process operative in intergovernmental context. Theories of regions and analysis of metro planning, area planning, regional planning by states, single-purpose agencies, and TVA. Prereq: 5110 or consent of instructor.

5310 State Planning (3) Evolution of planning function in state government, with emphasis on institutional environment in which planning occurs. Context and scope of state planning, and relationships with other branches and levels of government. Prereq: 5110 or consent of instructor.

5340 Implementation (3) Policy formulation, information systems, taxation, capital improvement programming, and other aspects of plan implementation. Programming public actions to affect development. Prereq: 5440. W

5360 New Towns (2) Historical development of planned new towns and implications for national urbanization policy in United States; process by which new towns are created, from establishment of objectives to administration of development process and provision of public services; organizational alternatives for new town planning, development and management in context of past experience and future objectives. Prereq: 5110 and consent of instructor.

5380 Housing (3) Nature and demand for housing in U.S. and abroad with emphasis on U.S. experience. Private market processes and public influences. Problems of change in housing supply, impact of new technology, and governmental programs to improve supply and quality of housing. Coreq: 5110 or consent of instructor.

5390 Futures (3) Alternative futures and their implications for future living patterns and community planning. Techniques of future research.

5410-50-30 Special Topics in Planning (1-3, 1-3, 1-3) Lecture, group discussion, and individual research and study on specialized topics in planning not covered in depth in other courses. May be repeated. Prereq: Consent of Instructor. E

5425 Planning and Government (3) Governmental context within which planning occurs. Policy making as public process. Planning structures, powers, and functions.

5440 Planning and Land Use Controls (4) Legal basis for planning and guiding community development. Exercise of police power and eminent domain. Development and administration of zoning, subdivision controls, and related devices. Prereq: 5435. F, Su

5455 Urban Revitalization (3) Goals, principles and strategies for restoring and revitalizing cities. Review and analysis of historic, current, and proposed public and private programs aimed at urban revitalization.
Graduate School of Social Work

Ben P. Granger, Dean
Lou M. Beasley, Branch Director, Nashville
M. Kate Mullins, Branch Director, Memphis
Roger M. Nooe, Branch Director, Knoxville
Ronald K. Green, Director, Office of Continuing Social Work Education

THE MASTER'S PROGRAM
The University of Tennessee School of Social Work is a fully accredited two-year graduate professional school, with a program (thesis or non-thesis option) leading to the degree of Master of Science in Social Work. The full two-year curriculum is offered in all three branch locations.

GRADUATE PROFESSIONAL EDUCATION
The School of Social Work has as its primary objective the education and training of persons for leadership in the social welfare profession and the social work practice community. Leadership roles include positions in social welfare administration, social planning and policy development, and positions as treatment team leaders, supervisors, consultants, and expert practitioners.

Central to professional leadership are a commitment to the values and goals of the profession and a developed capacity for self-awareness and self-discipline. The experience of a graduate professional education builds commitment, and the School's program guides students into independent, analytical thought and prepares them to use their skills and knowledge to effective purpose. The School of Social Work recognizes and enjoys the challenge of cultural pluralism in society and encourages applications for admission from minority group members. Through the planned inclusion of significant and pertinent racial and ethnic content in the curriculum, the School provides students with the educational background needed to take creative roles in the social work profession's efforts toward the elimination of racism and such other social ills as poverty, crime, neglect, and social injustice.

A special bulletin describing the facilities, admission, fees, and degree requirements is obtainable from The School of Social Work, 2014 Lake Avenue, Knoxville, Tennessee 37996-3910.

AREAS OF PROFESSIONAL PRACTICE
Specializations within the School's curriculum prepare students for social work careers in such practice fields as criminal and juvenile justice systems; family and child welfare services in public and voluntary agencies; group services in neighborhood and community centers; health services; mental retardation; public welfare services; mental health services; rehabilitation services; school social work; and social gerontology.

THE PROFESSIONAL CURRICULUM
The School of Social Work's curriculum is designed to provide the student with the basic components of professional competence through a progression of course work and supervised practice experience. Students may elect a thesis or non-thesis option. The two-year, six-quarter program includes a core curriculum, a specialization in one of two areas—social work treatment or social welfare administration and planning—and concurrent field practice.

THE CORE CURRICULUM
The core curriculum is offered during the first two quarters of the first year and is required of all students. It is a 30-quarter-hour sequence of five basic courses. As the initial phase of the School's educational program, the core curriculum contributes to the process of socialization and professional identification, and presents students with a comprehensive and broad knowledge base from which to operate in the future as practitioners and administrators.

Central to professional leadership are a commitment to the values and goals of the profession and a developed capacity for self-awareness and self-discipline. The experience of a graduate professional education builds commitment, and the School's program guides students into independent, analytical thought and prepares them to use their skills and knowledge to effective purpose.

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A special bulletin describing the facilities, admission, fees, and degree requirements is obtainable from The School of Social Work, 2014 Lake Avenue, Knoxville, Tennessee 37996-3910.

AREAS OF PROFESSIONAL PRACTICE
Specializations within the School's curriculum prepare students for social work careers in such practice fields as criminal and juvenile justice systems; family and child welfare services in public and voluntary agencies; group services in neighborhood and community centers; health services; mental retardation; public welfare services; mental health services; rehabilitation services; school social work; and social gerontology.

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The School of Social Work's curriculum is designed to provide the student with the basic components of professional competence through a progression of course work and supervised practice experience. Students may elect a thesis or non-thesis option. The two-year, six-quarter program includes a core curriculum, a specialization in one of two areas—social work treatment or social welfare administration and planning—and concurrent field practice.

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Social Welfare Administration and Planning

Social welfare administration and planning deals with the design, implementation, and continued operation of effective programs for client service. Specifically, the method deals with assessment of client characteristics, development of environmental resources, design of effective organizational structures, management, staff development, program evaluation, social planning, neighborhood and community development, financing, and coordination of services.

FIELD PRACTICE

Field practice is a critical component of the student's first- and second-year program. Because The UT School of Social Work cooperates with a wide range of social agencies and human service programs in the principal cities in Tennessee and areas in the classroom course each quarter, the School is able to provide field placements in a variety of social work practice areas. The faculty works closely with the placement agency and the field instructor to ensure that the student has a quality field practice experience which meets the objectives of the core curriculum and the specialization.

The first-year curriculum is on a concurrent class and field plan, with students engaged in classroom study two or three days per week and in field practice the remainder of the week. First-year agency placements are selected to provide the student with practice experiences related to the content and beginning specialization. Within the placement, each student's experiences are planned and designed according to the educational needs.

In the second year, students are engaged full time in classroom courses during the fall quarter. The winter and spring quarter plans consists of a block field placement of four days per week and at least one concurrent classroom course each quarter. Second-year placements are selected according to the student's area of specialization, individual career interests, and educational needs. The student actively participates with the field practice coordinator and the specialization committee in selection of the second-year placement. The second-year field practice experience focuses on the integration of social work knowledge and values, and emphasizes the acquisition and development of full practice skills.

Students are responsible for meeting the requirements of their placement agencies in terms of office hours and workload coverage. This responsibility takes precedence over scheduled University breaks and may result in variations in holidays and office hours for the student.

DEGREE REQUIREMENTS

1. Satisfactory completion of the curriculum
2. All courses taken as part of the degree programs, whether taken within the School of Social Work or outside, must be acceptable for graduate credit, relevant to social work and to the student's career objectives, and have the approval of the student's faculty advisor.
3. Achievement of a B average on all work presented for the Master's degree
4. Completion of each required course at a satisfactory level (a grade of C or above)
5. Graduate courses may not be repeated to raise a grade.
6. Students who elect a thesis must pass an oral examination conducted by a faculty committee.
7. Students who elect a non-thesis option must pass a written comprehensive examination.
8. Credits to be counted toward the degree must be earned within six years from the beginning date of the earliest course applied toward the degree, except in cases where permission to update courses has been granted.
9. The minimum number of credit hours required for a degree shall be 79 hours including a maximum of 36 S/N credit hours.
10. Performance at a satisfactory level in field practicum, which is designed to teach professional practice skills.

ADMISSION REQUIREMENTS

Admission to the professional curriculum is based on the following requirements:
1. A Bachelor's degree from an accredited college or university with some preparation in the social sciences. At least three-fourths of the applicant's undergraduate work should be in the social sciences, humanities, physical sciences, and other liberal arts subjects.
2. A grade point average of 2.5 on a 4.0 scale, with those falling below the average to be admitted on supplemental evidence of ability to perform at a satisfactory level.
3. Personal qualifications acceptable for entrance into the professional practice of social work.
4. Preference is given to applicants with a B average in undergraduate work and substantial preparation in the social sciences. Applications should be filed no later than March 1 for the year in which admission is desired.

APPLICATION PROCESS

Individuals who wish to be considered for admission should obtain the required application materials from the Office of Admissions, UT School of Social Work, 2014 Lake Avenue, Knoxville, TN 37996-3910, telephone (615) 974-3175, or one of the Branch offices. Beginning students are admitted only in the fall quarter. Applications for first-year admission should be filed as early as possible. Minimum of nine weeks should be allowed for consideration of the application.

Students intending to apply for financial aid are encouraged to apply for admission to the School as outlined above.

TRANSFER CREDITS

Courses completed in another accredited graduate school of social work are usually accepted for the University of Tennessee School of Social Work degree requirement providing the applicants meet the admission requirements of The Graduate School and The University of Tennessee School of Social Work, and if previous courses equivalent to required or elective courses offered here. The University of Tennessee School of Social Work allows a maximum of 45 credit hours of graduate course work taken at another accredited institution to be transferred into the student's Master's program. Such work must have been taken for graduate resident credit and passed with a B or better. In addition, it must be part of the course satisfactory to graduate program (A average) and be approved by the branch director and the dean.

This course work must be completed within the six-year period prior to the receipt of the degree. In addition, S/N credit earned for the field practicum is also accepted.
THE DOCTORAL PROGRAM

The UT School of Social Work offers a Doctoral Program with a major in Social Work. This newly approved Ph.D. program will begin Fall Quarter, 1983.

The focus of social work education at the doctoral level is to foster the development within students of an attitude of scientific inquiry, competence in applying scientific methodology as applied to problems in social welfare, and ability to develop professional role models, conduct research, and contribute to knowledge in leadership roles in social work education, research, and practice.

The character of the UT School of Social Work doctoral program will be derived from its focus upon:

—Analysis and evaluation of the interrelationships between direct intervention and social processes and between each of them and their social policy, programmatic, organizational and community context.

—Development, within this interrelational framework, or research-based knowledge to inform and guide social work practice, social policy, planning and social welfare program development.

The core courses will be offered in four quarters on the Knoxville campus. After this, students will be assigned to one of the three branches for an internship and to complete dissertation research under the supervision of qualified faculty. For example, students interested in health care could be assigned to the Memphis Branch where there are opportunities for internships and for research in health care.

Requirements for admission to the doctoral program are being developed. Inquiries and requests for admission should be sent to: Doctoral Program Admissions, UT School of Social Work, 2014 Lake Avenue, Knoxville, TN 37996-1573.

Graduate students majoring in fields other than social work are admitted to certain social work courses with the approval of the School of Social Work and the student’s major professor.

Faculty

Professors:

- B. P. Granger (Dean), Ph.D., Brandeis; M. H. Bloch, M.S., Ohio State; R. B. Bronovich, D.S.W.; Washington; G. E. Fryer, E.D., Columbia; G. McLarnan (Emeritus), M.S.S.W., Tennessee; M. K. Mullins, Ph.D. Chicago; R. M. Noe, D.S.W.; Tulane; B. Orchard (Emeritus), M.S.; Western Reserve; S. W. Spencer (Emeritus), M.S.; New York School of Social Work.

Assistant Professors:

- G. W. Ayers, D.S.W., Tulane; L. M. Beasley, Ph.D., Denver; W. B. Bell, D.S.W., Tulane; J. R. Gates, Ph.D., Michigan; C. T. Grunthol, D.S.W., Tulane; J. C. Eades, Ph.D., Southern Illinois (Carbondale); M. L. England, D.B.A.; Pittsburgh; R. K. Green, J.D., Tennessee; C. F. Hairston, Ph.D.; Western Reserve; H. Hirayama, D.S.S.W., Pennsylvania; K. K. Marshall, Ph.D.; St. Louis; A. E. Moses, D.S.W., California (Berkeley); R. B. Rowen, Ph.D.; Arizona; N. P. Tate, Ph.D.; Brandeis; H. T. W. Vaughn, M.S.W., Tennessee; A. R. Wachter, D.S.W., Tennessee; C. S. Wicks, Ph.D.; St. Louis; P. G. Zerback, M.S.W., Wisconsin.

Graduate School of Social Work 155

Courses

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

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

5070-80 Social Work Research I, II (3, 2) Research methodology as applied to problems in social welfare. Provides basic knowledge of instrument construction; data collection, analysis, and presentation; and research reporting. F; W

5081 Evaluative Research in Social Work (2-3) Advanced research course. Topics include sociopolitical and organizational context of evaluative research, research design and methodology appropriate to evaluative research, and utilization of research findings. Prereg: Completion of core or consent of instructor. Sp

5082 Practicum in Social Work Research (3-9) Supervised practice in application of research methods and tools to major problem areas generated by faculty, students, or social welfare agency or organization. Prereg: 5070-80 and consent of faculty member conducting investigation. S/N only. Sp

5083 Directed Readings in Research (2-4) May be repeated with approval of instructor. Maximum 4 hrs. F, W, Sp

5090 Special Problems in Social Work (2-9) Individual study or research on problems of special significance to student's program, under supervision of major professor. May be repeated. F, W, Sp

5110 Social Welfare Policy and Services I (3) In-depth study of programmatic, organizational and community policy and practice policies. Prereq: Completion of core or consent of instructor. F, W, Sp

5120 Social Welfare Policy and Services II (3) Examination of complex organizations applied to service delivery settings. Transformations of collective social welfare resources into divisible and indivisible social welfare benefits through organized institutional action of professional nature. W

5130 Social Policy Analysis (2-3) "Policy science" techniques considered for appropriateness in assessing social, political, and economic implications of social policy programs. Prereg: Completion of core or consent of instructor. Sp

5161 Social Welfare Seminar (2-3) Problem area or field of practice seminar focusing on substantive knowledge. Prereq: Approval of faculty. May be repeated. Maximum 15 hrs. F, W

5210-20 Human Behavior and Social Environment I and II (3, 3) Examination of theories pertaining to individual, family, and small group within context of functions, structures, roles and processes. Behavior conceptualized along functional-cultural and normal-deviant continuum. Organizing themes, development and maturation, effects of environment, learning mechanisms. Open system approach used to understand interrelations of biological, psychological, and social variables with emphasis on implications of culture and ethnicity. F, W

5290 Special Accelerated Program in Social Work (15) Ten-week program providing qualified students with an accelerated academic and field practicum experience that qualifies them to enter second year of graduate study upon successful completion of this term. S only.

5310 Human Behavior and Social Environment (2-3) Deeps extends students knowledge or range of adaptive behavior; continuum of behavior from normal to pathological; evaluation techniques. Prereg: Second-year status. May be repeated.

5311 Imaginative Perspectives on the Human Condition (2-3) Theoretical and social service implications of the empirical and scientific study of the human condition. Prereg: Completion of core or consent of instructor.

5312 Psychopathology and Social Deviance (3-3) Theories of and recent research in etiology of pathological behavior and social variances. Categorical approach to psychopathology examined and differentiated from other approaches to human behavior. Prereg: Completion of core or consent of instructor. F

5313 Deviant Behavior of Children and Youth (2-3) Deviant behavior and conduct disorders in children and youth, etiology, symptomatology, and range of social services and treatment modalities. Prereg: Completion of core or consent of instructor. F

5314 Comparative Theories of Personality (2-3) Personality theories most relevant for social work practice with individuals, groups, or families. Prereg: Completion of core or consent of instructor. Taught at branches only. Available at UTC as Psychology 4510.

5315 Human Sexual Problems (2-3) Desensitization and resensitization of personal and social attitudes toward sexual behavior, clinical problems and approaches to make social workers better able to deal with clients sexual problems. Prereg: Completion of core or consent of instructor. F

5316 Mental Health and Employment (2-3) Work as major task and value, attitudes toward work, patterns of employment, effect of changing technologies on individual and community, interdependence of individual and organizational well-being, experience that qualifies them to enter second year of graduate study. Prereg: Completion of core or consent of instructor.

5317 Social Work and Black Families (2-3) Historical and contemporary theories regarding Black families, emphasis on child rearing as a system; Framework to assess and plan for Black families within service delivery systems. Prereg: Completion of core or consent of instructor.

5410 Social Work Practice I (3) Basic theory, values and beginning skills development generic to social work intervention at various system levels. Combines classroom skills and laboratory experiences. F

5420 Social Work Practice II (3) Assessment, planning, methodology and skills development fundamental to social work intervention. Combines classroom skills and laboratory experiences. W

5440 Family Therapy in Social Work Practice (2-3) Application of practice theory to assist in acquisition of skills in treatment of family as unit. Prereg: Completion of core or consent of instructor.

5441 Transactional Analysis (2-3) Philosophy, theory, and therapeutic technique of transactional analysis. Lectures, discussion, and experiential methods facilitate individual learning and application of techniques to use transactional analysis as treatment modality. Prereg: Completion of core or consent of instructor.
5442 Short-term Treatment (2-3) Theory and prac-
tice of short-term treatment focusing on nature of 
methods, characteristics of clients responsive to this 
approach, and methods of social work practice, including short-
term treatment services. Specific techniques of 
assessment and treatment applied to practice with individuals 
and groups. Prereq: Completion of core or 
consent of instructor. W

5443 Seminar on Behavior Therapy (2-3) Behavior 
 modification methodoloy applied to clinical assess-
mint, choice of designs to assess treatment in-
terventions, skill in evaluating data on effectiveness of 
treatment interventions. Prereq: Completion of core 
or consent of instructor. May be repeated. Max-
imum 6 hrs. Sp

5444 Social Work Practice with the Poor (2-3) 
Problems, issues, and dilemmas of practice in social 
services with poor and attributes of service-delivery 
systems which make that practice possible. Prereq: 
Completion of core or consent of instructor.

5460 Social Work Treatment with Individuals and 
Families (3) Social work literature, social casework 
as method of social work practice and as form of 
interpersonal treatment. Prereq: Completion of 
core or consent of instructor. Sp

5470 Contemporary Treatment Modalities: Indi-
vidual and Family (2-3) Well-established and de-
development of treatment modalities in terms of essential 
indicators, and future trends in social work treatment: 
organization and function, enabling problem-solving effectiveness, facil-
ating transfer of change, and evaluating individual 
change and group effectiveness. Prereq: Completion of 
core or consent of instructor. Sp

5480 Special Topics in Social Work Treatment (2-
3) Treatment with individuals, families, and small 
groups. Prereq: Completion of core or consent of 
structor. May be repeated. Maximum 8 hrs. F, W, Sp

5560 Social Work Treatment with Groups (3) De-
velopment of knowledge and skill in use of group 
methods in social work practice; organization and 
forming group, structuring group tasks and experi-
s, leading group discussion, enabling group func-
tion, enabling problem-solving effectiveness, facilitat-
ing transfer of change, and evaluating individual 
change and group effectiveness. Prereq: Completion of 
core or consent of instructor. Sp

5561 Interpersonal Skill Development (2-3) Train-
ing group employed to enhance interpersonal com-
petence in application of human relations skills in 
social work practice. Prereq: Completion of core or 
consent of instructor.

5570 Comparative Methods of Group Treatment 
(2-3) Comparative analysis and critical review of 
theory and methodology of some of major group 
treatment modalities with emphasis on theory-base, 
leadership, techniques and procedures, and 
selection of a group. Prereq: Completion of core or 
structor. A

5601 Social Work in Rural Communities (2-3) 
Characteristics of rural populations and rural com-
munities; methods of analysis of rural social 
services and delivery systems. Development of so-
ical work generalist concept and occupational func-
tion in rural areas. Prereq: Completion of core or 
consent of instructor. W

5661 Community Organization (2-3) Using beha-
avioral and social science knowledge about com-
unities and organizations to assist in development of 
resources to meet human needs. Prereq: Comple-
tion of core or consent of instructor. Sp

5670 Social Planning (2-3) (Same as Planning 
5670.) F

5671 Planning and Management of Change in 
Social Work (2-3) Planning and management of 
change such as planned change, conflict, and evolutionary 
change in relation to organizational change, com-
unity improvement, locality development, and 
economic development related to social welfare ser-
VICES. Prereq: Completion of core or consent of 
structor. F

5701 Administration in Social Work (2-3) Introdu-
tion to social welfare administration; it relates to 
administrative work purpose and development of admin-
istrative principles that make possible effective pro-
vision of welfare services.

5706 Community Organizing (2-3) Theories of com-
mitment to the theory of organizing for social 
change and the techniques of organizing. Prereq: 
Completion of core or consent of instructor.

5707 Administration in Social Work (2-3) Introdu-
tion to social welfare administration; it relates to 
administrative work purpose and development of admin-
istrative principles that make possible effective pro-
vision of welfare services.

5708 Management of Residential Settings (2-3) 
Issues and trends in management and programming 
for residential programs, including geriatric mental 
illness, mentally retarded, juvenile and adult offenders, 
and other groups. Prereq: Completion of core or con-
sent of instructor.

5812 Organizational Perspectives in Juvenile 
Justice (2-3) Aspects of juvenile justice system: 
overview of juvenile delinquency, introduction to theo-
dies of causation, role of police in detecting de-
niquency and apprehension of delinquent offenders, 
hospital procedures, role of juvenile court, alternatives 
to institutions, correctional institutions, aftercare 
programs, and preventive strategies. Prereq: Second-year 
standing.

5820 Social Aspects of Illness (2-3) Social, econo-
ic, and emotional problems arising from or related to 
illness and disability as they affect individual, fami-
ly, and community. Services needed to obtain opti-
mum quality of life. Prereq: Some knowledge of 
medical and psychological care. Discussion, dis-
ertation, illustrated case material. Sp

5825 Drugs: Use and Abuse (2-3) Survey and 
analysis of social, cultural, medical, and psycholo-
gical factors underlying addiction and drug abuse, 
recent research and treatment innovations, social 
work with user and family. Prereq: Completion 
of core or consent of instructor. Sp

5826 Social Work Treatment for Marital Adjust-
ments (2-3) Basic principles of work related to the 
family, marriage, and family therapy. Attention given 
to current issues in profession and to development 
of theory. Prereq: Completion of core or consent of 
structor. Sp

5830 Law and Social Work (2-3) Basic principles of 
work related to the law known to society, the legal 
courts; legal aid societies; and other problems of 
legal nature that affect social work. Sp

5860 Social Gerontology (2-3) Physical, psycholo-
ical, and social aspects of aging; economic and 
social aspects of aging; special populations in com-
munity programs for aging; retirement—phe-
nomenon of modern society, Sp

5865 The Roles of Women (2-3) Roles and statuses 
of women in contemporary society. EMPHASIS ON 
Scenic. Empirical research as well as popular litera-
ture. Ascribed and achieved facets of women's sta-

tes, A

5900 Graduate Seminar in Public Health (1-2) 
(Same as Public Health 5900, Nursing 5900, Nutri-
tion and Food Science 5910, and Physical Education 
5900.) S/NC only.

5910-20 Field Practice (3, 4) Instruction and super-
vised practice in methods of social work with indi-
viduals, groups and communities. Prereq: Admission 
to the School; 5410 concurrently or prior to 5910; 
5420 concurrently or prior to 5910. Must be taken in 
sequence. Required: S/NC only. F, W

5930-40-50-60 Field Practice (4, 4-8, 4-8, 4-8) 
Specialized instruction and supervised practice methods of 
social work treatment, administration, and plan-
ing in community health and welfare programs and 
agencies. Prereq: Admission to the School. Must be 
taken in sequence. S/NC only. Sp; W; Sp

5961 Integrative Seminar (2) Required seminar 
facilitates integration of two-year M.S.W. program; 
attention given to current issues in profession and to 
pressing social problems. Student participation in 
symposia, discussions, simulations, and gaming 
situations prepares graduating student to assume 
positions of responsibility and leadership within pro-
fessional and governmental settings. Prereq: Second-
year status. S/NC only. F

5970 Outcomes in Social Work Practice (2-3) Ap-
plied theories of decision making in social work; 
problem-solving within existing service and commu-
ITY systems. Critical appraisal of functional rela-
tionships between problem, policy, planning, prac-
tice, and outcomes. Examination of problems from 
practice to determine key elements of optimal ser-
vice delivery and implications for policy decisions. S/NC 
only. Sp

5980 Practicum in Governmental Social Welfare 
Policy Making (2-3) Practical introduction to prog-
ress of legislative and/or administrative policy mak-
ing at state and/or local governmental level, through
assignment of students to offices of elected or appointed proximate policy makers. Limited social welfare policy research activities. Seminar to present normative and descriptive theory about policy-making process, and models of policy analysis. Pre-req: 5110 and consent of instructor. May be repeated.
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