educational psychology with 3 hours credit.
5. Electives (with approval of advisor): a. Music Education: 12 credit hours from courses 
   numbered 3000, 4000, or 5000 levels. No courses 
   required in the undergraduate curricula may 
   be included.
   b. Music: 3 credit hours from courses at the 
      3000, 4000, or 5000 levels. No courses 
      required in the undergraduate curricula may be 
      included.
   c. Education: 3 credit hours, elected from 
      other departments in Education.
6. Evaluation (in addition to routine 
examinations in courses):
   a. Written comprehensive examination in 
      major and minor fields.
   b. The student shall elect one of the 
      evaluation procedures below (with approval 
      of advisor and committee):
      (1) Oral examinations in major and minor 
      fields.
      a. Public recital in principal instrument, 
         piano, or voice.
      (3) The presentation in public performance 
         of an original musical composition(s) accepted 
         by the committee as music suitable for school 
         music performing groups.
      (4) Plan, rehearse and conduct a full 
         public performance of music by junior or senior 
         high school music groups. This shall be worked 
         out as a long-term project under the supervision 
         of the student. 7. Student's Committee: A minimum of 
         three faculty members—the advisor from 
         music education, one member from music; 
         one member from education.
   4441-42-43 Teaching Class Piano (1, 1, 1) For 
   majors in music, music education, or elementary 
   4450 Music in Special Education (3) Techniques 
   and materials for exceptional children. Prereq: 3110-
   20.
   4480 Marching Band Techniques (3) Functions, 
   organization, and direction of a school marching 
   band. Prereq: Consent of instructor. Coreq: 3511. F.
   Su
   5000 Thesis (1-15) 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 de-
   gree requirements. May be repeated. S/NC only. E
   5150 Studies in Secondary School Music (3) De-
   velopment of the music areas of the general music 
   curriculum. Prereq: 5710 or equivalent and 
   consent of instructor. Su
   5260 Music for Early Childhood (3) Prereq: Consent 
   of instructor. Coreq: 3120 or 3130 or consent of in-
   structor. Su
   5270 Studies of Music for Children in the Primary 
   Grades (3) Children's growth processes in music for 
   Grades 1-3, and musical experiences. For major in 
   music education and/or elementary education. 
   Prereq: 3120 and 3130 or consent of instructor. Su
   5230 Advanced Choral Literature and Conducting 
   (3) Reading, conducting, and interpreting vocal 
   scores suitable for school, college, church, and com-
   munity groups; emphasis on contemporary and stan-
   dard major choral works. Prereq: Undergraduate de-
   gree with a major in music or music education; 4450,
   4510 or equivalent. E
   5410 Advanced Band Literature and Conducting 
   (3) Reading, conducting, and interpreting band 
   scores suitable for school, college, and community 
   bands; emphasis on contemporary and standard 
   band literature. Prereq: Undergraduate degree with a 
   major in music or music education; 4430 or equiva-
   lent. Su
   5510-20-30 The Talent Education Program of Shi-
   nichi Suzuki (2, 2, 2) Study of the psychology, pro-
   cedures and literature utilized by Shinichi Suzuki in 
   Talent Education program in Japan. Prereq: Consent 
   of instructor. F. W. Sp.
   5710 Research in Music Education (3) Prereq: 
   Consent of instructor. Su
   5810 Seminar (3) Music teaching in primary and 
   intermediate grades. Survey of research, professional 
   literature and development of bibliography. Labo-
   ratory activities. Projects. Prereq: Admission to M.S. 
   program.
   5820 Seminar (3) Music teaching in vocal and 
   general music areas of junior high school curriculum. 
   Survey of research, professional literature and de-
   velopment of bibliography. Laboratory activities. 
   Projects. Prereq: Admission to M.S. program.
   5830 Seminar (3) Music teaching in instrumental 
   areas of the elementary, junior high, and senior high 
   curricula. Survey of research, professional literature 
   and development of bibliography. Laboratory activi-
   ties. Projects. Prereq: Admission to M.S. program.
   5840 Seminar (3) Music teaching in vocal, theoreti-
   cal, historical, and appreciation area of the secondary 
   school curricula. Survey of research, professional li-
   terature and development of bibliography. Labora-
   tory activities. Projects. Prereq: Admission to M.S. 
   program.
Continuing and Higher Education
MAJOR
Adult Education
College Student Personnel

DEGREE
M.S.

Professors:
M. C. McMillan, Jr. (Head), Ph.D. Florida State; 
W. H. Coffield, Ph.D. Iowa; J. P. Goddard, Ed.D. 
Tennessee; J. M. Peters, Ed.D. North Carolina 
State; E. M. Ramey (Emeritus), Ed.D. Columbia.

Associate Professor:
K. O. McCullough, Ph.D. Florida State.

Assistant Professor:

The Master of Science degree in Adult
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Prerequisites</th>
</tr>
</thead>
<tbody>
<tr>
<td>4010</td>
<td>International Education: Europe and the Americas (3)</td>
<td>History, philosophical, and sociological foundations; special reference to England, USSR, France, and Germany.</td>
</tr>
<tr>
<td>4150</td>
<td>School Library Administration (3)</td>
<td>Same as Library and Information Science (4150).</td>
</tr>
<tr>
<td>4230</td>
<td>Introduction to Diagnosis and Correction of Classroom Arithmetic Difficulties (3)</td>
<td>Strategies for diagnosis and correcting arithmetic difficulties grades 1-8. Prereq: 3350 or 3751 or equivalent.</td>
</tr>
<tr>
<td>4240</td>
<td>Classroom Instructional Organization (3)</td>
<td>Developing understandings and skills relating to grouping, individualization, space utilization, organization, grading, integration, and achieving an effective social environment. For elementary classroom teacher. Prereq: Senior standing.</td>
</tr>
<tr>
<td>4300</td>
<td>Developmental Reading in Secondary School and Community College (3)</td>
<td>Approaches and materials for teaching basic reading skills and organizing reading classrooms and/or laboratories at middle school, secondary school, and community college level. Prereq: Consent of instructor.</td>
</tr>
<tr>
<td>4304</td>
<td>Developing Reading Skills in Content Fields (3)</td>
<td>Approaches and techniques for teaching reading skills of content areas of school. Emphasis on middle school and secondary school programs. Prereq: Consent of instructor.</td>
</tr>
<tr>
<td>4400</td>
<td>Problems in Improvement of Instruction (1-3)</td>
<td>Special conferences, workshops, or in-service programs designed for improvement of instruction. May be repeated. Maximum 9 hrs. S/NC only.</td>
</tr>
<tr>
<td>4410</td>
<td>Educational Sociology (3)</td>
<td>Same as Sociology 4410.</td>
</tr>
<tr>
<td>4450</td>
<td>Teaching in Kindergarten: Overview (3)</td>
<td>Relationship of kindergarten to total elementary program; goals, historical settings and current development.</td>
</tr>
<tr>
<td>4451</td>
<td>Teaching in Kindergarten: Program Development (3)</td>
<td>Curriculum planning and organization; classroom management. Prereq: Consent of instructor.</td>
</tr>
<tr>
<td>4545</td>
<td>Methods and Materials in Environmental and Science Education (3)</td>
<td>Instructional methods, curricular programs and current issues in environmental and science education for classroom teachers.</td>
</tr>
<tr>
<td>4750</td>
<td>Utilization of Instructional Media (3)</td>
<td>Introduces the basic communications process, need for instructional media, instructional development, selection and utilization of media, and basic software production techniques.</td>
</tr>
<tr>
<td>4860</td>
<td>Programmed Learning (3)</td>
<td>Theories of learning as related to technology of programmed instruction and applications of programming. Prereq: Psychology 3210, Educational Psychology 3730, or consent of instructor.</td>
</tr>
<tr>
<td>5000</td>
<td>Thesis (1-15)</td>
<td>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.</td>
</tr>
<tr>
<td>5002</td>
<td>Non-Thesis Graduation Completion (3-15)</td>
<td>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.</td>
</tr>
<tr>
<td>5040</td>
<td>Studies and Theory in Language Development (3)</td>
<td>Studies and theory of language development in children. Prereq: 1 elementary school language arts course or consent of instructor.</td>
</tr>
<tr>
<td>5070</td>
<td>Seminar in Intercultural Education (3)</td>
<td>Analysis of selected problems; political factors in creation of educational policy; social stratification and its bearing on education in elite and mass societies; relation of education to manpower planning and technological change; and others.</td>
</tr>
<tr>
<td>5090</td>
<td>Special Topics (1-6)</td>
<td>Topics to be assigned. May be repeated. May be offered for letter grade or S/NC.</td>
</tr>
<tr>
<td>5091</td>
<td>Independent Study (1-6)</td>
<td>Topics to be assigned. May be repeated. May be offered for letter grade or S/NC.</td>
</tr>
<tr>
<td>5092</td>
<td>Supervised Readings (1-6)</td>
<td>Topics to be assigned. May be repeated. May be offered for letter grade or S/NC.</td>
</tr>
<tr>
<td>5100</td>
<td>History of European Education (3)</td>
<td>Education in Western Culture. Prereq: 1 course in history and philosophy of education, or western civilization.</td>
</tr>
<tr>
<td>5120</td>
<td>Principles of Education (3)</td>
<td>Philosophical approach to lives and writings of influential educators. Froebel, Rousseau, Pestalozzi, Comenius. Prereq: Consent of instructor.</td>
</tr>
<tr>
<td>5140</td>
<td>Comparative Philosophies of Education (3)</td>
<td>Educational theory and policy programs of the major philosophic schools of thought. Prereq: Consent of instructor.</td>
</tr>
<tr>
<td>5141</td>
<td>Pragmatism in Education (3)</td>
<td>Effects of American pragmatist tradition on educational policy and practice. Prereq: At least one course in history or philosophy of education.</td>
</tr>
</tbody>
</table>
5142 The Existential Student (3) Literature of existentialism as a source for harmonizing students' educational goals and curriculum.

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

5160-90-200 Seminar Educational Specialist Research and Thesis (3, 3, 3)

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

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

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

5220 Advanced Study and Practicum in Diagnostics and Remediation of Arithmetic Difficulties (3) Assessment and practicum experience with students having corrective and remedial arithmetic needs. Prereq: 3270 or consent of instructor.

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

5250 Secondary School Instruction (3) Persistent instructional problems in secondary schools. Prereq: Consent of instructor. Sp, Su

5260 Philosophy of Education (3) Truth, knowledge, and evaluation in qualitative research. Prereq: 3010, Educational Psychology 2430 or 3810, or equivalents. E

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

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

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

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

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

5283 Programs and Materials in Teaching Elementary Science (3) Analysis of new and innovative science program materials; methods of diversifying teaching, using materials, and analyses of program structure. Prereq: Consent of instructor. Sp, Su

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

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

5291 Programs and Materials in Elementary School Language Arts (3) Programs and special instructional aids associated with language arts. Prereq: 3270 or equivalent or consent of instructor.

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

5301 Developmental Reading in the Elementary and Middle School (3) Methods and materials, basic approaches, examination of reading skills, development of functional relationship with other curricular areas. Not available for credit to persons with recent course in reading education. Prereq: Consent of instructor.

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

5303 Methods and Materials for Teaching Critical Reading (3) Instructional techniques, methods, and materials for development of higher level comprehension skills, concepts, and attitudes for creative (or productive) and critical (or evaluative) reading. Prereq: Course in reading education or consent of instructor.

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

5305 Trends and Issues in Teaching Reading (3) Differentiation of issues through analysis of past, present, and future programs, materials, and developments. Prereq: Graduate course in reading education or consent of instructor.

5306 Teaching Reading to the Linguistically Different Learner (3) Language characteristics and special reading problems pertaining to linguistically different learner. Prereq: Course in reading education or consent of instructor.

5307 Assessment and Correction of Classroom Language Arts Difficulties (3) Classroom approaches to assessing and correcting language arts (other than reading) difficulties. Prereq: One graduate level course in elementary school language arts or consent of instructor.

5350 Curriculum Development and Evaluation (3) Examination of alternative approaches to improving current practice. Prereq: 5580 or consent of instructor.

5360 Curriculum Development at the Local Level (3-6) Systematic approach to planning and development of curriculum at local school or system level. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs. S/NC only.

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

5379 Diagnosis and Correction of Classroom Reading Problems (3) Procedures, methodologies and materials for identifying, diagnosing and correcting reading problems or consent of instructor. Prereq: In reading education or consent of instructor.

5380 Practicum in Diagnosis of Reading Problems (3) Theoretic, practical application of specific reading diagnostic instruments; testing of elementary and/or secondary school students, preparing case study reports, and conducting parent conferences. Prereq: Course in diagnosis and correction of reading problems or consent of instructor. May be repeated. Maximum 3 hrs.

5381 Practicum in Remediation of Reading Problems (3) Application of principles of learning and teaching methodology in working with elementary and/or secondary school students on one-to-one or small group basis. Prereq: Course in diagnosis and correction of reading problems or consent of instructor. May be repeated. Maximum 6 hrs.

5382 Developmental Reading Practicum (3) Diagnosis and correction of reading needs. Prereq: Course in diagnosis and correction of reading problems or consent of instructor. May be repeated. Maximum 6 hrs.

5400 Problems in Improvement of Instruction (1-3) Conferences, workshops, and in-service programs. May be repeated. Maximum 9 hrs. S/NC only.

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

5510 Education in Cultural Perspective (3) Contribution of anthropological concepts (primarily concepts of culture) to understanding of education processes, problems, and thought in our society and others. (Same as Anthropology 5510.)

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

5570 The Junior High and Middle School Curriculum (3) Curriculum designs and appropriate patterns of instruction to middle grade students.

5580 Curriculum Planning and Development (3) Introduction to curriculum theory and basic principles. Prereq: 5410 or 5270 or consent of instructor. E

5610 Educational Statistics (3)

5620 Direction and Supervision of Student Teaching (3) Roles and responsibilities of cooperating teachers and student teachers; objectives and policies of student teaching programs; elements of clinical supervision; overview of research.

5630 Individualization of Instruction (3) Practical experience in designing individualized activities and materials. Prereq: 5580 and 5600 or consent of instructor.

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

5550 Curriculum Laboratory for Elementary Schools (2-6) Workshops and in-service programs to improve instruction of teachers. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs. S/NC only.

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

5680 Teacher-Parent-Community Relations (3) Development of techniques for effective relations between parents and teachers. Roles and expectations of parents and teachers, parent involvement, and influence of community on educational process. W

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

5691 Advanced Production of Audiovisual Software (3) Lining, editing, soundtrack projects, mounting, preserving, synchronizing, photocopying, nonphotographic slides, and videotaping for producing classroom audiovisual aids or other media. Prereq: Consent of instructor, Library and Information Science 4750 or equivalent. (Same as Library and Information Science 5691.) Prereq: Consent of instructor.

5692 Evaluation of Instructional Media (3) Evaluating and recycling media prototype to meet needs and objectives of learners. Prereq: 5681 or consent of instructor.

5693 Administering Instructional Media Programs (3) Duties, functions, and responsibilities of media professionals developing and administering
media program in various organizational and learning settings. Prereq: 5691, 5692, or consent of instructor.

5694 Utilization of Educational Television and Radio (3) Use of noncommercial educational TV and radio in schools and colleges. Prereq: Consent of instructor.

5695 Research in Instructional Media (3) Media research and its application toward improvement of instruction and learning. Prereq: Consent of instructor.

5696 Practicum Experience in Instructional Media (3) Practicum experience in professional media role as identified by student in various organizational and learning settings. Prereq: Consent of instructor.

5697 Application of Instructional Media (3) Media theory and research, new media and technology, application of media in instructional settings. Prereq: Consent of instructor.

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

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

5790 Career Development: Workshop (1-6) (Same as Education Professional Prac 5790).

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

5810 Introduction to Data Processing in Education (3) Analysis of current activities in field of educational data processing. Emphasis on curricular, administrative, and research opportunities in education, using modern electronic data processing machines and machines. Prereq: Consent of instructor.

5820 Seminar in the Teaching of Mathematics (3) Current methods and materials for grades 7-12 for experienced teachers. Prereq: 1 year teaching experience (mathematics grades 7-12) or consent of instructor. Sp

5825 Teaching Mathematics in the Middle and Junior High School (3) Problems related to teaching mathematics in middle and junior high schools. Emphasis on understanding of mathematical concepts, strategies, methods, and materials for teaching. Prereq: 2 5000-level courses (preferably 5379 and 5304) in reading education and in language arts or consent of instructor. Su

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

5835 Teaching Mathematics in the Senior High School and Community-Junior College (3) Curriculum and teaching problems. Methods of teaching "analysis" courses such as Algebra II, trigonometry, analytic geometry and calculus. Prereq: 3751-52 or equivalent. Su

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

5842 Applications of Theory in Early Childhood Education (K-3) (3) Principles and practices from several theoretical orientations for young children (K-3). Teaching strategies, materials and evaluation methods. Prereq: Course in child development or child psychology at senior or graduate level.

5843 Seminar in Early Childhood Education (3) Analysis of research in early childhood education (K-3) relating to theoretical perspectives. Prereq: 4450 or equivalent, or consent of instructor. May be repeated. Maximum 6 hrs. W

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

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

5846 Language Arts in Early Childhood Education (K-3) (3) Language development of young learner with emphasis on teaching methods, procedures, program and materials in early childhood language arts program. Prereq: 3260 or equivalent or consent of instructor.

5899 Field Experience (1-6) Application of curricular and instructional principles, methods, and materials in schools. Program prerequisites must be met, and consent of instructor required. May be repeated. Maximum 12 hrs. S/NC only.

5900 Seminar in the Teaching of English in the Secondary School (3) Su

5901 Linguistics and the Teacher of English (3) Analysis and application of linguistics in the classroom. Su

5902 Teaching Composition in the High School (3) Techniques for teaching rhetoric. W

5903 Teaching Fiction in the Secondary School (3) Reading, study, and analysis of literary selections. F

5904 Teaching the Mass Media in the English Classroom (3) Nature of mass media and importance to American education and life. Sp

5905 Teaching English in the Community/Junior College (3) Emphasis on thorough understanding of communication needs of community/junior college students and objectives, strategies, and materials for meeting these needs. Su

5906 Teaching Poetry in Grades 7-12 (3) Materials and strategies for teaching poetry. W

5907 Teaching Drama in Grades 7-12 (3) Strategies and materials for teaching drama. W

5908 Developing Speaking and Listening Skills in Grades 7-12 (3) Strategies and materials for teaching skills of speaking and listening. Sp

5909 Instructional Theory and Design (3) Instructional process and relationship to curriculum and learning. Prereq: Consent of instructor.

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

5911 Direction of the Forensic Program (4) (Same as Speech 5911)

5912 Play Production in Secondary Schools (4) (Same as Theatre 5912)

5920 The Function of the Thinking Process in Education (3) Analysis of thinking process for purpose of tracing its implications for education theory and practice.

5960 The Teaching of Natural Science (3) Strategies, laboratory techniques, testing and evaluation, professional guidelines for middle, junior and senior high schools, community colleges. Prereq: Consent of instructor.

5961 Seminar in Science and Environmental Education (3) Recent developments in science education. Interrelationships of major environmental factors on science education for middle, junior and senior high schools, community colleges. Prereq: Consent of instructor.

5962 Studies in Energy Education (3) Major and alternative energy sources with applications for development of energy educational programs and materials; special emphasis on science taught in schools including community colleges. Prereq: 5961 or consent of instructor.

5970 The Teaching of the Social Studies (3) Su

5980 Projects, Programs, and Materials in Social Studies (3) Projects and aids associated with each social science discipline. W

6000 Doctoral Research and Dissertation (3-15) E

6010 Studies in English Education (3) Reading and study in various areas of teaching of English: composition, language, and literature. Su

6020 Seminar in Teaching the Social Studies (3) Problems associated with classroom instruction in junior and senior high schools. Su

6030 Research and Theory in Teaching Reading (3) Research and theory in application to teaching of reading; research design as it applies to reading investigations. Prereq: Two 5000-level courses in reading. W

6031 Seminar in Reading and Language Arts (3) Topics new to reading and language arts chosen by need and instructor(s). Prereq: 5000-level course in reading education and in language arts or consent of instructor. Su

6032 Organization and Administration of Reading Programs (3) Synthesizing instructional and learning components of reading into classroom, school, and system programs. Prereq: 2 5000-level courses (preferably 5579 and 5304) in reading education or consent of instructor.

6040 Seminar in Curriculum and Instruction (1) Required three quarters. S/NC only. E

6060 Advanced Studies in Elementary Education (3) Critical analysis of research as it applies to classroom practice. Prereq: 5710 or 5800; 12 hrs at graduate level; or consent of instructor. W

6080 Advanced Seminar in Philosophy of Education (3) Some selected philosophical issues in education. Prereq: At least 2 courses in history or philosophy of education.

6081 Phenomenology and Education (3) Theory and applications to selective educational issues. Prereq: 2 courses in history or philosophy of education.

6082 Philosophical Analysis and Education (3) Philosophical analysis of language and concepts in educational research and writing. Prereq: At least 2 courses in history or philosophy of education.

6090 Special Topics (1-6) Topics to be assigned. May be repeated. May be offered for letter grade or S/NC. E

6091 Independent Study (1-6) Topics to be assigned. May be repeated. May be offered for letter grade or S/NC. E

6092 Supervised Readings (1-6) Topics to be assigned. May be repeated. May be offered for letter grade or S/NC. E

6150 Education as Social Policy (3) Education as instrument of national policy; topical problems faced by society in shaping educational programs. Prereq: Consent of instructor.

6210 Seminar in Elementary School Social Studies Research (3) Current research in elementary social studies, status of research in field, needed research-related research from other fields. Prereq: Undergraduate course and one graduate course in social studies, or equivalent. Su

6230 Programs for Curriculum Improvement (3) W

6240 Interpretation of Research in Curriculum and Instruction (3) Research studies and relation of findings to professional assignments. Prereq: 5800 or 5710 or equivalent.

6250 Seminar in History of Education (3) May be repeated with consent of instructor.

6282 Advanced Studies in Elementary School Science (3) Critical analysis of current research in elementary school science. Prereq: Undergraduate course and one graduate course in science, or equivalent.
6350 The Professional Education of Teachers (3) Principles and practices of preservice preparation of teachers for American elementary and secondary school curricula, current and historical trends and issues, innovations and directions for future.

6400 The Dynamics of Educational Change (3) Interdisciplinary approach to change process in education. Prereq: Consent of instructor.

6500 Advanced Studies in Early Childhood Education (3) Prereq: 2 graduate level courses in early childhood education and consent of instructor. May be repeated. Maximum 6 hrs. S/NC only.

6510 Advanced Studies in Elementary School Language Arts (3) Critical research analysis of selected issues in elementary school language arts. Prereq: 2 graduate level courses in elementary school language arts or consent of instructor. Sp.

6511 Advanced Studies in Educational Anthropology (3) Ethnographic methods applied to formal and nonformal educational settings. Prereq: 2 courses in cultural anthropology, educational anthropology, or consent of instructor.

6610-20-30 Seminar in Dissertation Proposal Writing (2, 2, 2) Preparation and evaluation of dissertation proposal. Prereq: Completion of at least one research competency or consent of instructor. S/NC only.

6710 Advanced Educational Statistics (3)

6720 Interpretation of Data (3) Types of data in published materials in education; principles of sound interpretation.


6731 Advanced Studies in Curriculum (3) Analysis of influential curriculum theories and approaches, structure and design of educational programs. Prereq: 5580 and 5350, or equivalent.

6830 Studies in Mathematics Education (3) Reading and studying related to historical trends and issues in mathematics education in United States providing broad perspective on current curricular problems and future trends. Prereq: 5830 or consent of instructor.

6850 Principles of Educational Leadership (3) Conflicting concepts, with application to major problems in instruction, supervision, and administration.

6899 Internship (1-6) Advanced level experiences in application of principles and practices of curriculum development and instructional improvement. Program prerequisites must be met and consent of instructor required. May be repeated. Maximum 12 hrs. S/NC only.

6960 Advanced Studies in Secondary Science and Environmental Education (3) Programs, materials, and recent research for middle, junior and senior high schools, community colleges. Prereq: 5960 or equivalent, consent of instructor.

*May not be used toward meeting 6000 requirements.

**Education**

**MAJOR**

**DEGREE**

**Education**

Ph.D.

6001 Trans-College Seminar (1) Minimum of four consecutive quarters required of all Ph.D. students. Prereq: Admission to Ph.D. program. May be repeated. May not be used to meet 6000 requirement. S/NC only.

**Educational Administration and Supervision**

<table>
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<th>DEGREE</th>
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<tr>
<td>M.S.</td>
<td>Education and Supervision Education</td>
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<tr>
<td>Ed.D.</td>
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<td>Ph.D.</td>
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</tbody>
</table>

Professors:

H. O. Stollgrand (Head), Ph.D. Ohio State;
C. M. Peccolo, Ph.D. Iowa; R. K. Roney, Ed.D. Tennessee;
C. K. Tanner, Ed.D. Florida State;
G. C. Kubat, Ph.D. Minnesota;
F. P. Venditte, Ed.D. Colorado State.

Associate Professors:

H. F. Aldman, Ed.D. Tennessee;
G. W. Harris, Jr., Ph.D. Michigan;
P. M. Husen, Ed.D. Stanford.

Assistant Professor:

N. T. Mertz (Adjunct), Ed.D. Columbia.

Lecturer:


Programs are planned for (1) students preparing for administrative positions normally found in the educational structure of the state; (2) students preparing for the position of supervisor of education; (3) administrators and supervisors in service who wish to improve their professional competence; (4) students and teachers preparing for teaching positions involving administrative responsibilities; and (5) students preparing for teaching educational administration or for administrative positions in higher education.

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

The Doctor of Philosophy degree with a major in Education includes options and emphases as listed on page 49.

5000 Thesis (1-15) E

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

5100 Internship in Educational Administration (3) May be repeated with consent of department. Maximum 6 hrs. E

5130 Introduction to Educational Administration (3) Tasks, functions, and processes of educational administration; organization and structure of educational programs and institutions. E

5180-90-200 Educational Specialist Research and Thesis (3, 3, 3) E

5220 Philosophy and Theory in Educational Administration (3) Philosophical and theoretical foundations of educational administration, programs, and institutions within the framework of American culture. F, W, Su

5230 Seminar in the Behavioral Sciences in Educational Administration (3) Key behavioral science concepts and their application in educational administration and supervision, social science and organization, interpersonal behavior, motivation and morale, role theory, W, Sp, Su

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

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

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

5430 Building Level Administration (3) For beginning school principals and administrators, and for those operating in rural elementary, secondary, or consolidated schools. W, Su.

5440 Introduction to Law, Finance, and Business Management at the Building Level (3) Orientation for beginning principals for basic foundations of the American legal system; how case law effects daily building level operations; building level methods of fiscal and logistical support measures. F, W, Su.

5450 Organization of the School Program (3) For principals and supervisors; conceptual and technical skills in organizing school program including curriculum, instruction, student grouping, staff, schedules, and space. F, Sp, Su.

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

5470 Introduction to School Facility Planning (3) For school administrators; facility planning; skills in building planning, design, and evaluation. F, Su.

5480 Instructional Supervision—Local School (3) Developing a concept of supervision; instructional help, support, and service for teachers; supervision of curriculum; staff development; and staff evaluation. F, Sp, Su.

5530 Introduction to Educational Planning (3) Processes for improving decision-making function through both quantitative and qualitative planning techniques. Relating educational policy analysis to educational planning. F, Su.


5560 Research for Educational Administrators (3) Descriptive, experimental, and quasi-experimental design to help student without quantitative background to read and understand technical literature. Primarily for nonthesis option students. Should be taken early in M.S. or Ed.D. program. W, Su.

5580 Seminar in Communication Skills for Educational Administrators (3) Identification, development, and use of interpersonal and group related communication skills. F, Sp.

5711 Problems in Educational Administration and Supervision: School Operation (3) May be repeated. E

5712 Problems in Educational Administration and Supervision: Higher Education (3) May be repeated. E

5713 Problems in Educational Administration and Supervision: State School Administration (3) May be repeated. E

5714 Problems in Educational Administration and Supervision: Preparation Programs (3) May be repeated. E

5740 Problems in Educational Administration and Supervision: Community Education (3) Independent study of administrative problems. May be repeated. E

5751 Problems in Educational Administration and Supervision: Finance (3) May be repeated. E

5752 Problems in Educational Administration and Supervision: Transportation (3) May be repeated. E

5753 Problems in Educational Administration and Supervision: Health and Safety (3) May be repeated. E

*College of Education 55*
5754 Problems in Educational Administration and Supervision: Business Management (3) May be repeated. E
5755 Problems in Educational Administration and Supervision: Personnel (3) May be repeated. E
5756 Problems in Educational Administration and Supervision: School Plant (3) May be repeated. E
5757 Problems in Educational Administration and Supervision: Organization and Structure (3) May be repeated. E
5758 Problems in Educational Administration and Supervision: School Law (3) May be repeated. E
5759 Problems in Educational Administration and Supervision: Supervision (3) May be repeated. E
5770 Maintenance of School Plants (3) Skills in operating school custodial and maintenance programs. Sp.
5810 Survey Research Methods (3) Overview of descriptive studies, data collection, analysis, and interpretation for survey studies and school surveys, strategies for descriptive research in education. W, Su, Sp.
5850-60-70 Independent Study in Educational Administration (3, 3, 3) Prereq: Consent of instructor. E
5890 Decision Making and Decision Theory in Educational Organizations (3) Theoretical constructs underlying executive decision theory problem-solving activities for preservice and practicing administrators. Executive decision making at several administrative levels in complex educational organization. S/NC only. A
5900 Special Topics (3) May be repeated. E
5910-20-30 Problems in Lieu of Thesis (3, 3, 3) Prereq: Presently a school supervisor or administrator or consent of instructor. May be repeated. S/NC only. F
5950 Elementary Administrators Seminar (3) For in-service training of elementary school administrators. Developments, programs, problems, and trends of a school superintendent or assistant superintendent. W, Su.
5955 State-Federal Relations in Education (3) Purposes and functions of federal, state, and local educational agencies, organizational control and political variables. Major education laws, rule and regulation-making process, grants and contracts as inter-level policy instruments. Su.
5960 Legal Foundations of Public Education (3) Legal framework and theoretical concepts that impinge on operations of schools within present legal structure of the United States. Sp.
5970 Seminar in Managing Conflict (3) Learning about and experiencing various forms of conflict. W, Su.
5995 Special Topics (3) May be repeated. E
6000 Doctoral Research and Dissertation (3-15) E
6040 Seminar in Educational Administration and Supervision (1) Required three consecutive quarters. S/NC only. E
6100 Internship in Educational Administration (3) May be repeated at discretion of student's committee. Credits may be granted to doctoral students and advanced graduate students to gain experience in performance of critical tasks of educational administration under supervision of practitioner and University representative. E
6110 Administrator Update (3) Current topics of concern to practicing school administrators, selected each quarter and presented by a specialist. Prereq: Presently a school supervisor or assistant supervisor or consent of instructor. May be repeated. S/NC only. E
6190 Administration in Higher Education (3) Developing conceptual understanding of administrative theory and practice in higher education. F, Sp
6220 Programs for the Professional Preparation of Education Administrators and Supervisors (3) E
6340 Current Trends in School Law (3) Logical arrangement of case and statutory material for public school administration; curriculum and organizational problems concerning the law and public education. W, Su.
6380 Instructional Supervision—School District (3) Definition and analysis of instructional supervision at the school district level: Supervisory operations, including level development; curriculum development; instructional support, help, and service for teachers and administrators; personnel development; program evaluation. W, Su.
6420 School Board-Supervintendency Relationships (3) The local unit of school administration, school district and its governing body, board of education or school board. Sp.
6440 School Business Management (3) Emphasizes superintendency team concept; planning, procurement and utilization of fiscal resources. F, Su.
6450 Grant and Contract Proposal Preparation (3) Grants and contracts processes in education. Basic concepts applicable to other special agencies. Sp.
6460 School Personnel Administration (3) Personnel administration functions for professional and supporting staff in educational organizations. Recruitment, selection, placement, personnel policies, employee wage and salary administration, fringe benefits, collective negotiations, human relations, staff development, and staff evaluation. F, W, Sp.
6480 Special Topics in School Personnel Administration (3) Human problems in school personnel administration; staff planning, record systems, personnel policies, collective bargaining in education; and staff evaluation. May be repeated. Maximum 12 hrs. F, W, Sp.
6530 Futuristic Educational Planning Methods (3) Methods for describing alternative futures. W
6540 Contemporary Economics and Educational Finance (3) Contemporary educational financial policies and their influence on educational service and program, national economy, welfare of individuals, and welfare of the nation. F, Su.
6550 State-Federal Relations in Education (3) Purposes and functions of federal/regional/state/local educational agencies, organizational control and political variables. Major education laws, rule and regulation-making process, grants and contracts as inter-level policy instruments. F, Su.
6560 Legal Foundations of Public Education (3) Legal framework and theoretical concepts that impinge on operations of schools within present legal structure of the United States. Sp.
6580 Seminar in Managing Conflict (3) Learning about and experiencing various forms of conflict. W, Su.
6750-60-70 Independent Studies in Educational Administration and Supervision (3, 3, 3) Prereq: Consent of instructor. May be repeated. E
6800 Administration of Complex Educational Organizations (3) Concepts and theoretical formulations to understand, analyze, evaluate, and change complex educational organizations. W, Sp.
6870 Advanced Study in School Facility Planning (3) In-depth experiences in development of educational specifications and techniques of leadership in creation of quality educational facilities. W
6900 Special Topics (3) May be repeated. E
6981 Specialized Seminar: School Operation (3) E
6998 Specialized Seminar: School Law (3) E
6999 Specialized Seminar: Supervision (3) Sp.

Educational and Counseling Psychology

MAJORS

DEGREES

Guidance

M.S.

Education Psychology

M.S.

Educational Psychology and Guidance

Ed.S., Ed.D.

Education

Ph.D.

Professors:


Associate Professors:


Assistant Professors:


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

¹Part-time
²Adjunct
teaching. The Doctor of Philosophy degree with a major in Education includes options and emphases as listed on page 49. Appropriate courses taken in this department and in the Department of Psychology will satisfy requirements for certification as a school psychologist. Write the department for information concerning the program requirements. Application deadlines to Ed.D./Ph.D. are February 1 and May 1; Ed.S. and M.S. deadlines are October 15, February 1, May 1, and July 15.

4110 Psychology of Sex Role Development (3) Examination, from both a theoretical and research base, of factors which contribute to sex role development and definition in society and role of education in these changes. For student with minimal background in behavioral sciences. F, Sp, Su

4130 Mental Health (3) Studies and exploration of positive mental health. Application of mental health criteria to a study of a group assessed on a battery of personality assessment instruments.

4350-60-70 Special Topics and Problems (1-6) May be repeated. S/NC only.

4440 General Evaluation Procedures for Public Schools (3) Prereq: 2430 or equivalent. E

4640 Standardized Testing (3) Use and interpretation of standardized group instruments in assessment of intelligence, aptitude, achievement, vocational interests, and personality adjustment. E

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

4780 Advanced Child Study (3) Prereq: 2430 or 3810 or consent of instructor. W, Su

4800 Psychology of the Disadvantaged Child (3) Significant behavioral differences and causes; appropriate intervention approaches. F

4810 Psychoeducational Aspects of Appalachian People (3) Exploration of psychology of people of Appalachian area with emphasis on development, implementation and evaluation of consultation and guidance programs. W


4890 Differential Psychology (3) Nature and sources of individual differences in behavioral characteristics, and differences between racial, ethnic, socioeconomic, sex, and other groups.

5000 Thesis (1-15) E

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

5040 Guidance and Pupil Personnel Services in Education (3) (Same as Vocational-Technical Education 5040, F, Su

5050 Children and Adolescents (3) Mental, social, physical, and emotional growth, development, and learning of children and adolescents: prevention, identification, and remediation of learning problems. W, Su

5060 Group Approaches with Students (3) Knowledge and skills appropriate to functioning with groups in counseling: psychological and parent education. F, W, Su

5070 Seminar in Elementary School Guidance (3) Trends, role, function, and administration of guidance in elementary school. Sp

5099 Field Work (1-6) Practical experience in departmentally approved field placement. Supervision by field and University personnel. Program prerequisites to field work must be met. May be repeated. Maximum 6 hrs. S/NC only.

5100 Developmental Psychology (3) (Same as Psychology 5101) Theory and research on principles and problems of adolescent development; application to individual adolescents. Prereq: 3610 or equivalent.

5110 Psychology of Women (3) Past and current educational and psychological theory and practice with special attention to assumptions and practice in regard to women; social context in which various theories were developed and current theories and research focusing on women and/or sex differences. Prereq: 4130 or basic course in personality theory. E

5111-12-13 Seminar in Current Issues in School Psychology (1, 1, 1) (Same as Psychology 5111-12-13) S/NC only.

5120 Seminar in Bias-Free Counseling (3) Feminist psychology, bias-free education, and counseling. Prereq: 4110 and 5110 or consent of instructor. May be repeated. Maximum 9 hrs.

5140-50-60 Psychoeducational Assessment (3, 3, 3) (Same as Psychology 5140-50-60.)

5149-59-69 Practicum in School Psychology I (2, 2, 2) (Same as Psychology 5149-59-69) S/NC only.

5180-90-200 Educational Specialist Research and Thesis (3, 3, 3) E

5210 Interpreting Published Articles: Statistics (3) Descriptive and experimental research in educational psychology, guidance and counseling, and college student personnel. Prereq: Non-thesis option students only or consent of instructor. F, W, Su

5220 Interpreting Published Articles: Research Design (3) For students not conducting research projects; interpret and evaluate statistical tables and statistical tests as reported in journals. Prereq: 5210 or consent of instructor. W, Sp, Su

5310 Diagnostic and Corrective Teaching (3) Application of psychology of learning to instruction and problem-solving situations that student encounters in classroom. Prereq: Course in general psychology. May be taken for undergraduate credit by undergraduates admitted to teacher education or consent of instructor.

5319 Field Work in School Psychology: Level I (2)

5320 Advanced Classroom Behavior Modification (3) Current research in psychology and its application in educational settings. E

5330 Theory and Research in Human Learning (3) Contemporary learning theory; current research and its influence upon school practice. F

5331 Current Developments in Human Learning (3) Sp

5340 Group Dynamics (3) Principles of group dynamics as they apply to a variety of group settings. Group counseling, personal growth, and group leadership skills. (Same as Psychology 5340, E

5350 Educational Applications of Cognitive Theories (3) Developmental theory of Jean Piaget and implications for education. Related theories such as Bruner and Ausubel.

5560 The College Student (3) Nature, characteristics, and needs.

5720 Evaluation in Education (3) Techniques and instruments for identifying and appraising social values, the thinking processes, social adjustment, emotional needs, personal interests, and problems.

5780 Career Development: Theory and Research (3, 3) F, Su

5785 Career Development: Program Development Implementation and Evaluation (3) Career development and prevocational programs and practices, K-adult with emphasis on development, implementation, and evaluation. Prereq: 5780 or equivalent, or consent of instructor. Sp

5790 Career Development: Workshop (1-6) Designed for in-service training of school personnel. Developments, problems, and trends related to career development. May be repeated. Maximum 6 hrs. (Same as Curriculum and Instruction 5790 and Special Education 5790.)

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

5850-60-70 Special Topics and Problems (1-6, 1-6, 1-6) May be repeated. May be taken for letter grade or S/NC. E

5880 Career Development: Occupational and Educational Resources (3) Gathering, interpreting, and using educational, social, occupational, and community information in the guidance program; sources, types of materials, and occupational files. For use both in group and individual guidance programs. W, Su

5885 Career Development: Field Experience (1-3) Application of career development principles and practices in school, college, business, and industry. May be taken concurrently or separately: 5780, 5785, 5790, 5880, and/or consent of instructor. May be repeated. Maximum 6 hrs. E

5980 Counseling Theories and Techniques (3) Presentation, demonstration, and application. Open to students interested in counseling process. (Same as Psychology 5890.) F, W, Su

5987 Practicum (3) Didactic experiences and counseling simulations in learning laboratory. Coreq: 5890. E

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

5940 Counseling Practicum (3) Supervised practice in counseling in elementary or secondary school guidance and/or student personnel work. Prereq: 4460, 5690 (or 5340), 5680, 5897 or consent of instructor. May be repeated with consent of department. Maximum 6 hrs. E

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

5958-5969 Practicum in Consultation (2, 2) (Same as Psychology 5958-59-69) S/NC only.

5980 Organization and Administration of Counseling Services (3) Program planning, policies, procedures, and practices. Prereq: 4130, 4640 or consent of instructor. Sp, Su

6000 Doctoral Research and Dissertation (3-15) E

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

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

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

6120 Application of Experimental Research Design (3) Experimental designs used by researchers in educational psychology, counseling, and college student personnel. F, W

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

6550-60-70 Seminar in College Student Personnel (2, 2, 2) Issues in college student personnel, college counseling, and college student personnel. Prereq: 6110 or equivalent. W, Sp
Special Education and Rehabilitation

MAJORS
Special Education
Vocational Rehabilitation Counseling

Professors:

Associate Professors:

Assistant Professors:
S. M. Brenner, Ed.D. Columbia; K. H. Kopp, Ph.D. George Peabody; W. Mulkey, Ph.D. Florida State; S. B. Reese, B.S. Memphis State

Instructors:
M. Griffin, M.S. Tennessee; G. D. Tyler, M.S. Tennessee; K. M. Wardan, M.S. Tennessee

Lecturers:
R. J. Akins, M.S. Tennessee; Z. H. Brody, M.A. Tennessee; H. L. Byrd, Jr., M.S. Tennessee; O. E. Reese, B.S. Memphis State

The Department of Special Education and Rehabilitation provides competency-based programs and training opportunities for students to prepare for careers in special education, rehabilitation, and related positions. Specialized courses may be distributed over several areas of exceptionality with emphasis in an area of special interests or need. Facilities are available for continuous observation and participation in direct relationships with handicapped children and adults who are hospitalized, homebound, or in residential schools, special classes, or regular classes.

Courses should be planned in specialized areas to include (1) hearing impaired; (2) gifted; (3) learning disabilities; (4) mentally retarded; (5) multiple disabilities; (6) socially or emotionally maladjusted; (7) rehabilitation counseling; (8) disability evaluation education; and general special education and rehabilitation.

Programs lead to the Master of Science学位在 one of the specialized areas. Under the sponsorship of Social and Rehabilitation Services, a specialized program for the preparation of professionals to adapt their skills toward services to hearing impaired and deaf people is provided.

For further information, consult the department head.

EDUCATION OF THE HEARING IMPAIRED

4000 Rehabilitation Practicum (3) Evaluation of client data; placement; rehabilitation prognosis. Prereq: 4230. F, Sp

4190 Speech Development of Hearing Impaired (3) Anatomy and physiology of speech system. Relation of hearing loss to speech development. Reactivation of speech development and improvement; for hearing impaired children. Prereq: Audiology and Speech Pathology 3500. (Same as Audiology and Speech Pathology 4200.) W, Su

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

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

4220 Language Development of Hearing Impaired II (3) Various communicative systems required by hearing impaired persons: speech and language development; auditory training, speech reading, manual language, and its relation to other forms of communication. Observation and practicum. (Student must acquire a degree of proficiency in use of manual language.) Prereq: Consent of instructor. E

4231 Communication Processes for the Hearing Impaired II (3) Intermediate course in manual communication skills and techniques with emphasis on vocabulary development with receptive and expressive language. Prereq: 4220 or consent of instructor. (Same as Audiology and Speech Pathology 4220.) W, Su

4230 Communication Processes for the Hearing Impaired (3) Various communicative skills required by hearing impaired persons: speech and language development; auditory training, speech reading, manual language, and its relation to other forms of communication. Observation and practicum. (Student must acquire a degree of proficiency in use of manual language.) Prereq: Consent of instructor. E

5200 Curriculum Development and Instruction for the Hearing Impaired (3) Applications of educational theories and techniques in the development and implementation of educational programs for hearing impaired children. Prereq: 4200 and consent of instructor. (Same as Audiology and Speech Pathology 5540.) W, Su

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

5500 Seminar in Language Pathology (3) (Same as Audiology and Speech Pathology 5540.) W, Su

5820 Curriculum Development Applied to Programs for the Hearing Impaired (3) Current curriculum trends adopted for hearing impaired individuals. The curriculum in education of these children. Current education theories for programs for hearing-impaired children. Prereq: Curriculum and Instruction 5580 or equivalent and consent of instructor. Sp

EDUCATION OF THE MENTALLY RETARDED

4110 The Nature and Concept of Mental Retardation (3) Identification, description, and study. E

4120 Education of the Mentally Retarded Child (3) Philosophy and rationale underlying teaching and guidance of mentally retarded: methods and materials in special and regular classes. Prereq or coreq: 4110. E

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

4810 Student Teaching Mental Retardation (3) Prereq: Major in education of mental retardation. S/N only. F, W, Sp


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

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

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

5113 Advanced Curriculum for the Mentally Retarded (3) Individualized curriculum in education of mentally retarded children and adults. Emphasis on varied curriculum alternatives to regular education. Sp, Su

MULTIPLE DISABILITIES

4130 Education of the Brain-Injured Child (3) Nature of brain-injured child; skills for identifying educational, physical, and emotional characteristics; special educational techniques. E

4150 Education of Children with Crippling and Special Health Conditions (3) Medical and educational needs of cerebral palsied; evaluative techniques; related services. A

4156 Appraisal of the Severely Mentally Retarded (3) Special educational techniques. E

4157 Educational Diagnosis of the Brain-Injured Child (3) Nature of brain-injured child; skills for identifying educational, physical, and emotional characteristics; special educational techniques. E

EDUCATION OF THE EMOTIONALLY DISTURBED

4510 Nature and Characteristics of Learning and Behavior Disorders (3) Forms of academic and socially disturbing behavior, degrees of severity, possible causes, and relationships to each other. Parenting techniques, respect to personality characteristics and development factors interpreted through behavioral and psychodynamic theory as well as practical situations in which learning and behavior disorders may occur. E

4620 Education of the Emotionally Disturbed Child (3) Managing behaviors, models for instruction, teaching techniques and materials, and teacher-pupil family interpersonal relationships as basic to academic achievement for the pupil. Prereq: 4610. Su

4630 Practicum in Residential Settings Serving Children with Disturbing Behavior (3) Practice in scientifically identifying, observing, and recording disturbing behaviors. Initiating behavior changes relevant to personality characteristics. To perform in a tutor capacity within a residential classroom; and to take part in discussion and planning on the relevant academic curriculums and reinforcement schedules. Prereq: 4610 and 4620 or consent of instructor. A

4640 Practicum in Public School Systems Serving Children with Learning and Behavior Problems (6) Academic tutoring in a teacher aide capacity within regular classrooms. Particular emphasis and practice in individualized instruction for learning and behavior problem children within the regular classroom setting. Discussion and evaluation of relevant methods and materials unique to each teaching situation. Prereq: 4610 and 4620 or consent of instructor. A

4924 Student Teaching of the Emotionally Disturbed (1) Observation and classroom teaching. Prereq or coreq: Curriculums and Instruction 4720 or 4820. S/NC only. A

REHABILITATION COUNSELOR EDUCATION

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

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

5120 Psychosocial Aspects of Disability (3) Medical and psychological impacts of major disabilities; rehabilitation processes including implications of family and community. Sp

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

5130-40 Seminar in Rehabilitation (3, 3) Practicum in Public School Systems Service to Retarded Child (3) Valuation to retarded child's education. Sp, Su

5141 Diagnostic Vocational Evaluation in Rehabilitation (3) Process, principles, and techniques used to diagnose vocational assets and liabilities of handicapped individual; functions of analysis of biographical data and use of evaluation interview. W

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

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

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

5145-47 Practicum in Rehabilitation (3, 3, 3) Supervision, guidance, and evaluation of client's work experiences, and job training. Emphasis on application of concepts, principles, and skills acquired in previous or concurrent course work. Prereq: Consent of instructor. W; Sp; Su

5150-50 Internship in Rehabilitation (9, 9) Practicum in Public School Systems Service to Retarded Child (3) Observation and classroom teaching. Prereq or coreq: Curriculum and Instruction 4720 or 4820. S/NC only. A

5170 Systematic Human Relations Training (3) Active listening, observing verbal and nonverbal behavior, empathetic understanding, and communicating with handicapped individuals. F

5180 Approaches to Rehabilitation Counseling (3) Approaches and techniques in individual and group counseling with handicapped adults to further develop student's counseling skills. Problem-solving techniques and utilization of alternative modes of counseling procedures in rehabilitation. Prereq: 5170 or consent of instructor. W

DISABILITY EVALUATION EDUCATION

5700 Evaluation and Mobilization of Community Resources (3) Issues, processes, and programs relating to community resources and services integration with emphasis on social and rehabilitation facilities and agencies. Assessment utilization and mobilization of community resources to facilitate the development of innovative service programs for handicapped. W

5710 Medical Aspects of Disability I (3) Etiology, clinical signs, symptoms and diagnostic procedures related to musculoskeletal, neurological, circulatory, and respiratory diseases/disorders. Effect on structure and function of human body. Restorative measures to eliminate or minimize resulting handicaps; skills necessary to communicate effectively with lay persons and medical community on evaluation of impairments and administration of appropriate rehabilitation services. W

5720 Medical Aspects of Disability II (3) Etiology, clinical signs, symptoms and diagnostic procedures related to neoplastic, skin, digestive, genito-urinary, and endocrine, mental, and respiratory disorders. Effect on structure and function of the human body. Restorative measures to eliminate or minimize resulting handicaps; skills necessary to communicate effectively with lay persons and medical community on evaluation of impairments and administration of appropriate rehabilitation services. Sp

5730 Vocational Assessment in Disability Evaluation (3) Vocational assessment: resource materials; criteria for vocational assessment of disability claims under Social Security; on-site job analysis and case file vocational assessment experiences. Prereq: Admission to program in disability evaluation or consent of instructor. Sp

5740 Disability and Work in Society (3) Relationship of work to physical, social, psychological, and economic development of disabled individual. Process and techniques of vocational evaluation, work adjustment services in rehabilitation. F

5750 Principles and Problems of Disability Evaluation (3) Individual identification and analysis of principles and problems of disability evaluation process or structures; emphasis on problems of disability evaluation process or structures, and innovation, exploration of alternatives, and sharing experience within group. Prereq: 5760 or consent of instructor. W

5762 Seminar: Functional Capacity Assessment (3) Criteria for residual functional capacity assessment; problems in achievement or acquisition of residual functional capacity assessments. Prereq: 5710-20 or consent of instructor. Su

5770-71 Current Problems in Disability Claims Evaluation (1-3, 1-3) Current problems in process, content, or administration of disability claims evaluation; workshops in identification and proposal of alternative solutions. May be repeated with consent of instructor. S/NC only. A

SCHOOL SPEECH AND HEARING THERAPY

4030 The Public School Speech and Hearing Program (3) Organization, administration, and procedure. Sp

4040 Appraisal of Speech and Language Disorders (4) Same as Audiology and Speech Pathology 4040.)

4310 Stuttering (3) Same as Audiology and Speech Pathology 4310.)

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

4330 Clinical Practice in Speech Pathology (1-4) Same as Audiology and Speech Pathology 4330.)

4340 Clinical Practice in Speech Pathology (1-4) Same as Audiology and Speech Pathology 4340.)

4350 Clinical Practice in Communication Disorders in Schools (3) Prereq: 4300, 4320-30-40 and consent of instructor. F, W, Sp

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

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

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

College of Education 59
4930 Aural Rehabilitation: Speechreading and Auditory Training (3) (Same as Audiology and Speech Pathology 4930.)
4940 Introduction to the Verbo-Tonal System (4) (Same as Audiology and Speech Pathology 4940.)
5040 Advanced Clinical Practice in Audiology Study and Practice (1-6) (Same as Audiology and Speech Pathology 5040.)
5380 Cerebral Palsy (3) (Same as Audiology and Speech Pathology 5380.)
5390 Cleft Palate (3) (Same as Audiology and Speech Pathology 5390.)
5540 Seminar in Language Pathology (3) (Same as Audiology and Speech Pathology 5540.)

EDUCATION OF THE VISUALLY HANDICAPPED
4160 Education of Partially Sighted Children (3) Curricular adjustments and materials; home visits for parents; cooperation in medical care and special needs. A
4850 Eye Problems Encountered by the Teacher (3) Eye anatomy and hygiene; common diseases and their treatment; ocular adjustments for specific eye conditions; related service resources. A
4923 Student Teaching of the Partially Seeing (3) Observation and supervised practicum in special and regular classes. S/C Grace only. A

GENERAL COURSES
3333 Education of the Exceptional Child (3) Principles, characterisitcs, and special needs; local and state programs for diagnosis and care; educational, psychological, personal, and social problems; special classes, home teaching, and social and vocational guidance. E
4350-50-70 Problems in the Education of Exceptional Children (3, 3, 3) E

5510-20-30 Administrative Practicum on Problems in Institutional Care of Children (3, 3, 3) Physical and social development; business and personnel management. Prereq: Training and experience in institutions for children, or consent of instructor. A
5550-60-70 Problems in the Education of Exceptional Children (3, 3, 3) E
5555-65-75 Special Topics (1-3, 1-3, 1-3) S/C or letter grade.
5620 Counseling Parents of Exceptional Children (3) Interpreting exceptionalities (handicapped and gifted) to parents and helping in understanding and acceptance of the child in school/home. E
5630 Psychology of the Exceptional Child (3) Employment of special needs. Characteristics, needs, and scope of each group. E
5790 Career Development: Workshop (1-6) (Same as Educational Psychology 5790.) A
5910-20-30 Problems in Lie u of Thesis (3, 3, 3) E
5970 Juvenile Delinquency and the School (3) Recognition of characteristics of problem children in the school, sources of maladjustment; school function in community programs for children's welfare; curricular adjustments, directed study of socially maladjusted children, environment, and programs for meeting A

Vocational-Technical Education

MAJORS

DEGREES

Agricultural Education

M.S. Vocational-Technical Education

M.S.

Business Education

M.S., M.ACT

Industrial Education

M.S.

Distributive Education

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

Ph.D.

Education

Ph.D.

Professors:
J. I. Matthews (Head), Ph.D. Arizona State
W. A. Cameron, Ph.D. Ohio State; J. F. Woodin (Emeritus), Ph.D. Ohio State. Agricultural Education: D. G. Craig, Ed.D. Cornell;

Associate Professors:

Assistant Professors:

Instructor:
R. Pierce, M.A. East Tennessee State.

THE MASTER'S PROGRAM

The M.S. degree with a major in Vocational-Technical Education is available with concentrations in agricultural education, business education, distributive education, vocational-technical education, general vocational-technical education, home economics education, industrial education, and technical education.

Requirements are:

Concentration1 18 hrs
Research 6 hrs
Electives 12 hrs
Thesis Option 9 hrs

Problems in Lie u of Thesis Option 9 hrs
Course Option2 15 hrs

Total 45-51 hrs

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

Each vocational service area (agricultural education, business education, distributive education, industrial education and vocational-technical education) offers similar programs leading to the Master's degree. Both thesis and non-thesis options are available. Details regarding the Master's programs of each of the service areas may be obtained from the coordinators of the service areas.

The MACT is also available in the business education area.

THE SPECIALIST PROGRAM

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

THE DOCTORAL PROGRAM

The comprehensive Ed.D. program in Vocational-Technical Education is designed to provide for achieving professional objectives, developing needed competencies, and gaining desirable experiences and understanding of vocational-technical areas.

The Vocational-Technical Education doctoral curriculum consists of the following: professional education core, 9 hours; service area, 18 hours; vocational-technical education, 18-27 hours; cognate fields, 9-18 hours; research techniques, 15 hours (consult advisor for details); and dissertation, 36 hours. A minimum of 120 hours above the baccalaureate is required.

The Doctor of Philosophy degree with a major in Education includes options and emphases as listed on page 49.

General

4010 Development and Utilization of Advisory Committees (3) Craft advisory committees, selection, organization, implementation, and utilization.
4750 Utilization of Instructional Media (3) (Same as Curriculum and Instruction 4750 and Library and Information Science 4750.)
5000 Thesis (1-15) 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/C only. E

1 Student must meet the service area entrance requirements for the concentration selected. General vocational-technical education requires 6 hrs
Vocational-Technical Education 5250 and 5610.
2 9 hrs course work approved by graduate faculty in area of emphasis outside of area of concentration.
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Prerequisites</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>5005</td>
<td>Problems in Lieu of Thesis (3)</td>
<td>May be repeated.</td>
<td>3</td>
</tr>
<tr>
<td>5010</td>
<td>History and Organization of Vocational-Technical Education (3)</td>
<td>Vocational and technical education in public schools through analysis of social, economic, legislative, and organizational models.</td>
<td>3</td>
</tr>
<tr>
<td>5015</td>
<td>Issues and Trends in Vocational-Technical Education (3)</td>
<td>Problems and innovations.</td>
<td>3</td>
</tr>
<tr>
<td>5020</td>
<td>Placement, Follow-up and Evaluation Procedures in Occupational Education (3)</td>
<td>Methods and procedures in establishing placement programs, curriculum revision.</td>
<td>3</td>
</tr>
<tr>
<td>5030</td>
<td>Organization and Operation of Area Vocational-Technical Schools (3)</td>
<td>Area vocational-technical school concept, administration and supervision of vocational and technical education programs in area schools.</td>
<td>3</td>
</tr>
<tr>
<td>5040</td>
<td>Guidance and Pupil Personnel Services in Education (3)</td>
<td>Same as Educational Psychology 5040.</td>
<td>3</td>
</tr>
<tr>
<td>5050</td>
<td>Supervision of Vocational-Technical Education (3)</td>
<td>Program planning, coordination, instruction.</td>
<td>3</td>
</tr>
<tr>
<td>5055</td>
<td>Vocational School Administration and Management (3)</td>
<td></td>
<td></td>
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<tr>
<td>5070</td>
<td>Competency Based Vocational Education (3)</td>
<td>Introductory, comparative, and practical approaches.</td>
<td>3</td>
</tr>
<tr>
<td>5080</td>
<td>Continuing Education in Vocational-Technical Education (3)</td>
<td>Importance, objectives, historical development, psychological and sociological formulations, methods and techniques, research, evaluation.</td>
<td>3</td>
</tr>
<tr>
<td>5100</td>
<td>Occupational Program Development for Disadvantaged Persons (3)</td>
<td>Academic, socioeconomic, cultural and/or other handicaps that prevent individuals from succeeding in regular vocational education programs.</td>
<td>3</td>
</tr>
<tr>
<td>5110</td>
<td>Principles and Objectives of Vocational-Technical Education (3)</td>
<td>Fundamental principles and contemporary objectives.</td>
<td>3</td>
</tr>
<tr>
<td>5130-31-32</td>
<td>Problems in Vocational-Technical Education (1-6, 1-6, 1-6)</td>
<td>May be repeated. Maximum 9 hrs.</td>
<td>9</td>
</tr>
<tr>
<td>5140</td>
<td>Individual Study in Vocational-Technical Education (1-3)</td>
<td>Must be approved by supervisory instructor and service area coordinator or department head. Approval form must be filed in office of department head. May be repeated. Maximum 12 hrs.</td>
<td>1-3</td>
</tr>
<tr>
<td>5150</td>
<td>Microcomputer Operations and Educational Applications (3)</td>
<td>Operating System-CP/M, TRSDOS and QBasic, sequential and random I/O, analysis and operation of commercial educational programs, and teacher-designed programs.</td>
<td>3</td>
</tr>
<tr>
<td>5155</td>
<td>Software Design for Microcomputers in Education (3)</td>
<td>Advanced BASIC software design: operating System-CP/M, TRSDOS and QBasic, sequential and random I/O, analysis and operation of commercial educational programs, and teacher-designed programs.</td>
<td>3</td>
</tr>
<tr>
<td>5180-00</td>
<td>Educational Specialist Research and Thesis (3, 3, 3)</td>
<td>Selection, analysis, and completion of problem necessitating original investigation beneficial to investigator and vocational-technical field.</td>
<td>3</td>
</tr>
<tr>
<td>6000</td>
<td>Doctoral Research and Dissertation (3-15)</td>
<td></td>
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</tr>
<tr>
<td>6010</td>
<td>Curriculum Planning in Vocational-Technical Education (3)</td>
<td>Prereq: Curriculum and Instruction 5410 or equivalent.</td>
<td>3</td>
</tr>
<tr>
<td>6020</td>
<td>Program Planning and Development in Vocational-Technical Education (3)</td>
<td>Planning vocational-technical and work force state, local and institutional programs, research in planning, advisory committees, planned change, administrative structures, and evaluation procedures.</td>
<td>3</td>
</tr>
<tr>
<td>6030</td>
<td>Evaluation of Vocational-Technical Education Programs (3)</td>
<td></td>
<td></td>
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<tr>
<td>6040</td>
<td>Seminar in Vocational-Technical Education (1, 1, 1)</td>
<td>Required 3 consecutive quarters during residency. S/NC only.</td>
<td>3</td>
</tr>
<tr>
<td>6050</td>
<td>Administration of Vocational-Technical Education (3)</td>
<td>Administrative principles and relationship to vocational and technical training.</td>
<td>3</td>
</tr>
<tr>
<td>6111-12-13</td>
<td>Internship in Vocational and Technical Education (3, 3, 3)</td>
<td>Field experiences in selected areas of vocational and technical education. S/NC only.</td>
<td>9</td>
</tr>
<tr>
<td>6200</td>
<td>Agricultural Education (3)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6230-31-32</td>
<td>Special Problems in Agricultural Education (3, 3, 3)</td>
<td>May be repeated. Maximum 18 hrs.</td>
<td>9</td>
</tr>
<tr>
<td>6240</td>
<td>Current Literature in Agricultural Education (1-3)</td>
<td>May be repeated. Maximum 6 hrs.</td>
<td>1-3</td>
</tr>
<tr>
<td>6250-51</td>
<td>Agricultural Education in Off-Farm Agricultural Occupations (3, 3)</td>
<td>Developing occupational experience programs; course planning, teaching procedures.</td>
<td>6</td>
</tr>
<tr>
<td>6260</td>
<td>Agricultural Education for First-Year Teachers (3)</td>
<td>Adjustment to situation in which employed; group meetings in selected centers, and visits by instructor.</td>
<td>3</td>
</tr>
<tr>
<td>6270</td>
<td>Adult Education in Agriculture (3)</td>
<td></td>
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</tr>
<tr>
<td>6290</td>
<td>Supervised Occupational Experience in Agriculture (3)</td>
<td>Prereq: 4350.</td>
<td>3</td>
</tr>
<tr>
<td>6300</td>
<td>Business Education (3)</td>
<td></td>
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<tr>
<td>6305</td>
<td>Methods and Materials for VOE Programs (3)</td>
<td>Development of instructional aids, recent developments and research, individualized instruction, occupational clusters.</td>
<td>3</td>
</tr>
<tr>
<td>6306</td>
<td>Organization and Management of VOE Programs (3)</td>
<td>Developing office occupations, guidelines in cooperatives, laboratory, and model office programs. Physical facilities, instructional aids, related instructional activities (clubs), enrollment, instructor and advisory committees.</td>
<td>3</td>
</tr>
<tr>
<td>6307</td>
<td>Measurement in Business Education (3)</td>
<td>Evaluative methods and tools for all courses in business education and related areas of study in secondary and postsecondary business education.</td>
<td>3</td>
</tr>
<tr>
<td>6308</td>
<td>Curriculum in Business Education (3)</td>
<td>Curriculum designs in career, secondary, postsecondary, and adult education. Legislation technology, social, economic, and research results that affect business education curricula.</td>
<td>3</td>
</tr>
<tr>
<td>6309</td>
<td>Evaluation of Research in Business Education (3)</td>
<td>Prereq: Curriculum and Instruction 5610 or equivalent.</td>
<td>3</td>
</tr>
<tr>
<td>6310</td>
<td>Graduate Seminar in Business Education (3)</td>
<td>Review of techniques for research and preparation of proposal for thesis or problem/project.</td>
<td>3</td>
</tr>
<tr>
<td>6311-12</td>
<td>Special Topics in Business Education (1, 1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6313-14-15</td>
<td>Practicum in Business Education (2, 2, 2)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6320</td>
<td>Improvement of Instruction in Basic Business Courses (3)</td>
<td>Issues, research findings, methods, and materials for improved instruction at both secondary and postsecondary levels.</td>
<td>3</td>
</tr>
<tr>
<td>6330</td>
<td>Improvement of Instruction in Typewriting and Clerical Work (3)</td>
<td>Research, principles of learning, issues and materials.</td>
<td>3</td>
</tr>
<tr>
<td>6340</td>
<td>Improvement of Instruction in Shorthand/Secretarial Subjects (3)</td>
<td>Principles of learning, issues, research findings, and materials on secondary and postsecondary levels.</td>
<td>3</td>
</tr>
<tr>
<td>6350</td>
<td>Improvement of Instruction in Accounting and Data Processing Programs (3)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6360</td>
<td>Improvement of Instruction in Business Communications, Accounting and Data Processing (3)</td>
<td>Basics of and strategies for teaching written communications, word processing and oral communications.</td>
<td>3</td>
</tr>
<tr>
<td>6389-85</td>
<td>Problems and Projects in Business Education (3, 3)</td>
<td>Required in the non-thesis option. S/NC only.</td>
<td>6</td>
</tr>
<tr>
<td>6390</td>
<td>Problems in Business Education (1-9)</td>
<td>Variable topics. May be repeated. Maximum 9 hrs.</td>
<td>1-9</td>
</tr>
<tr>
<td>6390-10-20</td>
<td>Current Issues in Business Education (3, 3, 3)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6393-40-50</td>
<td>Advanced Studies in Business Education (3, 3, 3)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6360</td>
<td>Higher Education for Business (3)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6430-31-32</td>
<td>Problems in Distributive Education (1-3, 1-3)</td>
<td>Research in planning and coordinating distributive education programs. May be repeated. Maximum 9 hrs.</td>
<td>3</td>
</tr>
<tr>
<td>6440</td>
<td>Supervised Distributive Experience (2)</td>
<td>Minimum 200 hours experience for each 3 credit hours in approved distributive business; concurrent analytical project. May be repeated. Maximum 9 hrs.</td>
<td>2</td>
</tr>
<tr>
<td>6450</td>
<td>Areas of Distribution (3)</td>
<td>Marketing, product or service technology, social skills, basic skills, and distribution as they affect distributive education curriculum in secondary and postsecondary programs.</td>
<td>3</td>
</tr>
<tr>
<td>6460</td>
<td>Organization and Operation of Distributive Education Programs (3)</td>
<td>Background and development needs, federal and state legislation; curriculum implications; establishing, evaluating, reporting, and improving programs.</td>
<td>3</td>
</tr>
<tr>
<td>6470</td>
<td>Methods and Materials in Distributive Education (3)</td>
<td>Prereq: 4310 or consent of instructor.</td>
<td>3</td>
</tr>
<tr>
<td>6480</td>
<td>Coordination Techniques in Distributive Education (3)</td>
<td>Selecting training agencies; job analysis; selecting and briefing training supervisors; advisory committees; adult and other community services.</td>
<td>3</td>
</tr>
<tr>
<td>6490</td>
<td>Administration and Supervision of Distributive Education Programs (3)</td>
<td>Development of distributive education program and work of city or county supervisor. Understanding and appreciating problems from high school principal's and department head's point of view. Trends in distributive education; community surveys, state plans, teacher-coordinator qualifications, changing curriculum.</td>
<td>3</td>
</tr>
<tr>
<td>6410-26-36</td>
<td>Problems in Distributive Education: Retailing (3, 3, 3)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6420</td>
<td>Organizing and Teaching Adult Distributive Education (3)</td>
<td>Planning, organizing, teaching, and evaluating continuing education programs in distributive education, utilizing trade associations, employment agencies, business groups, and advisory committees in implementation.</td>
<td>3</td>
</tr>
<tr>
<td>6430-31-32</td>
<td>Special Problems in Distributive Education (3, 3, 3)</td>
<td>Individual research, conferences, and/or workshops in teaching and supervising high school, postsecondary, and adult programs.</td>
<td>3</td>
</tr>
<tr>
<td>5510</td>
<td>Organization of the Homemaking Curriculum in Secondary Schools (3)</td>
<td>Recent advances in home economics education. Development of teaching material in modern total homemaking program in secondary school—day school, adults, home experience, and Future Homemakers of America.</td>
<td>3</td>
</tr>
<tr>
<td>5515</td>
<td>Evaluation in Home Economics Education (3)</td>
<td>Purpose of evaluation in development of home economic education.</td>
<td>3</td>
</tr>
</tbody>
</table>
4680-91-95 New Developments in Industrial Educa-
tion (3, 3, 3) Ramifications of vocational and
educational education; relationships with general education
and trade and labor organizations; administering and su-
pervising schools and classes under federal voca-
tional education acts.

5830-31-32 Special Problems in Industrial Educa-
tion (3, 3, 3)

5850 Improving Teachers in Service (3) Problems
of coordination in part-time and apprentice training
programs.

5860 Advisory Committees and Apprentice Train-
ing (3)

5880 Advanced Methods of Teaching Skills and
Technical Information (3) Proper selection and effective
application of contemporary methods and
techniques in teaching of specialized skills and tech-
nical related information.

5890-91-92 Seminar in Industrial Technical Educa-
tion (3, 3, 3) Development, control,
and teaching experience.

5895 New Developments in Industrial Technical
Education (3) Prereq: B.S. in Industrial Education
and teaching experience.
The Health and Safety Division offers the following degree programs:

- Master of Public Health degree with a major in Public Health. Option in community health education is accredited by the American Public Health Association. Options with specialization in health planning/administration or occupational/environmental health and safety are also available.

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

Educational Specialist degree in Safety Education and Service.

Doctor of Education degree in Health Education.

Doctor of Philosophy degree in Health Education.

Public Health

3000 Foundations of Health Science (3) In-depth study of content areas relating to personal health and contemporary health problems, i.e., mood modifying products, consumer health, international health. Emphasis placed on factors involving humans, disease and environment. E

3210 First Aid and Emergency Care (4) Theory and practice of first aid and emergency care. Instruction in medical self-help. Course leads to Red Cross Certification in Advanced First Aid and Emergency Care. Applicant must be at least 16 years of age for certification. (Same as School Health 3210.) E

3310 Communicable and Noncommunicable Diseases (3) Modern concepts of diseases; etiology of common communicable and chronic disease problems, including prevention and control. Prereq: 1 yr of biological science and 1 course in bacteriology. F, W, Sp

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

4120 Community Health Problems—Alcoholism (3) Explores problems of alcoholism regarding overall health of community. Emphasis placed on factors making alcoholism a serious public health problem. Various types of educational programs to control the disease are covered. F

4130 Community Health Problems—Suicide (3) Explores problems of suicide regarding overall health of community. W

4140 Community Health Problems—Death Education (3) Exploration of ramifications of death and dying as related to personal and community health. E

4210 Urban and Industrial Health (3) Health problems created by a burgeoning population and the megalopolis; industrial health problems of concern to management, supervisor, and industrial worker, control of occupational diseases, poisons, accidents, and other conditions incidental to industry. Sp

4220 Communications for Better Health (3) Selective study of communications in health enterprise. Consideration of logical progression of the problems of transmitting current and new information to practitioners; communications among members of the modern health team, among health agencies, and use of mass media for transmitting health information. W, Sp

4410 Consumer Health and Safety Education (3) Survey of major consumer health and safety problems: selecting, purchasing, and financing of safety and medical services. E

4411 Instructor’s Advanced First Aid and Emergency Care (3) Designed to teach first aid. Satisfactory completion qualifies one for American National Red Cross Certification as an Advanced First Aid and Emergency Care Instructor. (Applicant must be at least 21 years of age.) Prereq: 3510 or valid Advanced First Aid and Emergency Care Certificate. F, W, Sp


4430 Women’s Health (3) Study of factors influencing women’s health throughout and as consumers of the nation’s health service delivery systems. 4700-10-20 Field Practice in Public Health (3, 3, 3) Field practice in public health under supervision of public health profession. S/NC only. E

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

4840-50-60 Problems in Public Health Education (1, 1, 1) Individual identification and study of current problems in public health education. Extensive reading of literature required. Prereq: Consent of instructor. S/NC only. E

5010 Workshop in Public Health Education (3, 3, 3, 3) Designed to deal with specific public health problems in local communities. Prereq: Consent of instructor. Su

5070-90-90 Field Practice and Seminar in Public Health (3-5, 3-5, 3-5) Internship or field experience under professional supervision in public health. S/NC only. E

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


5150 Industrial Toxicology (3) Elements of industrial toxicology as they relate to the improvement of occupational health and safety. Prereq: Consent of instructor. Sp

5220 Health and Sickness (3) Formulation of models of positive health within life cycle and within community; types of sickness afflicting individuals and groups. Sp

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

5420 Administration of Public Health (3) Administrative considerations of public health agencies including governmental aspects, legal bases, organizational principles, personnel factors, fiscal management, and public relations. 3 hrs and 2 labs. W

5430 Vital and Medical Statistics (4) Application of basic statistical principles to living things. F, W, Sp

5440 Methods and Materials in Public Health Education (4) Theory and practice in use of communication techniques and materials in community health education. 4 hrs and 2 labs. W

5540 Factors in Problem Solving for Community Health (5) Tests skills in communications and group process en route to problem identification, objective setting, problem solving and planning for health education. 4 hrs and 2 labs. W

5550 The Public Health Educator in Community Organization and Development (4) Overview of health organizations and agencies in the community, prefixes exploration of conflicting theories and divergent styles of practice in community organization and development. Laboratory to delineate a community near campus and to practice. 2 hrs and 4 labs. F

5560 Functions and Roles of the Public Health Educator (3) Professional science is examined with special attention to roles and functions. Consideration of philosophy and motivation and differences between health education service and health education program for community levels. 1 2-hr lecture-seminar session per week. F

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

5705-10-15 Advanced Professional Health Education: Health Planning I, II, III (3-5, 3-5, 3-5) Theory and practice in selected areas. F, W, Sp

5720 Dental Health Education (3-5)

5735 Emergency Medical Services (3-5) Sp

5745 Family Health Unit (3-5) W

5750 Health and Medical Care Legislation and Law (3-5) Su

5755 Health Facilities Administration (3-5) W

5760 Health Services Administration (3-5) F

5785 Occupational Health Unit (3-5) Sp

5790 Self-Care Unit (3-5) Sp

5785 The Training of Paramedical Personnel (3-5) F

5840-50-60 Problems in Public Health Education (1-3, 3-3, 3-3) Individual identification of current problems in public health education. Extensive reading and critical analysis of literature. E

6000 Doctoral Research and Dissertation (3-15) E

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

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

6210 Health Aspects of Gerontology (3) Su

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

6230 International Health (3) W

Safety

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

4010-20-30 Problems in Safety (1-3, 1-3, 1-3) Individual identification and study of current problems in safety. 3 hrs and 2 labs. W

4410 Driver and Traffic Safety Education (5) Preparation and teachers of driver education in schools and colleges. Students are required to teach at least one program. Valid driver’s license required. 3 hrs and 2 labs. E
3620 The Teaching of Sex Education (3) Trends, content, methods, and materials in sex education. F, W, Sp

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

4710 Workshop in School Health Education (3-4) For advanced students, teachers, school administrators, nurses and other paramedical school personnel. Emphasizes demonstrations, films, field trips, and supervised research in special health problems. May be repeated. Su

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

5000 Thesis (1-15) E

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

5230 Behavioral Problems in Safety Education and Accident Prevention (3) Problems of behavior, causes of accidents, and application of principles of psychology in the development of safe behavior in all segments of our environment. F

5330 Problems and Research in Accident Prevention (3) Analysis of safety problems found in wide variety of accidents that occur in community; findings of current research in behavioral sciences as related to variation incidence of accidents. Sp

5340 Organization, Administration, and Supervision of Safety Programs (3) National, state, and local safety programs, including administrative, instructional, and supervisory aspects. Basic emphasis on implementation of relevant programs. W

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

5720-30-40 Graduate Workshop in Safety (3-8, 3-6, 3-6) Deals with specific safety problems. Special safety problems in a concentrated period of time. Su


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

6100-30-30 Internship and Research in Safety (3, 3, 3) Allows the student opportunities for engaging in field experience so that a significant problem in that experience is to be identified, researched, and reported on in acceptable form. E

School Health

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

3410 School Health Instruction (3) Selection of health content in the school curriculum. E

3420 School Health Services (3) Development, maintenance, and protection of health of students including examination, screening, special services, communicable disease control, emergency care, and school health records. F, W, Sp

3510 The School in Community Health (3) Role of teacher in community health education; school's responsibility in promoting healthful living and the place of school in developing competencies in program. Not open to health and physical education majors. E

3610 Methods in Elementary Health Instruction (3) Preparation and presentation of health topics. Teaching method emphasized and student participation stressed. Required for elementary teachers. Prereq: 3510 or Public Health 1110 or Nutrition 1230. E

Division of Physical Education

MAJOR

Physical Education Education

DEGREES

M.S., M.A.T., Ph.D.

Professors:

J. E. Acker, M.D., Tennessee; G. F. Brady (Emeritus), Ph.D. Iowa; E. K. Garper (Emeritus), Ph.D. Iowa; B. D. Franke, Ph.D. Illinois; T. E. Howley, Ph.D. Wisconsin; A. J. Kozar, Ph.D. Michigan; W. P. Lienhoft, Ph.D. Iowa; M. M. Phillips, Ph.D. Iowa; H. B. Watson (Emeritus), Ph.D. Michigan; H. G. Welch, Ph.D. Florida.

Associate Professors:

P. A. Beitel, Ed.D. North Carolina (Greensboro); R. Crosskey, M.F.A., Southern Methodist; R. E. Jones (Chairperson), Ph.D. Toledo; N. E. Lay, Ph.D. Florida State; B. J. Mead, Ph.D. Purdue; W. J. Morgan, Ph.D. Minnesota; C. A. Wilsberg, Ph.D. Michigan.

Assistant Professors:


The Physical Education Division offers the following degree programs:

Master of Science degree in Physical Education (thesis and non-thesis programs). Doctor of Education degree in Physical Education with concentrations in exercise physiology, motor behavior, adapted physical education, and philosophical and sociological foundations.

The Doctor of Philosophy degree with a major in Education includes options and emphases as listed on page 49.

3050 Rhythmic Analysis (2) Emphasis on analysis of organic movement. Prereq: Consent of instructor. A

3090 History of Dance and the Related Arts I (2) Dance history and the arts related to it from beginnings in primitive societies through the nineteenth century. F

3151 History of Dance and the Related Arts II (2) Survey of dance and the arts related to it, tracing their development in a historical context. W

3430 Adaptive Physical Education Laboratory (1) Practical work, including student teaching, supplementing 4110. E

4010 Advanced Modern Technique (2) Development, integration, and synthesis of previous dance vocabulary; emphasis on advanced practice and principles. Prereq: 3030. May be repeated. Maximum 6 hrs. Available to dance majors and minors with consent of instructor. F, W

4020 Practicum in Dance Production (2) Prereq: Consent of instructor. W

4060 Advanced Composition (4) Application of compositional, production and administrative skills culminating in presentation of two complete choreographic projects. F

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

4110 Adaptive Physical Education (3) Classification of atypical students who require modified programs in physical education activities and class organization suitable for required or special physical education classes. E

4140 Measurement and Evaluation in Physical Education (3) Reliability and measurement and evaluation in physical education. Administration and critique of appropriate measures of physical fitness, sports skills and knowledge. W, Sp, Su
Immunity to longevity, weight control, cardiovascular diseases, and aging. Applications for maintenance of health. Prereq: Course in physiology of exercise or consent of instructor. 5 lectures per week. (Same as Public Health 5580.) Su

5500 Applied Physiology (6) Principles of physiology with special emphasis on application of physiological findings to practical problems related to human function. Prereq: 1 yr general chemistry, or consent of instructor.

5610 Advanced Exercise Physiology (4) Principles of energy transfer in humans with special emphasis on integration of organ systems in adapting to requirements of muscular exercise. Prereq: Zoology 4940 or equivalent. Recommended: 1 yr chemistry, physics, and mathematics. 3 hrs and 1 lab. W

5820 Experimental Techniques in Applied Physiology (2) Laboratory, and use in experimental methodology and instrumentation. Respiratory and blood gas analysis, human calorimetry, blood chemistry, and pulmonary function tests. May be repeated with consent of instructor. S/NC only.

5650 Social-Psychological Dimensions of Physical Activity (3) Examination of sociopsychological factors which influence performance in physical activity with emphasis on research. Prereq: Psychology 3120 or equivalent. F

5810-20-30 Seminar in Physical Education (1, 1, 1) Current issues and problems in physical education with emphasis on outstanding studies and research in field. E

5910-20-30 Problems and Projects in Physical Education (1-3, 1-3, 1-3) Problems of professional interest and value to the individual student, selected by the student and approved by the major professor. S/NC only. E

6000 Doctoral Research and Dissertation (3-15) E

6220 Independent Research (3) Selection of topic, development of procedure, and conduct of study including final writing of research paper. S/NC only. E

6330 Advanced Motor Behavior (3) Theoretical issues of contemporary significance in human motor behavior. Prereq: 5340 or consent of instructor. Sp

6410 Practicum in Kinesiology (3) Electromyography laboratory and film analysis of sports skills. Prereq: 5310, 5500 and Physics 2210 or equivalent. May be repeated with consent of instructor. S/NC only. E

6510-20 Issues and Problems in Physical Education (3, 3) Critical examination of most comprehensive, systematic, and revealing accounts of metaphysical, epistemological, and axiological status of sport. Prereq: 5140 or consent of instructor. Sp

6610 Seminar in Applied Physiology (2) Prereq: 5610. May be repeated with consent of instructor. S/NC only. F, Sp

6640 Research Participation in Applied Physiology (1-6) Advanced research techniques under supervision of faculty member. Possibilities for help with outstanding studies and research in a selected area within the broad field of recreation administration, and therapeutic recreation. May be repeated with consent of instructor. May be repeated with consent of division. Maximum 6 hrs. E

5000 Thesis (1-15) E

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

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

5140 Leisure Service Delivery Systems (3) Various ways in which leisure services are involved in provision of leisure services for community at large. Prereq: Consent of instructor. F

5150 Current Issues in Recreation (3) Identification and consideration of broad issues-social, environmental, ethical—which currently have greatest impact on use of leisure, and implications for recreation administration. Prereq: Consent of instructor. Sp

5420 Therapeutic Recreation (3) Role of recreation in lives and treatment of persons with disabilities—mental, physical and medical. Possibilities for helpinghand-disabled to realize their fullest potential. Prereq: Consent of instructor. W

5250 Implementation of Recreation Services for the Ill or Disabled (3) Policies and guidelines for organizing and implementing programs of recreation for ill or disabled in treatment centers and other community agencies. Prereq: 4200 or consent of instructor. Sp

5260 Leisure and Mental Health (3) Relationship between leisure activity and mental health, with emphasis on its use in therapeutic recreation. Prereq: Psychology 3650 or equivalent, and consent of instructor. W

5300 Seminar in Recreation (1) Presentation and general discussion of students' research studies, projects, and thesis in recreation. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs. S/NC only. W, Sp

5340 Administration of Recreation Funds (3) Development and management of budgets for recreation agencies with special emphasis on obtaining federal funds appropriated specifically for recreation, management of revenue received, and exploration of funding alternatives. Prereq: 4130. Sp

5350 Organizational Policies for Recreation (3) Advanced study in the analysis of organizational policies and functions of management in recreation. Prereq: 4130. W

5360 Management and Operation of Recreation
Facilities (3) Management process as it pertains to operation of recreation facilities. F

5440 Problems and Projects in Recreation (1-9) Individual research on problem of special significance to student. Research projects of limited nature undertaken in lieu of thesis. May be repeated. Maximum 9 hrs. New problem must be undertaken for each repetition. E

5450 Specialized Study in Recreation (1-9) Advanced comprehensive study in selected specialized area within leisure and recreation field. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs. E
R. E. C. Weaver, Dean
W. K. Stair, Associate Dean
W. A. Miller, Associate Dean
A. W. Spickard, Assistant Dean

Graduate degree programs of the College of Engineering provide opportunities for advanced study leading to the Master of Science degree, the Master of Engineering degree, and the Doctor of Philosophy degree. For a listing, consult majors and degrees available on page 8.

OFF-CAMPUS GRADUATE INSTRUCTION BY VIDEOTAPE-ELECTROWRITER

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

Graduate courses have been offered to students at other campuses and established centers of the UT System (Chattanooga, Kingsport, Martin, Nashville, and Tullahoma). Graduate courses have also been made available to engineers in industrial plants. Such courses are also offered to students using classroom facilities at Jackson State and Columbia State Community Colleges.

The remotely-taught courses offered by UT carry full graduate credit toward the Master’s degree under authorization of the regional accrediting agency, the Southern Association of Colleges and Schools.

YEAR-IN-JAPAN M.S. PROGRAM

This is a unique program allowing American engineering students to develop some understanding, both scientific and cultural, of Japan. It allows an M.S. candidate to obtain a degree from UTK while carrying out research work at a Japanese university. The program requires approximately two years, one year being spent in Japan and the remaining period being spent at UTK to fulfill the course requirements and to write the thesis or project report, as appropriate to the particular department. The program is administered in the framework of each department’s regular graduate program except that the research is done in Japan.

Although the language of communication in Japan would be English, cultural understanding is one of the important objectives of the program and as such a participant would be asked to begin Japanese language study. At the option of the department, up to 6 hours of graduate credit may be allowed for language study, either at UTK or in Japan.

Financial support for living expenses in Japan and for the roundtrip transportation can usually be arranged through fellowships from the Japanese Ministry of Education.

Engineering Experiment Station

W. K. Stair, Director

The Station is organized to conduct investigations in fundamental engineering science and to aid in the development of the state’s resources and industries as far as funds available will permit.

The Station may also make special arrangements with any person or company to study any technical question within the capacity of its resources, and to report the results to the company requesting the study. In such case, the whole expense will be carried by the parties requesting the investigation.

Engineering Administration

MAJOR DEGREE

Engineering Administration

M.S.

Committee:

A program of study leading to the degree of Master of Science with a major in Engineering Administration is offered. This program is aimed at providing education for graduate engineers in the organization and direction of work in engineering functions, at a level which requires understanding of such areas as marketing, finance, and industrial relations. It should be emphasized that this is an engineering program, aimed at preparing individuals for line management positions in construction, design, development, and manufacturing where both technical and nontechnical factors exert significant influence on the success of a given activity. The program does not provide the opportunity for in-depth study of any of the traditional areas of business administration. Students with such interests are advised to consider graduate programs available in the College of Business Administration.

To be admitted to The Graduate School as a potential candidate for a Master’s degree with a major in Engineering Administration, the applicant must submit reasonable evidence of ability to pursue graduate studies at an acceptable level of performance. In general, the applicant should have graduated from an A.B.E.T. accredited undergraduate institution in engineering with a satisfactory grade point average. In addition, applicants must satisfy one of the following experience requirements: (1) at least two years of engineering experience after graduation if a full-time student or (2) current employment in engineering work if a part-time student.

THE MASTER’S PROGRAM

Minimum requirements for the Master’s
degree are the satisfactory completion of the following courses:

1. An Engineering Core, 27 hours of graduate credit consisting of Engineering Administration 5900, at least three courses chosen from: Industrial Engineering 4150, 5110, 5520, and 5710, and a complement of engineering courses normally selected from the student's undergraduate major department or from courses of other related fields.

2. A Business Administration Core, 15 hours of graduate credit consisting of Accounting 5030, Finance 5010, Marketing 5010, Management 5130, and either Business Law 5000 or Transportation 5210. A student may take both the business law and transportation courses and count one of them as a general elective.

3. General Electives, 9 hours of graduate credit chosen from computer science, economics, engineering, management science, mathematics, psychology, statistics, and other program-related disciplines.

The program requirement totals 51 hours of graduate course credit. No thesis is required. A final oral and written examination must be passed on the work offered for the degree. Course prerequisites for the program are Accounting 2110-20 or 5010, Computer Science 3150, Economics 2110-20 or 5010, Economics 5020, Industrial Engineering 4520, and Statistics 3450 or their equivalents. None of these prerequisites, except Economics 5020, may be counted as part of the 51 hours of credit offered for the degree. These course prerequisites may be waived by the department offering the course upon presentation of evidence of competency in the course by the student.

Graduate programs lead to the degrees of Master of Science and Doctor of Philosophy in Chemical Engineering with concentrations in chemical engineering, chemical bioengineering, advanced control systems, and polymer science and engineering, and in Polymer Engineering.

THE MASTER'S PROGRAM

Minimum departmental requirements include the satisfactory completion of:

- A major consisting of 18 to 27 quarter hours of graduate courses in chemical engineering, metallurgical engineering, or polymer engineering. The polymer engineering major must include Polymer Engineering 5110, 5230, 5310, 5410, and 5120.
- One or two minors or collateral work, 9 to 18 hours total in engineering, chemistry, mathematics, physics, or other related fields.
- Master's thesis, 5000, totaling 9 to 18 quarter hours.
- Active participation in graduate seminars in the department. Resident students must register for the appropriate 5010 every quarter offered.
- Final examination covering thesis, related fields, and graduate course work.

THE DOCTORAL PROGRAM

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

Department requirements consist essentially of the satisfactory completion of:

- Graduate courses in chemical engineering, metallurgical engineering, or polymer engineering amounting to approximately 40 quarter hours, at least 12 of which must be in 6000 series courses. The polymer engineering major must include Polymer Engineering 5110, 5210, 5230, 5310, 5410, 5120, and Chemistry 5140.
- Supporting courses in related scientific and engineering fields amounting to approximately 36 quarter hours, subject to approval by the student's faculty committee. These related fields will normally include:

**Chemical, Mathematical, and Polymer Engineering**

**MAJORS**

Chemical Engineering

Mechanical Engineering

Polymer Engineering

**DEGREES**

M.S. Ph.D.

M.S. Ph.D.

M.S. Ph.D.

Professors:

H. F. Johnson (Head), D. Enig, Yale; D. C. Bogue, Ph. D. Delaware; S. B. Bore, Ph. D. Massachusetts Institute of Technology; P. R. Brooks, Ph. D. Tennessee; E. C. Clark, Ph. D. California (Berkeley); L. W. Crawford, Ph. D. Cincinnati; L. O. Culberston,

*Space Institute, Tullahoma.*

**Economics 5020, may be counted as part of the 51 hours of credit offered for the degree.**

**Chemistry, Mathematics, Physics, and Engineering**

3. The comprehensive examination, usually given in two parts, and covering such materials as chemical, metallurgical, and polymer engineering operations and processes, thermodynamics, technology, mathematics, physics, chemistry, and other related fields.

4. Active participation in graduate seminars conducted by the department. Resident students must register for the appropriate 5010 every quarter offered.

5. Reading knowledge of a foreign language relevant to the candidate's research program; selection of language to be made in consultation with the faculty committee. Appropriate languages are French, German, Italian, Japanese, Russian.

**UTK-JAPAN COOPERATIVE PROGRAM IN POLYMER ENGINEERING**

The UTK-Japan Program provides a means for Japanese research professors to teach part-time in the graduate program, and provides a joint Japanese-UTK program for the admission of Japanese students into the polymer engineering graduate program. A committee of faculty from Japanese universities makes recommendations for students and a UTK committee acts on them.

**PROGRAM OPTIONS IN POLYMER SCIENCE AND ENGINEERING**

M.S. and Ph.D. degrees with specialization in polymer science and engineering are possible through two routes—one in the department (through chemical or metallurgical engineering) with an engineering emphasis, and a second in a Chemistry Department having a chemical emphasis.

The specialization program in the department requires, for the M.S. degree, a thesis in the field, completion of Polymer Engineering 4910, 5110, 5310, 5410, and either 5230 or 5210 plus active participation in the Polymer Seminar. The Ph.D. candidate must meet the above course requirements, pass a special written examination in polymer science and engineering, and complete an additional academic program to be specified by the student's committee.

M.S. and Ph.D. degrees in the joint specialization program with the chemistry department require a thesis or dissertation in the field. Chemical and metallurgical engineering departmental requirements include completion of Polymer Engineering 4910 and 4920, Chemistry 5531 and 5140, plus active participation in the Polymer Seminar. Ph.D. students must also pass a special written examination as well as complete the above requirements.

**Chemical Engineering**

3410 Flow of Fluids (4) Differential and overall momentum balances, mechanical energy balances, flow in tubes, piping systems, and packed beds; metering devices, pumps. Prereq: Chemical and Metallurgical Engineering 3305, Mathematics 2850, 3 hrs and 1 lab.

3420 Heat Transfer (4) Differential and overall energy balances; steady and unsteady state, heat conduction in simple geometries, heat transfer in tubes and heat exchangers; condensation and boiling; radiation. Prereq: 3410. 3 hrs and 1 lab.

3440 Stagnewse Operations (3) Analytical and

4740 Introduction to Transport Phenomena in Biological Systems (3) Application of principles of transport phenomena to biological systems. Transfer of chemical energy and various cellular active transports; structure and theoreology of physiological fluids, membrane and interfacial phenomena; analysis and design of artificial organs. Prereq: 3440, 3450 or consent of instructor.

4750 Microbiological Process Engineering (3) Application of chemical engineering principles and design concepts to microbiological processes: continuous culture of microorganisms, food processing, and pharmaceutical processes. Prereq: 3440, 3450, or consent of instructor.

4760 Principles of Biochemical Separation (3) Fundamental aspects and similarities of modern biochemical separation methods: classroom demonstrations, design of production, and analytical systems. Prereq: Consent of instructor.

4781-82-83 Topics in Chemical Bioengineering (3, 3, 3) Problems of interest in chemical bioengineering. Prereq: Consent of instructor.

4810-20-30 Special Problems in Chemical Engineering (3, 3, 3) Chemical engineering problems related to recent developments in industrial practice. Prereq: Consent of instructor.

5000 Thesis (1-15) E 5010 Graduate Seminar (1) Prereq: Admission to graduate program. May be repeated. E 5050 Engineering Analysis (3) Analytical formulation and solution of chemical, metallurgical and polymeric engineering problems involving deformation of solids, heat transfer and motion of fluids. (Same as Metallurgical Engineering 5050 and Polymer Engineering 5050.)

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

5130 Methods of Optimization (3) Principles and applications of mathematical programming techniques to chemical and biochemical process systems, including reactors and separation processes. Prereq: 5120.


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

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

5510 Chemical Reactor Design (3) Nonideal flow patterns in chemical reaction systems, residence times in two phase systems; introduction to heterogeneous catalysis and reactor stability. Prereq: 4530.
3060 Metallurgical Kinetics (3) Application of principles of chemical reaction kinetics, fluid flow, and heat and mass transfer, to pyro-, hydro-, and electrochemical processes. Reaction order and basic rate laws; activated complex theory; principles of adsorption and catalysis. Roasting of sulfides; reduction of oxides; electrowinning; electroplating; and leaching. Prerequisite: 3050; Chemical Engineering 3410 and 3420 or equivalent. 3 hrs or 2 hrs and 1 lab.

3110 Engineering Materials I (4) Introductory course correlating the atomic, crystal, and microstructure of solids with mechanical, physical, and chemical properties of engineering significance. 3 hrs and 1 lab.

3120 Engineering Materials II (3) Extension of 3110 or 3110 with emphasis on control of mechanical properties of materials by specification of composition, thermal, and mechanical treatment; correlation of resultant properties with service performance. Suggested for mechanical, civil, and industrial engineering students.

3130 Engineering Materials III (3) Extension of 3110 or 3110 with emphasis on control of electrical and magnetic properties of materials by specification of composition, thermal, and mechanical treatment; control of resultant properties with service performance. Suggested for electrical engineering students.

3140 Engineering Materials IV (3) Extension of 3110 or 3110 with emphasis on materials processing. Suggested for mechanical and industrial engineering students.

3150 Engineering Materials V (3) Extension of 3110 with emphasis on the mechanisms and control of reaction, the microstructure of materials with aqueous, nonaqueous, and gaseous environment. Prerequisite: 3110 or equivalent.

3160 Engineering Materials VI (3) Extension of 3110 or 3110 with emphasis on materials of significance in nuclear engineering; nuclear reactor construction materials; nuclear fuel materials, and interaction of radiation with solids to produce changes in engineering properties. Suggested for nuclear and mechanical engineers.

3210 Plastic Deformation (4) Phenomena and theory of plasticity of single and polycrystalline materials. Applicable concepts of crystallography and x-ray diffraction; use of stereographic projections. Prerequisite: Chemical and Metallurgical Engineering 2030.

3220 Diffusion and Annealing (3) Introduction to solid state kinetics; point defects, solid solutions, diffusion equations and mechanisms, annealing of cold worked structures. Prerequisite: 3210; Mathematics 2840.

3230 Phase Transformations (4) Thermodynamic analysis of genealogy and phase equilibria; equilibrium and non-equilibrium transformations. Kinetics and morphology of precipitation and phase transformations in simple and complex systems. Prerequisite: 3220. 3 hrs and 1 lab.

3310 Biomedical Applications of Materials for Life Sciences (3) Principles and applications of engineering materials in biological and medical applications. Prerequisite: Chemistry 1110-20-30 or equivalent.

3520 Materials Behavior and Chemical Process Equipment Design (3) Mechanical, metallurgical, and chemical behavior and equipment design in chemical processing equipment. Prerequisite: Chemical and Metallurgical Engineering 2030 or equivalent: 3160; and Chemical Science 3420. (Same as Engineering Science and Mechanics 3520.)

3710 Metallurgical Applications in Manufacturing Technology (3) Fabrication methods and principles of control for nonferrous and semisemifinished articles; casting, powder metallurgy; plastic forming, joining, heat treatment. Prerequisite: 2110 or equivalent.

4240 Engineering Materials Design (3) Property control through composition, heat treatment and transformation in ferrous alloys. Plain carbon steels, alloy steels, and tool steel processing for property selection and service requirements. Prerequisite: 3230 or consent of instructor.

4250 Design and Analysis (3) Design and laboratory sessions on analysis of materials, requirements, and performance in engineering structures and components. Prerequisite: Senior standing.

4510-20 X-Ray Diffraction and Crystallography (3, 3) Lecture and laboratory work in crystallography, X-rays, diffraction phenomena and techniques, introduction to structure determinations. The first quarter serves as an introduction to the subject. 2 hrs and 1 lab.

4540 Fracture-Safe Design (3) (Same as Engineering Science and Mechanics 4540.)

4610 Physical Properties of Materials (3) Electron theory of solids, types of bonding in solids; thermal, electrical, and magnetic properties of materials; relationship between mechanical structure and properties. 3 hrs or 2 hrs and 1 lab.

4720 Mechanical Metallurgy I (3) Elastic behavior. Description of stress, strain, and elastic constitutive relations. Effects of composition, microstructure, and loading on mechanical behavior. Failure by yielding. Prerequisite: 2110 or 3110 or Chemical and Metallurgical Engineering 2030. Suggested for mechanical engineers.

4730 Mechanical Metallurgy II (3) Ductile and brittle fracture, creep and stress rupture, fatigue, and residual stresses. Effects of state of stress, loading rate, time, temperature, and metallurgical structure. Prerequisite: 3120 or 3220, and 4730 or Mechanical Engineering 3650 or consent of instructor. Also suggested for mechanical engineering, engineering mechanics, and engineering science students. 3 hrs or 2 hrs and 1 lab.

4760 Casting and Welding (3) Principles and processes of casting and welding; heat transfer, solidification segregation, gas-metal and slag-metal interactions, thermal treatments, associated stresses. Prerequisite: 3120 or 3230. 3 hrs or 2 hrs and 1 lab.

4770 Mechanical Metallurgy III (3) Finite plastic strain. Plastic stress-strain relations. Principles of fabrication: forging, swaging, extrusion, rolling, deep drawing. Prerequisite: 4730 or consent of instructor. Suggested for mechanical engineering, engineering mechanics, and engineering science majors. 3 hrs or 2 hrs and 1 lab.

5000 Thesis (1-15) E

5010 Graduate Seminar (1) Prerequisite: Admission to graduate program. May be repeated. E

5050 Engineering Analysis (3) (Same as Chemical Engineering 5050.)

5110 Point Defects and Dislocations (3) Theoretical and experimental analysis of point, line, and planar imperfections in solids. Prerequisite: 4730 or consent of instructor.

5120 Plastic Deformation (3) Geometry and mechanisms of plastic deformation of single crystals; slip and twinning; work hardening; effects of temperature and alloying on short-term loading. Prerequisite: 5110.

5130 Plastic Deformation II (3) Plastic deformation of polycrystalline materials; theoretical and experimental analysis of plastic deformation resulting from deformation and annealing. Prerequisite: 5120.

5140 Diffusion and Annealing in Solids (3) Analysis of models and experimental observations relating to phenomenological and mechanistic description of diffusion and annealing of point defects and cold work.

5150 Phase Transformations I (3) Analysis of models and experimental observations relating to phase transformations in ferrous alloys, precipitation, spinodal decomposition, spinodal decomposition. Prerequisite: 5140.


5210-20-30 Welding Metallurgy (3, 3, 3) Welding processes and physical metallurgy of welding, including power supplies, heat input, residual stresses, solidification, and solid state reactions. For both simple and complex alloys. Current theories of cold cracking, hot cracking and porosity formation are developed. Prerequisite: Physical Metallurgy 4160.

5310 Solidification and Crystal Growth I (3) Solute redistribution, thermodynamic considerations, kinetics, convection and fluid flow effects on the solid to liquid transition. Prerequisite: Mathematics 4550.

5420-20-30 Advanced X-Ray Diffraction (3, 3, 3) Review of mathematical techniques; generalized diffraction theory, analysis of scattered intensity in reciprocal space; relationship of scattered intensity to thermal motion, order-disorder, particle size and lattice faults. Introduction to crystal symmetry, space group theory, and crystal structure problems; some laboratory work. Prerequisite: Mathematics 4610.


5540-50 Electron Microscopy I and II (3, 3) Kinematic and dynamic behavior of electron beams; principles of electron microscopy. Some discussion is given to metallurgical applications such as plastic deformation, fracture, precipitation, and phase transformations.

5810-20 Radiation Effects on Materials (3, 3) Interaction of radiation with solid matter, radiation-induced changes in physical and mechanical properties; theory and experimental observation on solid state reactions. Phenomena associated with use of engineering materials in radiation environments. Prerequisite: Mathematics 4540, Physics 3730 or consent of instructor.

5750 Corrosion (3) Analysis of corrosion processes in terms of polarization measurements and the Pour-BAx diagram. Influence of stress, temperature, and localized conditions contributing to pitting, crevice, and stress corrosion.

5810-20-30 Special Topics in Metallurgy (3, 3, 3) Lectures and recitation on more recent advances in metallurgy and related fields.

5840-50 Metallurgy of Deformation and Fracture (3, 3) Theoretical and engineering analysis of effect of stress state, strain rate, environment, temperature, and metallurgical structure on mechanical behavior in service, testing, and failure. Prerequisite: 4740 or Physics 3720; Mathematics 4550 and consent of instructor.

5910-20-30 Special Topics in Metallurgy (3, 3, 3) Application of thermodynamic and physicochemical methods to metals and metallurgical reactions. Relation of theory and experiment to structure of liquid and solid solutions, and to alloy systems.

6000 Doctoral Research and Dissertation (3-15) E

6110-20 Theoretical Metallurgy (3, 3, 3) Phases of solid state physics applicable to metallurgy; elasticity, introductory quantum theory, specific heats, electron theory, electrical and thermal conductivity, magnetic properties, theory of alloy formation. Prerequisite: 4610 or Physics 3720; Mathematics 4650 and consent of instructor.

6210-20-30 Rate Process in Metallurgy (3, 3, 3) Theoretical and practical considerations of rate processes in solids such as diffusion, recrystallization and grain growth, and phase transformations.

6320-30 Solidification and Crystal Growth II and III (3, 3) Fluid flow, magnetohydrodynamic effects in incompressible liquid conductors, morphology, stability of steady state coupled heat and mass transfer problems in liquid, solidification, and solid state reactions for both simple and complex solidification, composites, nonsteady state dendritic phenomena, some nucleation phenomena. Prerequisite: 5310.

6410-20 Thermodynamics of Solids (3, 3) Classical and statistical thermodynamic analysis of stabi-
Polymer Engineering

4910 Applied Polymer Science (3) First course in the physical properties of polymers. Polymer structure, crystalline and glass transitions, physical properties of amorphous and crystalline polymers, crystallization kinetics and mechanical properties are discussed. Not for credit for Polymer Engineering majors.

4920 Polymer Processing (3) Rheological properties of polymer melts and solutions, viscometry, unit operations of fiber, plastics and rubber industries. Experimental analysis and scale-up, flow through dies and pipelines, screw extrusion, spinning of fibers, injection molding. Not for credit for Polymer Engineering majors.

4930 Principles of Fiber and Textile Engineering (3) Chemistry of fiber and textile structure of important fibers; melt, wet and dry spinning of manmade fibers; drawing and texturizing; preparation of yarn, dyeing, weaving, and knitting. Emphasis on quantitative aspects.

4940 Plastics Fabrication Operations (3) Lecture and laboratory course treating unit operations of the plastics industry. Types and mechanisms of operation of machinery used and the structure and properties of fabricated parts. Operations to include extrusion, coextrusion, injection molding including structural foam, thermoforming, blow molding, rotational molding.

5000 Thesis (1-15) E

5010 Graduate Seminar (1) Prereq: Admission to graduate program. May be repeated.

5050 Engineering Analysis (3) Same as Chemical Engineering 5090.

5110 Structural Characterization of Polymers with Electromagnetic Radiation (3) Theory of scattering and diffraction of electromagnetic waves by matter, special application to experimental techniques for polymers. Wide-angle x-ray scattering (WAXS), small angle x-ray scattering (SAXS), small angle light scattering (SALS). Interpretation in terms of polymer chain conformation, crystal structure, morphology and superstructure.


5210 Mechanics of Polymer Fluids and Solids (3) Equations of motion and application to polymer melts and glassy and crystalline polymer solids. Non-Newtonian fluid mechanics including viscometric flows and lubrication theory, Torsion, bending, and buckling behavior of solid polymers, foams, and composites. Rheological behavior of polymer melts and photoelastic stress analysis.


5310 Polymer Solution Properties and Characterization (3) Molecular weight determination, chromatography, solution thermodynamics, phase separation; application to synthetic and naturally occurring macromolecules. Prereq: Undergraduate physical chemistry.

5410 Rheology and Polymer Processing (3) Methods for determining the rheological properties of polymer melts, solutions and suspensions; linear viscoelasticity, simple nonlinear constitutive relationships, visco heat generation; application to processing, particularly extrusion, injection molding, film production.

5450 Principles of Injection and Blow Molding Operations (3) Technology, theoretical analysis of injection mold filling, structure of molded parts; principles of structural foam and sandwich molding; principles of polymer melts, solutions and suspensions; linear viscoelasticity, simple nonlinear constitutive relations, viscous heat generation, application to processing particularly extrusion, injection molding, film production.

5511 Laboratory Methods in Polymer Engineering I (1) Basic experimental procedures for polymer characterization, X-ray diffraction and optical methods. Coreq: 5110 or consent of instructor. 2 labs.

5512 Laboratory Methods in Polymer Engineering II (1) Basic experimental procedures for polymer characterization and processing, orientation, melt flow, processing. Coreq: 5120 or consent of instructor. 2 labs.

5513 Laboratory Methods in Polymer Engineering III (1) Basic experimental procedures for polymer characterization, polymer melt processing, mechanical behavior of polymers. Prereq: 5410 or consent of instructor. 2 labs.

5610 Textile Processing (3) Same as Textiles and Clothing 5610.

5620 Textile Engineering Mechanics (3) Same as Textiles and Clothing 5620.

5710 Phase Transformations in Polymer Systems (3) Analysis of nucleation and growth of phases in polymer systems, spinodal decomposition, application to crystallization from the melt, precipitation from solution.

5810 Physical Properties of Polymer Structures (3) Molecular weight and composition distributions in copolymers and star-shaped block polymers and polymer mixtures as related to glassy and crystalline transitions, phase incompatibility, thermal mechanical and optical properties.

5910-20-30 Selected Topics in Polymer Science (3) Advanced problems in modern polymer research of current interest to engineers. Prereq: 4910, 4920 or equivalent.

6000 Doctoral Research and Dissertation (3-15) E

6110 Optical Properties of Polymers (3) Maxwell's equations and electromagnetic theory of light, optical properties of isotropic and anisotropic dielectrics including theory of birefringence, applications to spherulites, fractures and fibers studies of Stein, light scattering from polymer films.

6150 Advanced X-Ray Diffraction Methods for Characterization of Macromolecules (3) Classical methods of x-ray diffraction: Powder diffraction; Patterson and Fourier functions: helical nets and Bessel function techniques; levels of order, thermal motions, defects, order-disorder transitions and polymorphism. Precision and Weissenberg photography, single crystal and powder diffractometry with applications to synthetic and biological macromolecules.

6210 Nonlinear Viscoelasticity (3) Tensor formula of constitutive equations of viscoelastic materials subjected to large deformations. Integral, differential, and fractional forms. Applications to polymer flow problems. Prereq: 5210 or equivalent. (Same as Engineering Science and Mechanics 6800.)

6220 Advanced Methods of Polymer Processing (3) Application of theories of rheological properties and constitutive equations to analysis of polymer processing operations. Prereq: 5210.

6230 Advanced Mechanical Behavior of Polymers (3) Stress analysis with emphasis on developing constitutive equations for yielding behavior of solid polymers, failure analysis and general deformation mechanics of solid polymers. Relation of microscopic properties to molecular structure.

6250 Large Deformation Elasticity (3) Curvilinear tensor analysis, theory of finite strains, Mooney-Rivlin formulation of isotropic non-linear elasticity, solution of large homogeneous and non-homogeneous deformation problems, application to vulcanized rubber, reinforcement with inextensible cords. Prereq: 5230 or equivalent.


6610 Advanced Industrial Polymer Chemistry (3) Chemistry and properties of structural characterization, highly integrated engineering and chemical approach. Prereq: Consent of instructor.

6910-20-30 Recent Advances in Polymer Science and Engineering (3-3-3) Treatment of latest developments in science and technology of polymers. May include topics of morphology, structure, characterization. Prereq: Consent of instructor.

Civil Engineering

MAJORS

Civil Engineering

DEGREES

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

Environmental Engineering

M.E., M.S.

Emeritus Professor:

R. G. Walker, S. M. Massachusetts Institute of Technology, P.E.

Professors:


Associate Professors:


Assistant Professors:


Lecturers:

J. M. Corum, Ph.D. Illinois; C. Franks, B.S. Tennessee; D. L. Garrett, B.S. Purdue; G. J. Hyfantis, Ph.D. Vanderbilt; R. L. Jolley, Ph.D. Tennessee; T. L. Miller, Ph.D. Tennessee.

The Department of Civil Engineering offers degrees leading to the Master of Science, Master of Engineering, P.E. degrees and Philosophy with a major in Civil Engineering, concentrating in environmental engineering.
structural engineering, soils engineering and materials, and transportation engineering; and to the Master of Science and Master of Engineering in Environmental Engineering with concentrations in water quality, water resources, and air quality.

MASTER OF SCIENCE PROGRAM

The Master of Science programs in Civil Engineering and in Environmental Engineering are offered to graduates of recognized undergraduate curricula. Departmental requirements provide that for a major in Civil Engineering, the Bachelor's degree must be in civil engineering, or certain undergraduate prerequisite courses must be taken before admission to candidacy for the Master of Science in Civil Engineering.

CIVIL ENGINEERING

The Department of Civil Engineering offers two options for the Master of Science degree in Civil Engineering.

Option I: A minimum of 45 quarter hours, including at least 9 hours of thesis, is required.

Option II: A minimum of 48 quarter hours, including a 3 quarter-hour special problems is required. The special problem will culminate in a written report which must be approved by the student's major professor.

ENVIRONMENTAL ENGINEERING

For a major in Environmental Engineering the Bachelor's degree may be in fields other than civil engineering. In some cases prerequisite undergraduate courses may be indicated, and in general these must be completed before courses for graduate credit can be taken. The Department of Civil Engineering offers both thesis and non-thesis options for work toward the Master of Science degree in Environmental Engineering.

Option I: The student must present a minimum of 45 quarter hours of approved graduate courses. The major shall include a minimum of 9 quarter hours of thesis and 18 quarter hours credit of approved environmental engineering course work. A minor may be selected but is not necessarily required.

Option II: The student must present a minimum of 48 quarter hours of approved graduate courses. The major shall include a minimum of 27 quarter hours of approved environmental engineering course work. A minor may be selected but is not necessarily required.

Option I or II must be approved by the department.

Normally, the graduate program of study will be adjusted by the head of the department and the student's committee to suit the individual academic requirements.

MASTER OF ENGINEERING PROGRAM

Graduate programs in Civil Engineering and in Environmental Engineering leading to the degree of Master of Engineering are available to qualified graduates of A.B.E.T. accredited undergraduate curricula in civil engineering or environmental engineering. At least one-third of the program of study must be classified as engineering design. The student's advisor will assist in planning the program of study to ensure that it includes the necessary design content. The thesis and non-thesis options noted under the Master of Science programs are available under these programs.

THE DOCTORAL PROGRAM

A graduate program leading to the degree of Doctor of Philosophy is offered in Civil Engineering.

Specific departmental requirements for the Ph.D. degree include the following:

1. A minimum of 108 quarter hours credit beyond the Bachelor's degree, exclusive of credit for the M.S. thesis. Of this number, a minimum of 36 quarter hours credit in Doctoral Research and Dissertation will be required.

2. A minimum of 36 quarter hours of graduate courses in the Civil Engineering Department, exclusive of thesis or dissertation credit, at least 9 hours of which must be 6000-level courses.

3. Supporting courses in related scientific and engineering fields, amounting to approximately 36 quarter hours, subject to approval by the student's faculty committee. These related fields will normally include such disciplines as mechanics, chemistry, mathematics, microbiology, physics, and other engineering fields. A minimum of 12 quarter hours of mathematics will be required beyond the civil engineering undergraduate requirements.

4. One foreign language if the student's faculty committee feels that a reading knowledge of a foreign language is crucial to the student's research efforts.

5. Upon completion of at least one-half of all course work, each student must pass a comprehensive examination.

6. After completion of the dissertation, prior to graduation, each student must pass a final examination administered by a faculty committee.

Civil Engineering

4120 Concrete Design (3) Reinforced concrete continuous beams and floor slabs; footings, and retaining walls. Prereq: 4110 and 4410. Sp

4220 Foundations and Substructures (3) Foundations explorations: principles of design of dry and subaqueous foundations. Prereq: 3310. Sp

4240 Structural Design (3) Plate girders, composite steel and concrete beams, connections and details, and design of small industrial buildings. Prereq: 3230 and 4410. 2 3-hr periods. W

4250 Photogrammetry (3) Methods of plotting maps from aerial photographs; stereoscopic plotting instruments; applications. Prereq: 2360 or Forestry Summer Camp for forestry majors. F

4420 Analysis of Framed Structures (3) Maximum stresses due to moving loads; uses of influence lines; lateral forces due to earthquake and wind; analysis of portals, building frames and space frames. Coreq: 4410. W

4430 Construction Methods and Equipment (3) Fundamental operations in construction and selection of equipment; production rates, balancing of equipment, and cost estimates. Prereq: 3710. F

4510 Advanced Structural Design (3) Plastic design in steel; design of typical short span, steel highway bridges in 4520. Prereq: 3520 or 4510. 2 3-hr periods. W, Sp

4530 Cost Comparison in Design and Construction (3) Cost of engineering and construction. Cost comparison of alternate designs with emphasis on applications to civil engineering problems. Prereq: 4430.

4540 Computer Utilization (3) Computer use, economic justification, and extent of use by industry. Utilization of computers for solution of civil engineering problems. Prereq: 3320. F

4550 Engineering Behavior of Soils (3) Plastic and elastic behavior of soils, determination and use of engineering properties of in-situ soils. Prereq: 4220 or consent of instructor. 2 hrs and 1 lab. F

4560 Stabilization of Soils (3) Mechanical stabilization of soils by compaction, drainage, and blending; chemical stabilization of soils with admixtures; waterproofing and modifying soils with additives. Prereq: 4510. 2 hrs and 1 lab. W

4620 Airport Planning and Design I (3) Emphasis on airport master planning. Included considered for the air side are runway configuration, capacity, geometrics and lighting; on the land side are included terminal layout and design and ground access systems and parking. Prereq: 3600 and 3610. Sp

4640 Traffic Engineering (3) Characteristics of driveways, roadways and their internship; traffic studies; basic considerations of traffic circulation and control; elements of urban transportation planning studies. F

4660 Airport Planning and Design II (3) Integration and application of principles of airport master planning for purpose of site selection and design of an airport facility through a comprehensive team project, includes environmental evaluation of design. Prereq: 4620. 1 hr and 2 tabs. Su

4710 Portland Cement Concrete Mix Design (3) Properties and tests of Portland cement concrete, methods of concrete testing, testing of concrete admixtures. Prereq: 3710. 2 hrs and 1 lab. F

4720 Asphalt and Bituminous Concrete (3) Properties and tests of asphalts and asphaltic mixes, mix design of bituminous concrete. Emphasis on use of asphalt in transportation construction projects. Prereq: 3710. 2 hrs and 1 lab. W

4731-32 Earthquake Resistant Structures I, II (4, 4) (Same as Architecture 4731-32.) Su

4800 Introduction to Civil Engineering Systems (3) Methods of modeling civil engineering systems and their specific application to problems of transportation, environment, water resources and materials. Prereq: Senior standing or consent of instructor. Sp

4850 Elementary Structural Matrix Methods (4) (Same as Engineering Science and Mechanics 4850 and Architecture 4850.) Su

4860 Structural Wood Design (3) Application of structural design principles to wood to design for various combinations of wood products. Beams, columns, and diaphragm construction with plywood. Various types of fastenings and connections. Prereq: 4320. F

5000 Thesis (1-15) E

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

5110-20 Statically Indeterminate Structures (3, 3) Deflection of beams and trusses; analysis by force methods and by slope-deflection; 5110, analysis of moment distribution and other displacement methods, secondary stresses in 5120. W, F

5140 Statically Indeterminate Structures (3) Analysis of complex planar and space frames. Prereq: 5110 and 5120. Sp

5150 Matrix Formulation of Structural Problems (3) Review of matrix algebra, vectors, stability considerations; stiffness and flexibility analysis of plane trusses, general members and structures composed of general members. Prereq: 4540 or consent of instructor. F

5160 Analysis and Design of Plate Structures (3) Bending and buckling of plates, analysis and design
of bridge and building floors and structural plate components. Prereq: 5110. F

5170 Introduction to Structural Dynamics (3) Analysis of free and forced vibrations, and transient response of structures having many degrees of freedom. Methods of solution include: Hamiltonian formulation; structural analysis; approximation methods; and computer programs. Prereq: 5160 or permission of instructor. F

5180 Finite Element Structural Analysis (3) Application of finite element method to structural analysis: plane stress, plane strain, axisymmetric, and three-dimensional elements; use of typical computer programs. Prereq: 5160, permission of Engineering Science and Mechanics 5860. (Same as Engineering Science and Mechanics 5180.) Sp, A

5220 Pavement Design (3) Pavement loads; pavement design; practices; construction and maintenance. Prereq: 5310. Sp

5240 Advanced Properties of Materials: Cement and Concrete (3) Permeability and durability; volume changes and creep; elastic and thermal properties of concrete; special types of concrete; causes of failure. Prereq: 4710. W

5250 Advanced Properties of Materials: Bituminous Substances and Mixes (3) Serviceability concepts; pavement failures and remedies; bituminous pavement mixtures; uses of other uses of asphalt products. Prereq: 4720. Sp

5270 Planning and Transportation (3) Preparation of transportation and elements of comprehensive development plans. Analysis of relationships between various aspects of transportation and between transportation and other community features. (Same as Planning 5270.) W

5310 Engineering Practice (3) Valuation and feasibility study; depreciation and useful life; engineering economics. F

5320-30 Engineering Practice Applied to Administration of Engineering Projects (3, 3) Engineering administration; planning of governmental and industrial projects; cost estimates and methods of financing. W, Sp

5410 Construction Contract Law and Administration (3) General principles applicable to construction contracts and construction related sales contracts. Emphasis on role of engineer in preparation, award, and administration of construction contracts. Case study method of instruction. Prereq: 4230 or consent of instructor. F


5460-70 Construction Estimating I, II, III (3, 3, 3) Project costs, estimating techniques; market cost conditions and methods as it applies to costs. Prereq: 4430 or consent of instructor. W, Sp

5550 Soil Mechanics—Plastic Equilibrium (3) Failure theories; earth pressure analysis, bearing capacity analysis, and slope stability analysis. Prereq: 3310 or consent of instructor. F

5560 Soil Mechanics—Elastic Behavior (3) Stress-deformation characteristics, consolidation, settlement analysis. Prereq: 3310 or consent of instructor. F

5570 Soil Mechanics—Seepage (3) Saturated flow through embankments, filter design criteria, seepage forces and velocities, subdrains, and embankment failures. Prereq: 3310 or consent of instructor. Sp

5610 Behavior of Steel Structures (3) Behavior of structural steel members due to static and fatigue loading; relation between research results and current specialization for design. Prereq: 3230. W

5730 Prestressed Concrete (3) Properties of pre-stressed concrete and design systems for pre-stressing; properties of post-tensioning systems; analysis of design and member of continuous structures. F

5740 Behavior of Reinforced Concrete Members (3) Ultimate strength and behavior of reinforced concrete members; relation between research results and current specifications for design. Prereq: 4120. W

5800 Urban Systems: Engineering and Management I (3) Management of various urban systems usually under city manager and/or city engineer. Organization, finance, personnel administration, purchasing and equipment management and dealing with engineering consultants as each deals with city and/or county urban systems. Prereq: 5150 or consent of instructor. W

5905 Urban Systems: Engineering and Management II (3) Continuation of 5800. Management and engineering of urban streets, including lighting, cleaning and snow removal, water supply and wastewater drainage, solid waste, air pollution and regulations. Prereq: 5800, Sp, A

5810 Traffic Engineering—Characteristics (3) Driver-vehicle-roadway system; level-of-service concept of capacity. Coreq: Statistics 3450. 2 hrs

5820 Traffic Engineering—Operations (3) Fixed-time and volume-density controllers; progressive systems; one-way operations; reversible flows; system operator's control; network and legal aspects of operational controls. Prereq: 5810. 2 hrs and 1-2 hr lab. W

5840 Geometric Design (3) Advanced theory and practice in the geometric design of highways. Prereq: 4630. W

5850 Functional Design of City Streets and Urban Freeways (3) Effect of street systems upon urban growth and development; classification and function of streets; design features, including cross section, intersections, utility considerations, parking, effect of mass transportation; channelization; marketing; lighting; drainage, frontage road, surface street system. Prereq: Consent of instructor. Su

5860 Urban Transportation Planning (3) Prediction of traffic demands and vehicular flows; land use planning; parking needs. Prereq: 5810. F

5870 Public Transit Planning (3) Person movement by bus, rapid rail and taxicab transit. Nature of public transit; its various roles and how they fit community's need; user preferences; modal split models; planning processes. Prereq: 4630 or 5810 or consent of instructor. W

5900 Special Problems in Civil Engineering (1-9) To fulfill the special problem requirement in the non-thesis program. Enrollment limited to civil engineering students in non-thesis program. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs. 5

5920-22-23 Special Topics (1-5) Special topics in Civil Engineering (3, 3, 3) Selected advanced problems of current interest in civil engineering. Prereq: Consent of instructor. E

Environmental Engineering

3000 Introduction to Environmental Engineering (3) Introduction to human interaction with the air, water, and land environment in which one lives; role of engineers in environmental protection. Prereq: Consent of instructor. Coreq: Statistics 3450. 2 hrs

4030 Environmental Engineering Chemistry (3) Fundamentals of chemistry which relate to generation, formation, analysis, and removal of environmental contaminants. Prereq: Chemistry 1130 and senior standing. F

4150 Urban Water Management (3) Introduction to urban water modeling; evaluation of optimum urban water policies; formulation of system constraints and analysis of decision-making process; management of storm water for beneficial use. Prereq: 3230. Sp

4210 Water Resources Engineering Design (3) Elements of water resource structures and systems, including reservoirs, dams, control works, and open channel design. Dam safety control, environmental impact of reservoir projects. Prereq: 3330 or consent of instructor. F

4230 Water Resources Engineering Development (3) Multivariable evaluation procedures for comparing and selecting among water resources development alternatives through subjective project optimization, single- and multi-purpose projects; special topics in new developments in water resources engineering. Prereq: 3330 or consent of instructor. W

4320 Hydrologic Design (3) Application of frequency and regression analysis to hydrologic design of water resources systems; unsteady surface runoff and streamflow modeling; urban peak runoff design using rational methods; calibration of runoff models, effects of land use changes on streamflow quantity and quality. Prereq: 3330. W
4510 Elements of Water and Wastewater Transport Systems (3) Introduction to theory and design of water transportation and distribution systems, stormwater collection systems. Prereq: 3120 and 3330. F, W

4520 Elements of Water and Wastewater Treatment Systems Designs (3) Introduction to unit operations and processes employed in physical, chemical, and biological wastewater and water treatment. Application of unit operations and processes in design of water and wastewater treatment plants. Prereq: 4510. Sp, Su.

4525 Water and Wastewater Treatment Plant Design (3) Detailed process design of water and/or municipal industrial wastewater treatment plants; sludge handling systems, ultimate disposal of residuals. Prereq: 4520 or equivalent.

4530 Environmental Engineering Laboratory (3) Standard analytical techniques for evaluation of specific air, water, and solid waste pollutants. Prereq: 4030. 2 hrs and 1 lab. W

4600 Solid and Hazardous Waste Management (3) Magnitude and characteristics of solid and hazardous waste problems; collection systems; disposal systems; incineration, landfilling, and anaerobic digestion; effects on receptors; engineering approaches for air pollution control. Sp.

4820 Environmental Engineering Law (3) Legal aspects of water and air pollution, drainage, land use controls and environmental impact statements with emphasis upon federal-state relations, recent legislation and court decisions, and enforcement. Prereq: J 4990. Senior standing. F.

5000 Thesis (1-15) E

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

5150 Water and Urban Welfare (3) Social, environmental, and economic impact on planning and management of urban water systems. Emphasis upon capital, water supply, and cost of water;小龙虾 effects on receptors; engineering approaches for air pollution control. Sp.


5232 Sediment Transport (3) Sediment properties and characteristics; bed loads and suspended load movement; erosion, scour, transport and deposition of sediments by flowing water; silting of reservoirs and related topics. Prereq: 5230. W

5234 Flood Damage Reduction (3) National, regional, local flood problems; hydrologic design criteria; traditional flood control measures; land use considerations; flooding, floods, flood insurance, and other flood damage reduction elements; interdisciplinary approach in floodplain management; case studies. Prereq: Consent of instructor. Sp.

5261 Basic Principles of Remote Sensing (3) Applications of remote sensing in agriculture, engineering, forestry, meteorology, land use planning, and resource assessment. Systems and techniques, electromagnetic radiation including wave theory, physical and geometric optics, and the interaction of EM radiation and materials; applications of memory handling technology. Prereq: Consent of instructor.

5262 Remote Sensing Data Acquisition (3) Active and passive sensors, their areas of special application and limitation, description of remote sensing platforms, image processing and Resource Management; Communication Systems; mission planning. Prereq: 5261 or consent of instructor.


5302 Stormwater Modeling II (3) Continuous flow models interpreted using methods of systems analysis. Prereq: Consent of instructor. W


5320 Waste Management Systems (3) Unit operations and processes in wastewater reclamation. Treatment of water and waste treatment systems. Emphasis on those systems used for wastewater reclamation. Prereq: Graduate standing, Civil Engineering 4800 or consent of instructor. Sp.

5501 Water and Wastewater Treatment Theory I (3) Theory of unit operations employed in sanitary engineering. Prereq: Consent of instructor. Sp.

5502 Water and Wastewater Treatment Theory II (3) Theory of physical, chemical, and biological processes employed in sanitary engineering. Prereq: 4520 W

5503 Advanced Water and Waste Treatment Systems (3) Theory, operation, and use of advanced water and waste treatment systems. Emphasis on those systems used for wastewater reclamation. Prereq: 4520 W

5630 Design of Solid and Hazardous Waste Disposal Systems (3) Unit operations and processes for solid and hazardous waste disposal: soil attenuation, incineration and heat recovery, biological processes, fixation and encapsulation, and resource recovery. Prereq: 4500, 5539, 5503, 1 lab.

5631 Design of Solid and Hazardous Waste Disposal Systems (3) Introduction to unit operations and processes for solid and hazardous waste disposal: soil attenuation, incineration and heat recovery, biological processes, fixation and encapsulation, and resource recovery. Prereq: 4500, 5539, 5503, 1 lab.

5700 Planning and Air Pollution Control (3) Relationship between air pollution, area development, and urban growth. Social, economic, and political processes involved in air pollution control.

5710 Air Pollution Control Engineering (3) Emission control systems for industrial and power generating processes, stack sampling methods, air monitoring, dispersion of pollutants. Prereq: Graduate standing. F.

5715 Ambient Air Monitoring (3) Physical and chemical techniques for ambient air monitoring. Survey network design. Quality control of air monitoring data. Appraisal of air monitoring techniques and equipment. Prereq: Consent of instructor. W.

5720 Air Pollution Particle Collection Theory (3) Mechanics of particles suspended in gaseous medium including particle motion, coagulation, and gravitational settling. Prereq: Graduate standing, Computer Science 3150. Sp.

5725 Air Quality Modeling and Impact Assessment (3) Techniques to assess the air quality impact of major transportation projects and industrial and urban growth. Social, economic, and political processes involved in air pollution control. Prereq: Consent of instructor. W.

5730 Air Pollution Control Device Design (3) Design and evaluation of systems used to control emission of gaseous and particle air pollutants. Prereq: Consent of instructor. F.


5745 Ambient Air Chemistry (3) Reaction mechanisms for production of secondary air pollutants from primary pollutants and natural occurring precursors. Prereq: Consent of instructor.

5760 Diffusion in the Atmosphere (3) Movement and dilution of natural or man-made material released into the atmosphere. Basic theory. Rise of buoyant plumes, relation between Eulierian and Lagrangian spectra, differences between instantaneous and continuous sources, diffusion in a zone of wind sheared and diffusion from urban area sources. Prereq: 5725.

5900 Special Problems in Environmental Engineering (1-5) To fulfill the special problem requirements of non-thesis students, this course is limited to environmental engineering students in the non-thesis program. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs. S/NC only. E

5910-20-30 Special Topics (1-6, 1-6, 1-6) Problems and topics in environmental analysis,левен в field of environmental engineering not included in other courses. May be repeated. E

5990 Environmental Engineering Seminar (1) All papers on environmental engineering, including reports on current research at The University of Tennessee, Knoxville. Course credit not applicable to graduate degree program. Prereq: Active graduate
standing in environmental engineering. May be repeated 0-2 times. Prerequisite: EN 5710. S/NC only. F, W, Sp.

6110-20 Advanced Topics in Fluid Mechanics and Convective Transport (3) (Same as Engineering Science and Mechanics 6110-20.)

6230 Kinematic Wave Theory (3) Approximations of DeSaint Venet equations by kinematic wave theory applied to deterministic and streamflow. Criteria for approximation and methods of linkage of infiltration, overland flow and streamflow. Prereq: 5230 or equivalent. Sp, A

6510 Industrial Waste Unit Operations and Processes (3) (Same as Environmental Engineering) May be repeated 0-2 times. S/NC only. F, W, Sp.

6550 Industrial Waste Management (3) Sources and characteristics of industrial wastes; recycling, waste reduction, energy recovery, resources recovery, and treatment options, ultimate disposal of residuals including thermal processes, land application, recovery, and incineration; design oriented, field trips. Prereq: 5501, 5502, 5503, 5509. 1 hr and 4 labs.

6910-20-30 Special Topics in Environmental Engineering (3, 3) Selected advanced problems of current interest in environmental engineering. Prereq: Consent of instructor. E

NOTE: Prerequisite to all graduate courses: Consent of instructor.

Electrical Engineering

MAJOR DEGREES

Electrical Engineering M.S., M.E., Ph.D.

Professors: J. M. Googe (Head), Ph.D. Georgia Institute of Technology, Ph.D.; J. Alexy, Ph.D. Wisconsin, P.E.; J. M. Bailey, Ph.D. Georgia Institute of Technology; A. O. Bishop, Ph.D. Clemson; T. V. Bliaock, Ph.D. Minnesota; R. E. Bockenheimer, Ph.D. Northwestern; R. C. Gonzalez, Ph.D. Florida; W. L. Green, Ph.D. Texas A&M; E. L. Hall, Ph.D. Missouri; P. G. W. Hoffman, Ph.D. Harvard; C. J. Hargrove, J. D. Tillman, Ph.D. Tennessee; H. P. Neff, Ph.D. Auburn; P. E. M. O. Pace, Ph.D. Georgia Institute of Technology, P. Z. Peebles, Ph.D. Pittsburgh, W. D. Penney, Ph.D. Vanderbilt; J. F. Pierce, Ph.D. Pittsburgh; R. W. Rochelle, Ph.D. Maryland; K. W. Szymanski, Ph.D. Northern Illinois; G. W. Hoffman, Ph.D. Harvard; J. D. Tillman, Ph.D. Auburn; C. H. Weaver, Ph.D. Wisconsin, P.E.


Assistant Professors: D. J. Birdwell, Ph.D. Massachusetts Institute of Technology; J. S. Lawler, Ph.D. Michigan State.

Masters of Science Program

Graduate work leading to the Master of Science degree in Electrical Engineering may be completed during one academic year of full-time study, or the degree may be obtained in two or three years of study in the evening. Graduate assistantships are available for outstanding students, who may obtain the Master's degree in one calendar year. Specific departmental requirements include:

1. Electrical Engineering 5070-80 and 5710. Electrical Engineering 5710 is normally available in both fall and spring quarters. Students electing courses such as 5500-60, 5270-30, or 5750-60 which require 5710 as a prerequisite should register for 5710 in the fall quarter.

2. Nine quarter hours of graduate credit in mathematics consisting of Mathematics 4710, 4550, and 4250, or 4510-20-30. Other 4000-5000 level mathematics courses approved by the student's Master's committee must be substituted for any of the above course material covered in undergraduate work.

3. An additional 18 quarter hours of 5000-level work in electrical engineering or 9 quarter hours of 5000-level work in one area of electrical engineering and 9 quarter hours of 5000-level work in another area approved by the student's Master's committee.

4. The 18 quarter hours of 5000-level work in Electrical Engineering must be divided equally between two different electrical engineering areas.

5. Master's thesis, totaling 9 quarter hours or more.

6. A final oral examination covering the thesis and related course work.

Masters of Engineering Program

A graduate program leading to the Master of Engineering degree is available to qualified graduates of A.B.E.T.-accredited undergraduate curricula in electrical engineering or its equivalent. Specific degree requirements which must be met include:

1. Electrical Engineering 5070-80 and 5710.

2. Nine quarter hours of graduate credit in mathematics consisting of Mathematics 4710, 4550, and 4250, or 4510-20-30. Other approved 4000-5000 level mathematics courses must be submitted for any of the above course material covered in undergraduate work.

3. An additional 18 quarter hours of 5000-level work in electrical engineering or 9 quarter hours of 5000-level work in one area of electrical engineering and 9 quarter hours of 5000-level work in another area approved by the student's Master's committee.

4. The 18 quarter hours of 5000-level work in electrical engineering must be divided equally between two different electrical engineering areas.

5. Master's thesis, totaling 9 quarter hours or more. A final oral examination covering the thesis and related course work.

A minimum of one-third of the program must be in engineering design, and one-third in one of, or a combination of, advanced math, computer sciences, basic sciences, or engineering sciences.

Doctoral Program

The Ph.D. degree with a major in Electrical Engineering may be pursued in the areas of circuit theory, computers, electro-optics, communication theory, electromagnetic theory, plasma engineering, power systems, solid-state electronics, and control systems. Specific departmental requirements for the Ph.D. degree include the following:

1. A Master of Science or Master of Engineering degree.

2. A minimum of 72 quarter hours of course work beyond the B.S. degree excluding thesis, research, and dissertation credit.

3. A minimum of 36 quarter hours credit in doctoral dissertation.

4. One foreign language if the student's faculty committee feels that a reading knowledge of a foreign language is crucial to the student's research efforts.

5. Satisfactory performance on both a basic and an advanced comprehensive examination. The basic examination consists of a 3-hour written examination in each of the following five areas: (1) networks, (2) electronics, (3) electro-magnetics, (4) power, (5) systems and computers. The advanced examination is in the student's major area and is prepared by the student's doctoral committee. The advanced examination must be passed and a formal dissertation proposal accepted by the student's doctoral committee before the student is admitted to candidacy for the Ph.D. degree.

The basic examination is normally taken after the completion of 36 hours of graduate course work. A minimum of 27 hours of graduate course work must be completed before the student has taken the basic part of the comprehensive examination the first time.

6. Participation in departmental seminars.

The 72 quarter hours of course work must satisfy the following:

a. A minimum of 36 quarter hours of work in electrical engineering at the 5000 and 6000 levels.

b. A minimum of 12 quarter hours of 6000-level course work. At least 3 quarter hours of this work must be in an area other than the student's major area.

c. A minimum of 18 hours of mathematics, including Mathematics (or Physics) 5610-20-30 and 9 hours of mathematics at the 4000 level or above.

Courses required in electrical engineering undergraduate curriculum cannot be used in the following:

a. A minimum of 36 quarter hours of work in electrical engineering at the 5000 and 6000 levels.

b. A minimum of 12 quarter hours of 6000-level course work. At least 3 quarter hours of this work must be in an area other than the student's major area.

c. A minimum of 18 hours of mathematics, including Mathematics (or Physics) 5610-20-30 and 9 hours of mathematics at the 4000 level or above.

The basic examination is normally taken after the completion of 36 hours of graduate course work. A minimum of 27 hours of graduate course work must be completed before the student has taken the basic part of the comprehensive examination the first time.

Many of the electrical engineering courses are offered in the evening. Engineers working in industry are encouraged to participate in the department's graduate program.

Departmental graduate programs providing special opportunities for academic and research work in areas pertinent to atmospheric and space flight are also available at the Space Institute, Tullahoma.

3010 Transient Analysis (3) Analysis of transient response of networks and systems; Laplace transform method and classical differential equation methods for system analysis; complex frequency and pole-zero concepts; applications to engineering problems. Prereq: 2030.


3050 Basic Field Theory (3) Forces between charges, electric and magnetic fields, Gauss's law and divergence, potential and line integrals, material bodies, polarization, magnetic circuits, Maxwell's equations, dynamical systems, and Mathematics 2860.
3060 Propagation I (3) Propagation of waves in transmission lines and in other guiding systems. Impedance, standing wave patterns, matching, and applications of basic theories to waveguides, slab waveguides, and optical fibers. Prereq: 3050. 3 hrs including biweekly lab.

3080 Energy Conversion (3) Magnetic circuits, transformers, and other magnetic devices. Energy conversion, principles of electromechanical energy conversion with emphasis on output-input characteristics; steady-state analysis of induction motors and d.c. machinery. Prereq: 3040. Includes biweekly lab.

3090 Energy System Operation (3) Synchronous machines, transmission-lines, and transformers as power system elements; power system representations, per-unit calculations, symmetrical components, and fault studies. Prereq: 3060. Includes biweekly lab.


3110 Basic Electrical Engineering—Circuits and Fields (3) For non-electrical engineering majors. Prerequisites: Mathematics 2850, Physics 2310-30. 3 hrs including occasional lab.

3120 Basic Electrical Engineering—Electronics (3) For non-electrical engineering majors. Prereq: 3110. 3 hrs including biweekly lab.

3130 Basic Electrical Engineering—Machinery (3) For non-electrical engineering majors. Prereq: 3110. 3 hrs including biweekly lab.

3180 Logic Design of Digital Systems (3) Introduction to boolean algebra and design of combinational circuits. Presents gate and flipflop characteristics. Design of clocked sequential circuits and other systems containing memory. Introduction to microcomputer architecture and system components to include busses, memory, I/O devices, and interface from a hardware and software point of view. Prereq: 3110. 4 hrs including occasional lab.

3190 Plasma I (3) Engineering applications of physical electronics, plasma effects and devices. Topics include electrostatic precipitators and vacuum cleaners, light sources, laser, optical and applications (e.g. holography, coherent and incoherent imaging. Engineering applications; holography. Prereq: 3010, Computer Science 3150. 3 hrs including biweekly lab.

3220 Basic Electronics II (3) Physical operation of bipolar transistors and vacuum tubes with applications in basic amplifiers. Integrated circuit fundamental. Prereq: 3830. 3 hrs including project laboratory.

3280 Basic Electronics III (3) Frequency and transient response of open-loop transistor amplifiers. Fundamentals of integrated-circuit operational amplifiers, basic feedback topologies, and applications. Basic digital switching circuits. Prereq: 3220. 3 hrs including project laboratory.

4020 Direct Electrical Energy Conversion (3) Basic principles, typical devices and applications for permanent magnet, thermoelectric, thermionic, solar, fuel and hydrogen cells. Laboratory demonstrations. Prereq: 3050, 3190 and 3810.

4080 Microwave Circuits and Electronics (3) Scattered wave propagation in guided wave systems, microwave transmission and amplifiers, coupled and power dividers, circulators, phase shifters, loading and interconnection of systems. Design of vacuum devices and by solid state (bun and junction) devices. Microwave switching, filtering and multiplexing. Prereq: 3060. 3 hrs including biweekly lab.

4090 Propagation II (3) Metal tube, dielectric rod, and string antennas. Waveguide resonators and other loading components. Design of structures utilized for microwave power transmission and for microwave integrated circuits. Prereq: 3060. 4 labs.


4410 Power System Components and Control (3) Analysis of power system components and their interconnection. Studies in control of power and frequency as well as voltage and reactive power. Prereq: 3090.

4420 Power Systems Analysis (3) System studies including load flow, faults, and stability. Prereq: 3090.

4430 Transmission, Distribution, and Protection (3) Studies in underground and d.c. transmission; consideration of voltages and insulation requirements; system protection against faults. Prereq: 3090.

4460 Lasers and Masers (3) Introduction of principles of laser and maser operation based on classical concepts and electrical engineering analogies. Consideration of practical devices and applications. Prereq: 3090. 3 hrs including occasional lab.


4480 Plasma III (3) Macroscopic plasma equations, particle orbits, interactions, oscillations and waves. Prereq: 3190


5000 Electro-optics Detection and Instrumentation (3) Sensitivity, resolution (frequency response) and noise concepts of practical engineering data for both spatial recording media (e.g. photographic emulsions) and temporal detectors (e.g. photo-diodes) will be given. The last third of the course will be devoted to selected electro-optic instrumentation systems (e.g. laser light scattering, optical data processing, holographic interferometry). Prereq: 3090.


5470 Electro-Acoustics (3) Wave equation for sound, radiation from pistons, Impedance of a piston, loudspeakers, horns, speaker systems, phonograph recorders and reproduction, tape recording and reproduction, noise reducing systems. Prereq: Senior standing.


4610 Analog-Digital Systems (3) Principles of analog computing applied to computer models of physical systems using programmable analog computer. Prereq: 3090, 3830. 3 hrs including biweekly lab.

4620 Sequential Machine and Digital System Theory (3) Considers design aspects of pulse, clock, and level-sensitive sequential circuits. Theory and characteristics of one- and two-dimensional iterative networks. Design of large scale digital systems using MSI and LSI technologies. Introduces principles of reliability and error detection in digital systems. Prereq: 3180. 3 hrs including biweekly lab.

4630 Digital System Organization and Design (3) Consider design of basic digital computer systems. Topics include microprocessor architecture and system design, including minicomputer and microprocessor architectures and comparisons. Characteristics of A/D, D/A and MPU structures. Digital system aspects related to hardware (e.g., ROM, and PROM building blocks), and input-output systems are developed. Consideration of concurrent and parallel modes of operation, synchronous—asynchronous time sequencing and microprocessor control. Prereq: 3180. 3 hrs including biweekly lab.

4650 Bioelectric Instrumentation (3) Nature and origin of bioelectric potentials, transducers, amplifier requirements, recording systems and noise problems.

4680 Electronic Amplifiers (3) Feedback amplifier principles. Wideband linear amplifiers. Audio and radio-frequency power amplifiers. Prereq: 3830, 3720. 3 hrs including project laboratory.

4690 Communications Electronics (3) Receiver and transmitter circuits for communications. Prereq: 3040, 3830. 3 hrs including project laboratory.

4700 Digital Integrated Electronics (3) Comparators, logic gates, flip-flops, registers, counters, memories, analog switches, A/D and D/A converters, clipping, clamping and sweep circuits. Prereq: 3830, 3180. 3 hrs including project laboratory.

4740 Integrated Circuits (3) Processing and fabrication of active and passive components for monolithic and hybrid circuits. Integrated circuit design techniques for linear and digital circuits. Prereq: 3830. 3 hrs including project laboratory.


4800 Hardware-Software Interface in Minicomputer and Microprocessor System Design (3) Prepros, specifications, and implementation. Hardware/software interaction and trade-offs. Priority interrupt structures are discussed and utilized in computer projects. A project oriented, contract course. Completion of two projects, one utilizing a minicomputer and the other a microcomputer, are minimal course requirements. Prereq: 3090.

4810 Discrete-Data Systems (3) Introduction to analysis and design of digital data systems using classical frequency domain techniques. Real-time digital filtering techniques; application of digital computers in closed-loop feedback systems.
4820 Introduction to Pattern Recognition (3) Role of pattern recognition within framework of artificial intelligence. Topics dealing with the design of learning machines, or statistical methods. Computer applications of pattern recognition to problems of practical significance. Computer simulation of elementary pattern recognition programs. Prereq: Either 3100 and Computer Science 3150, or Statistics 3450 and Computer Science 1510. (Same as Computer Science 4620.)

4830 Digital Image Processing (3) Principal mathematical concepts underlying image processing, and recent research. Computer algorithms for image filtering, and the effects of processing by means of digital computers. Computational algorithms for image operations. Prereq: 3100 and Computer Science 3450 or 3541 and Computer Science 1510. (Same as Computer Science 4830.)

4850 Small Computer Systems (3) Basic structure of small computer systems, input-output techniques, interrupt structures, peripheral devices, system software and assembly language programming. Course is project oriented. Prereq: Basic Engineering 1410, Computer Science 1510 or 3150 or consent of instructor. (Same as Computer Science 4850.)

4910-20-30 Special Electrical Engineering Problems (3, 3, 3) Problems in electrical engineering involving library and experimental research.

5000 Thesis (1-15) E

5040-50-60 Electrical Engineering Research (3, 3, 3)

5070-80 Modern Transform Methods (3, 3) Laplace transform and complex variable theory. Z-transform, difference equations and distributed parameter systems.


5120 Network Synthesis and Design (3) Frequency domain and time domain synthesis of network functions: realization of one-port and two-port networks by R, L, and C elements; approximation problems: complex pole and zero evaluation; application of the computer aided techniques. Prereq: 5070 or equivalent.

Wave propagation in isotropic and anisotropic media, transmitted power, stored energies, propagating and nonpropagating modes, orthogonality properties, boundary and radiation conditions, sources. Prereq: 5820.

5870 Introductory Microwave Networks (3) Circuit equivalents for n-port, junctions, obstacles, loading and fillings. One way and two way devices, directionality, lossy devices, scattering parameters, reflection charts. Prereq: 5810. Coreq: 5820.

5930 Digital Image Processing (3) Theory and techniques. Visual system models, two dimensional sampling and interpolation, image representation and transforms, image enhancement, restoration, reconstruction, image coding techniques, image de- correlation, source analysis and scene matching. Prereq: 4830 or consent of instructor.

5940-50 Advanced Small Computer Systems (3, 3) Real-time applications, memory and CPU organization, interface software, and peripheral devices of minicomputer and microprocessor system are studied. Project-oriented supported by hardware and software interface design. Prereq: 4830 or equivalent or consent of instructor. (Same as Computer Science 5940-50.)

6000 Doctoral Research and Dissertation (3-15) E

Engineering Science and Mechanics

MAJOR

DEGREES

Engineering Science M.S., Ph.D.


Graduate programs leading to the degrees of Master of Science and Doctor of Philosophy with a major in Engineering Science are available to graduates of recognized curricula in engineering, mathematics, or one of the physical or biological sciences. Program options include solid mechanics, fluid mechanics and biomedical engineering. In the biomedical area, special emphasis is placed on interdisciplinary programs that meet individual needs or interests. Each applicant will be advised as to any prerequisite courses before entering a program, and the student's program must be approved by his/her advisory committee, and must comply with the requirements of The Graduate School. The student's major professor may be selected from a department other than the Department of Engineering Science and Mechanics.

A departmental application is required in addition to The Graduate School application. The names and addresses of four references


6760 Coding Theory (3) Mathematical structure of algebraic and probabilistic codes. Coding metrics and bounds, linear codes, linear feedback shift registers, convolutional codes, burst-correcting codes and decoding methods. Prereq: 5710 or consent of instructor.


A departmental application is required in addition to The Graduate School application. The names and addresses of four references
must be included with the departmental application.

The flexibility and interdisciplinary aspect of the program options are intended to be of particular interest to prospective students currently employed in research, development, or design activities and whose interests in continuing education (either full-time or part-time) lie at one of the interfaces between science and engineering, or can best be met by interdisciplinary study in engineering. The department's course offerings and research activities are also intended to meet the needs of students who seek preparation for employment in engineering areas requiring specialization in mechanics, or in related interdisciplinary studies such as biomechanics.

THE MASTER'S PROGRAM

Two M.S. plans are offered: Plan I requires a thesis, while Plan II does not. The second plan is offered to meet the needs of engineers employed in industry, or those who plan to teach in community colleges and technical institutes. It will be available, however, to any student who, in the opinion of his/her advisory committee, can benefit from additional course work in areas of his/her thesis.

In Plan I a minimum of 45 quarter hours, including the thesis, is required. In Plan II a minimum of 48 hours is required. The requirements include the following:

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A final examination is required under both plans, covering graduate course work and the thesis (if any).

THE DOCTORAL PROGRAM

General policies and requirements of The Graduate School relating to admission, residence, languages, research, examinations, faculty advisory committee, and admission to candidacy apply to this program.

Specific departmental requirements for the Ph.D. degree include:

1. A minimum of 108 quarter hours credit beyond the Bachelor's degree, exclusive of credit for the Master's thesis. These shall include a minimum of 36 quarter hours credit in Doctoral Research and Dissertation and a minimum of 72 quarter hours credit in other courses.

2. A minimum of 36 quarter hours in engineering graduate courses, exclusive of thesis and dissertation credit. These courses will normally be numbered 5000 and above, with at least 12 quarter hours of 6000-level courses, which constitute one or two areas of concentration selected by the student. The number of courses in this group to be taken will depend on the program selected by the student and the approval of his/her advisory committee.

3. A minimum of 18 quarter hours in mathematics or computer science in courses numbered 4000 and above, exclusive of a first course in ordinary differential equations.

4. A minimum of 9 quarter hours of courses numbered 3500 and above, offered in departments other than mathematics, computer science, and the student's major department and which are not included in the areas of concentration selected by student under item 2.

5. Active participation in graduate seminars and colloquia.

6. Comprehensive examination consisting of a written qualifying examination and an advanced examination. The qualifying examination covers areas of engineering science and mathematics, for the most part at a level and scope expected of well-qualified recipients of a Bachelor's degree in engineering. The advanced examination requires demonstration of special competence in the areas of concentration selected by each student under item 2.

7. Submission of a written proposal for dissertation research to the student's advisory committee. Oral defense of the proposal is normally required when the student takes the advanced portion of the comprehensive examination.

8. Submission of a dissertation which meets the requirements of The Graduate School, the department, and the student's advisory committee.

3311 Mechanics of Materials (4) Concepts of stress and strain; stress-strain relations and Mohr's circle; static analysis of members; area moment of inertia; stress and displacement analysis of axially-loaded members; torsion; bending. Not for departmental graduate credit. Prereq: Basic Engineering 1310. Coreq: Mathematics 2850.

3410 Introduction to Biomedical Engineering (4) Designed to introduce the facets and opportunities of biomedical engineering, and to provide basic terminology and background knowledge for further courses in the field. Subjects include anatomy, physiology, biomechanics, and engineering systems. Coreq: Mathematics 2840 or consent of instructor.

3420 Introduction to Clinical Engineering (3) Applications in clinical/hospital setting: description, analysis, design, and implementation of health care delivery systems; hospital organization and structure; clinical use of biomedical equipment; principles of safety engineering in the hospital and applicable codes, standards, and regulations. Prereq: 3410, Physics 2320, or consent of instructor.

3520 Materials Behavior and Chemical Process Design (3) Same as Metallurgical Engineering 3520.

3700 Dynamics (4) Kinematics of rigid bodies; mass moments of inertia; coulomb friction; kinetics of rigid bodies using force, mass, acceleration; work-energy principle; momentum. Not for departmental graduate credit. Prereq: 2705 or Basic Engineering 1320, Mathematics 2840.

3710 Intermediate Dynamics (3) Three-dimensional dynamics of particles and rigid bodies; dynamics of bodies with varying mass; central force motion; LaGrange's equations. Prereq: 3700, Mathematics 2840.

4020 Computer-Aided Design (3) Use of computer graphics and analysis programs for design of selected systems, structures, and components. Evaluation of design alternatives. Prereq: 4810.

4430 Orthopedic Biomechanics (3) Introduction to engineering principles and applications in orthopedics and rehabilitation. Statics, Newton's laws of motion, statics, mechanisms, mechanical properties of engineering materials, biological materials. Prereq: Consent of instructor. For non-engineering majors.

4500 Applied Mechanics for Life Scientists (4) Converse and broad coverage of basic principles and concepts: Fundamentals; statics, stress, strain,; continuum mechanics, properties of materials. Applications in engineering and medicine. Prereq: Math 1170 or consent of instructor. Primarily for non-engineering majors.

4520 Biomedical Fluid Mechanics (3) Discuss objectives, review foundations and present developments in biomedicine and fluid mechanics. Properties of human blood and blood vessels, determinants of cardiac performance, analysis and measurement of flow and pressure in arteries, non-traumatic study of circulatory system, mechanics of microcirculation. Applications to areas of hemolysis, thrombosis, and fluid dynamics of heart assist devices. Prereq: 4500 or a course in fluid mechanics or consent of instructor.

4530 Biomechanics (3) Discuss objectives, review foundations and present developments in areas of biomechanics. Mechanics, concepts, statics, dynamics, fatigue and fracture mechanics. Properties of Injury and prosthesis, material compatibility of prosthetic devices and biomechanical problems related to impact. Prereq: 3311 or 4520 or consent of instructor.

4540 Fracture-Safe Design (3) A critical review of mechanical properties of materials that are indicative of fracture resistance in biological systems. Fracture theory, R-curves, stress intensity factors, and J-integrals; the use of these properties in design. Prereq: 3910, or Metallurgical Engineering 2110. Coreq: Same as Metallurgical Engineering 4540. 3 hrs or 2 hrs and 1 lab.

4580 Principles of Nondestructive Testing (3) Same as Physics 4580.

4610 Experimental Stress Analysis (3) Basic concepts: theory, techniques, and instrumentation of resistance strain gage theory and techniques of brittle coating methods; introduction to other stress analysis methods. Prereq: 3910, Electrical Engineering 2020 or 3110. 2 hrs and 2-3 hr lab.

4620 Dynamic Data Acquisition (4) Instrumentation of measuring systems for dynamic events and responses; signal conditioning, oscilloscopes, and magnetic tape recording; telemetry and data transmission; data processing. Prereq: 3120, Electrical Engineering 3120. 3 hrs and a 3-4 hr lab.

4630 Introductory Photonics (3) Introduction to photoelasticity, photoelastic coating methods. Moore method, interferometry, and holography. Prereq: 3110, Physics 2320. 2 hrs and a 3-4 hr lab.

4710 Fundamentals of Vibrations (3) Free and forced vibrations of damped and undamped lumped parameter systems; energy methods. Prereq: 2720, Mathematics 2840.


4810-20 Engineering Analysis (4, 3) Integration of fundamental physical laws and mathematical methods of analysis, with emphasis on application to realistic engineering problems. Prereq: 3110, 3311, and Mathematics 3150.

4850 Elementary Structural Matrix Methods (Same as Civil Engineering 4850 and Architecture 4850.)

4910 Special Engineering Science Topics (3) Problems related to recent developments and practice. Open to juniors or seniors with consent of instructor. May be repeated: Maximum 6 hrs.

5000 Thesis (115) E
5002 Non-Thesis Graduation Completion (3-15) Required for the non-thesis student not otherwise registered during any quarter when such a student undertakes facility curricula and/or faculty time before degree completion. May not be used toward degree requirements. May be repeated. S/NC only. E

5110-20 Fluid Dynamics (3, 3) Kinematics of fluids, vorticity, rate distortion, plane and axisymmetric streamline functions; Navier-Stokes equation, exact solutions, creeping flow and boundary-layer approximations; viscous flow, potential theory, complex potentials, conformal mapping. Prereq: 5800.

5130 Introduction to Turbulence (3) Macroscopic effects, analogies, statistical treatment, correlation functions, energy spectra, diffusion; application of turbulent jets and pipe flow. Prereq: 5800.

5140 Finite Element Methods in Fluid Mechanics (3) Computational fluid mechanics using finite element techniques. Basic methodology; initial-value techniques; matrix interaction; accuracy and convergence concepts. Laminar and turbulent boundary layer flow; inviscid and aerodynamic flows; incompressible vorticity, boundary layer separation and reattachment. Prereq: 5110 and 5860.

5180 Finite Element Structural Analysis (3) (Same as Civil Engineering 5180.)

5220 Mechanics of Viscous Flow (3) Viscous forces in flow phenomena, application of Navier-Stokes equations; boundary conditions; finite-difference and finite-stress-optic methods of laminar flow analysis. Prereq: Mathematics 4610. (Same as Chemical Engineering 5180.)


5410-20 Theory of Elasticity (3, 3) Stress, strain in three dimensions; traction, equilibrium of prismatic bars; axisymmetric stress distribution; stress concentration; plane stress, plane strain. Prereq: 5800.

5430 Thermal Stresses (3) Heat conduction; thermoelectric equations; thermal stresses in beams, rings, plates, and shells; thermal buckling problems. Prereq: 5410 or 5310-20-30, and Mechanical Engineering 5440.

5440 Theory of Linear Viscoelasticity (3) Linear viscoelasticity of solids; quasielastic problems; vibra-
tions; problems; dynamic problems; stability prob-
loms; foundations of three-dimensional linear visco-
elasticity. Prereq: 5500.

5550 Fracture Mechanics (3) Equilibrium cracks and geometric singularities; numerical methods for deter-
nation of fracture mechanics parameters. Prereq: 5800; Metallurgical Engineering 4730 or Mechanical Engineering 4740 or 5540.

5630-40 Photoelasticity (3) Physical optics, wave motion, polarized light, basic principles of photoel-
astics, equipment, and techniques; application to two-
dimensional elasticity and stress concentration; nu-
merical methods in photoelastic stress analysis, photoelastic coating methods, three-dimensional photoelasticity. Prereq: 3311, Mathematics 4610, and consent of instructor. 5640: 2 hrs and 3 labs.

5710-20 Advanced Dynamics (3, 3) Physical laws relative to translating and rotating reference frames; rigid body dynamics; variational methods; La-
grange's equations; Hamilton's principle. Prereq: 3710 or 4710, Hamilton's principle. Prereq: 3710 or 4710, Hamilton's principle. Prereq: 3710 or 4710.

5730 Advanced Vibrations (3) Vibrations of multi-
ple degree of freedom lumped parameter systems. Iterative and approximates solutions. Introduction to random vibrations. Prereq: 4710 and 4850.

5740 Vibrations of Continuous Media (3) Equations of motion for strings, rods, beams, membranes, plates, and shells; natural modes and frequencies; response of damped and undamped components to applied dynamic loads; approximate methods of solution. Prereq: 5410 and Mathematics 4550.

5750 Orbital Mechanics (3) Planetary, satellite, and astronomical orbits and trajectories; orbital perturba-
tions; classical principles of minimization. Prereq: 3710 and 4710.

5800 Introduction to Continuum Mechanics (3) Fundamentals of mechanics of solids and fluids; Cauchy's fundamental equations, deformation, and flow in continuous medium; constitutive equations, applications to solids and fluids. Prereq: 3130 and 3311 or equivalents. Mathematics 4610.


5910 Special Topics in Engineering Mechanics (3) Mechanics problems related to recent developments in the field; design, calculation, and experimental verification. May be re-
peeled with consent of department.

6000 Doctoral Research and Dissertation (3-15) E

6110-20 Advanced Topics In Fluid Mechanics and Convective Transfer (3, 3) Survey of literature on advanced convective momentum, heat, and mass transfer; High-speed flow based on the Navier-Stokes equations; boundary layer stability analysis; phenomenological theories of turbulence; turbulent boundary layer flow; high speed flow of phenomena in nonreacting and reacting systems. Prereq: 5110-20-30 or equivalent. Mathematics 4710, 4540-50. Prereq: as Environment Engineering 6110-20.


6230-40-50 Theory of Turbulence (3, 3, 3) Mathemati-
cal description of turbulence; isotropic turbulence, energy spectra, Kolmogorov's hypothesis; large and small eddy structure by turbulent flows; turbulent diffusion by continuous movement; applications to turbulent jets, wakes, pipe flow, and boundary layers. Prereq: 5110-20-30. Coreq: Mathematics 5610-20-30.

6310 Theory of Plates (3) Classical theory of bending, of plates of various shapes; thick plates; plates of variable thickness, large deflection problems. Prereq: 5310-20-30.

6320 Analysis and Design of Thin Shell Structures (3) Geometry of surfaces, derivation of thin shell theory of elasticity for structural engineer. Prereq: 6310 or Civil Engineering 5160.

6330 Theory of Elastic Stability (3) Theory of elas-

6340 Theory of Plasticity (3) Yield conditions; strain hardening; general constitutive equations; plastic potential; uniqueness theorems; extremum and variational problems; problems in perfectly plastic solids; finite plastic deformations; piecewise linear plasticity. Prereq: 5410 and Mathematics 4550.

6610 Photoelasticity (3) Stress-optic law in three dimensions and index ellipsoid, rotational effects in three-dimensional photoelasticity, techniques and applications of three-dimensional photoelasticity, scattered light methods, dynamic photoelasticity, photochromic effects, photoelasticity and photoviscoelasticity, recent developments in photoelasticity. Prereq: 5640, 5420 and consent of instructor. 2 hrs and 3 labs.

6710 Impact and Stress Waves in Solids (3) Mechanical impact; wave propagation in elastic solids; impact and waves in elastic rods, beams, and plates; control of elastic behavior; dynamic loading in viscoelastic and plastic materials; dynamic properties and materials. Prereq: 5410. Coreq: Mathematics 5630.

6800 Nonlinear Viscoelasticity (3) (Same as Pol-
ymer Engineering 6210.)

6810 Energy Methods (3) Virtual work, minimum potential energy, and complementary energy. Cast-
lagrange's theorem; Hamilton's principle, and La-
grange's equation of motion; variational methods; examples from theory of structures, plates and shells, buckling, vibrations, and advanced dynamics. Prereq: 5710-20 and Mathematics 5610-20-30.

6910 Special Topics in Engineering Mechanics (3) Advanced problems of interest in mechanics, working either as group or individually. Prereq: Con-
sent of instructor. May be repeated with consent of department.

NOTE: Not all of the above courses will be offered in any one year.

Industrial Engineering

MAJOR

DEGREES

Industrial Engineering

M.S., M.E.

Professors:


Associate Professors:


Assistant Professors:

M. K. Goodman, M.S. Tennessee, M. E. Hungerford, M.S., Ohio; K. E. Kirby, Ph.D., Tennessee.

THE MASTER'S PROGRAM

A graduate program leading to the degree of Master of Science is open to graduates of recognized undergraduate curricula in industrial engineering or to graduates of other engineering curricula who take up to 15 quarter hours of prerequisite course work. A non-thesis option with 45 hours of course work plus a 3-hour design project is available.

Graduates in Industrial Engineering providing for concentrations in operations research, industrial administration, manufacturing and production systems, human factors engineering, and systems engineering. Either one or two minors may be elected in Engineering, Mathematics, Psychology, Business, Computer Science, Statistics or Economics.

MASTER OF ENGINEERING PROGRAM

This professional degree program is intended as a culmination year in a five-year baccalaureate-master program which emphasizes engineering design and professional practice. Admission requirements include those presented above plus the requirement of a Bachelor's degree from an A.B.E.T. accredited engineering program. This 45-quarter hour program requires 18 hours of course work in an industrial engineering core, 9 hours of technical methods electives, 9 hours of industrial engineering design electives and 9-hour thesis or design project.

Any 4000-level course required in the Bachelor of Science in Industrial Engineering program at The University of Tennessee may
not be used for graduate credit in the M.S. or M.E. graduate program in Industrial Engineering.


4060 Production Systems Planning and Control I (3) Theory and applications of forecasting, production planning, inventory analysis, planning and control, and systems design and implementation. General system description and modeling. Analysis of the material requirements process as an integrated system. Prereq: 3510-20. Not available for graduate credit for industrial engineering students.

4070 Production Systems Planning and Control II (3) Theory and application of master scheduling, materials requirements planning systems, lot sizing and safety stocks, distribution requirements planning. Prereq: 4060.

4080 Forecasting Methods in Industrial Engineering (3) Application of technological forecasting techniques to industrial engineering problems. Includes moving averages and exponential smoothing, linear and polynomial regression models, autocorrelated time-series analysis, Delphi methods and other selected industrial forecasting methods. Prereq: 4060.

4150 Project Control with CPM and PERT (3) A study of project planning and control based primarily on CPM and PERT, including resource allocation, time-cost trade-off algorithms, multi-project control, and computer programs. Prereq: 3430.

4160 Materials Handling (3) Analysis and planning for the overall problem of moving, packaging, and storing of materials; equipment comparison and selection, cost analysis. Prereq: 4520 and Engineering 2110. Not available for graduate credit for industrial engineering students.

4170 Automatic Process Control (3) Characteristics of automatic processes and controllers; elementary open and closed loop analysis, and applications to industrial control system. Prereq: Mathematics 2860 and Engineering Science and Mechanics 2720.

4200 Production Facilities Design (4) Materials handling, plant layout, service areas, inventory control applications, and operating procedures design. Prereq: 3630, 3510-20, 4060, 4520.

4230 Scheduling Systems (3) Performance measurement of shop and flow shop scheduling, including both static and dynamic conditions, as well as techniques for generating production schedules. Determination and probabilistic dispatching conditions. Prereq: 3520.

4250 Work Measurement Applications (3) Application of learning curves, queuing theory, standard data methods and incentive systems to the design of industrial work situations.

4520 Engineering Economy (3) Methods and problems in selection or replacement of equipment. Decision making among engineering alternatives, involving capital recovery, economic life of equipment, and techniques common to industrial engineering problems. Includes capital recovery, economic life of equipment, and methods for determining the economic feasibility of new plants or projects.


4600 Predicted Time Systems (3) Work design and measurement using predicted time system; methods time measurement, basic motion time study, work factor. Theory and application. Prereq: 3830.

4610 Human Factors in Work Design II (3) Human capabilities and limitations affecting work place layout, working environments, design of tools and equipment, and communications and response in human-machine systems. Prereq: 3600, 3630, or consent of instructor.

4830 Health Systems Engineering (3) Hospital management systems and means by which they may be improved through application of modern industrial engineering principles and techniques.


4870 Mini-Computer Applications in Industrial Engineering (3) Characterization of processor hardware and computer interfaces; emphasis on small computers as element of larger system; applications and limitations of industrial engineering software; applications to solving industrial engineering problems. Prereq: Senior standing.

4910-20-30 Special Industrial Engineering Topics (3, 3, 3) Prereq: Consent of instructor. May be repeated. S/NC only. E 4950 Industrial Safety (3) Development of organization and programs for prevention and control of accidents with emphasis on OSHA Rules and Regulations.

models. Prereq: Statistics 3450, Computer Science 3150.


5900 Design Project (1-9) Industrial engineering topics, research material, and design project requirement in non-thesis program. Enrollment limited to industrial engineering students in non-thesis program. May be repeated. Maximum 9 hrs.

5910-20-30 Special Topics in Industrial Engineering (3, 3, 3) Special problems for students qualified to do individual or group research projects. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs.


6520 Operations Research Models in Engineering Economy Decisions (3) Traditional capital planning and budgeting techniques; operations research approaches to capital budgeting problems. Mathematical programming and computer simulation. Interrelated projects, uncertain cash flows, and choice of appropriate evaluation criteria. Prereq: 5520, 5710.

6700 Nonlinear Programming (3) Optimization techniques for static and dynamic nonlinear systems subject to various constraints. Applying optimization theory to solve nonlinear optimization problems. Variable metric methods, search methods, constrained nonlinear programming, and penalty function methods. Prereq: 5700.


6810 Advanced Topics in Industrial Engineering (3) Will cover topics not covered in other graduate courses. A forum for advanced graduate students to study individually or in group as appropriate. Prereq: Graduate standing and consent of instructor. May be repeated with consent of department.

Mechanical and Aerospace Engineering

MAJORS

Aerospace Engineering M.E., M.S., Ph.D.
Mechanical Engineering M.E., M.S., Ph.D.

Professors:


Associate Professors:


Graduate Students:


GRADUATE STUDY PROGRAMS

Graduate programs in Mechanical Engineering or Aerospace Engineering are available which lead to the degrees of Master of Engineering, Masters of Science, and Doctor of Philosophy with concentrations in solar energy, energy conversion and utilization, power generation, machine design and dynamics, aeroacoustics, stress analysis, propulsion, heat transfer and fluid mechanics, and thermodynamics. In addition to the general policies and requirements of The Graduate School, each student must satisfactorily complete a program of study which has been approved by the student's committee. Specific program requirements are given below.

Masters of Engineering Programs

Entrance into the Master of Engineering program is restricted to qualified graduates of A.B.E.T.-accredited undergraduate curricula in mechanical or aerospace engineering. At least one-third of the program of study must be classified as engineering design. The student's advisor will assist in planning the program of study to ensure that it includes the necessary design content. Three program options (thesis, course, and problems) are described below. Note that some students may not be eligible for the course option.

Masters of Science Programs

Entrance into the Master of Science program is available to qualified graduates of recognized undergraduate curricula in mechanical or aerospace engineering and to qualified graduates of other curricula who satisfy the necessary prerequisites. Three program options (thesis, course, and problems) are described below. Note that some students may not be eligible for the course option.

Masters' Program Options

Three program options are available:

A. The Thesis Option. The requirements of this option are that the student must satisfactorily complete a program of study that includes:

1. A minimum of 36 quarter hours of course work which includes at least 18 quarter hours of graduate (5000-level or above) courses in mechanical and/or aerospace engineering and normally 9 quarter hours of course work (4000-level or above) in mathematics.

2. A minimum of 9 quarter hours of credit in thesis.

3. Participation in the departmental seminar programs.

4. Submission and defense of a written thesis which demonstrates the ability to conduct and report on an independent investigation.

5. Passing a final examination on all work submitted for the degree.

B. The Course Option. Normally, this program is restricted to those students who have had significant engineering work experience. The evaluation of the work experience and the final selection of the student's program of study are left to the student's committee. The requirements of this option are that the student must satisfactorily complete a program of study that includes:

1. A minimum of 45 quarter hours of course work which includes at least 27 quarter hours of graduate (5000-level or above) courses in mechanical and/or aerospace engineering and normally 9 quarter hours of course work (4000-level or above) in mathematics. No more than 3 quarter hours of engineering course work may be below the 5000 level.

2. Participation in the departmental seminar program.

3. Passing a comprehensive written final examination on all course work submitted for the degree. The student's committee will be of sufficient size to include all the study areas reflected in the course program.

C. The Problems Option. The requirements of this option are that the student must satisfactorily complete a program of study that includes:

1. A minimum of 36 quarter hours of course work which includes at least 18 quarter hours of graduate (5000-level or above) courses in mechanical and/or aerospace engineering and normally 9 quarter hours of course work (4000-level or above) in mathematics.

2. A minimum of 9 quarter hours credit in Selected Engineering Problems (5900). A written report must be submitted for each problem investigated.

3. Participation in the departmental seminar program.

4. Passing a comprehensive written final examination of all course work submitted for the degree and an oral examination of all work (including problems) submitted for the degree.

THE DOCTORAL PROGRAM

Admission into the doctoral program will be granted to those applicants who have demonstrated superior achievement in their engineering backgrounds. The student must satisfactorily complete an approved program of study which normally includes:

1. A minimum of 72 quarter hours credit beyond the Bachelor's degree, exclusive of credit for the M.S. thesis or problems.

2. A minimum of 36 quarter hours of credit in doctoral dissertation.

3. A minimum of 18 quarter hours in mathematics in courses numbered 4000 or above.

4. A minimum of 36 quarter hours in mechanical and/or aerospace engineering courses numbered 5000 and above, with at least 12 quarter hours of 6000-level courses. These are exclusive of thesis, problems or dissertation credit.

5. Participation in the departmental seminar program.

GRADUATE CREDIT FOR UNDERGRADUATE COURSES

Junior (3000-level) and senior (4000-level) mechanical and aerospace engineering
courses may be taken for graduate credit by non-mechanical or non-aerospace engineering majors, if approved by the student's major department. Mechanical or aerospace engineering majors may not normally use more than one 4000-level engineering course to meet their advanced degree requirements. Non-mechanical or non-aerospace engineering graduate students should consult with instructors regarding prerequisites for undergraduate courses.

**Mechanical Engineering**

3000 Energy—An Overview (4) Introduction to available energy resources, recovery and utilization; power generation techniques including conservation schemes; emphasis on the resource-environment-human interaction associated with energy; primarily for non-engineering students.

3110 Applied Engineering Thermodynamics (3) Energy and laws governing energy transformations; thermodynamic properties; applications to engineering problems.

3311 Engineering Thermodynamics (3) Energy and laws governing energy transformations; thermodynamic properties.

3330 Engineering Thermodynamics (3) Properties of gases and liquids; chemical reactions; equilibrium; applications to mechanical engineering problems.

3410 Fluid Flow (3) Development of continuity, momentum and energy principles for fluid systems; applications of mechanical and aerospace engineering problems.


3520-30-40 Thermal Sciences (2, 3, 3) Fundamental principles of thermodynamics; and transport phenomena as applied to engineering design. To be taken in sequence.

3610 Mechanics of Machinery—Kinematics (3) Machine motions, graphical and analytical methods; instantaneous centers; velocities; accelerations.

3620 Mechanics of Machinery—Dynamics (3) Applications of Newton's laws, work, energy, and impact to machinery. Force analysis of mechanisms, balancing, gyroscopic effects, flywheels. Prereq: 3610.


3650 Introduction to Machine Design (3) Ductile behavior of materials under static and cyclic loading. Stress concentration, design factors and theories of failure. Changes in material behavior in processing and fabrication. 2 hrs and 1 2-hr lab.

3910 Engineering Analysis (3) Advanced analysis techniques for problems of aerospace and mechanical engineering. Emphasis on approximate methods.

410 Energy Conversion Systems (3) Operating and design characteristics including new technology development; selected direct conversion techniques.

4150 Energy Conversion Systems (3) Fossil fuel systems with emphasis on coal technology.

4160 Design of Energy Conversion Systems (3) Synthesis and design of system including economic and technical aspects. Participation in team design effort including formal presentations and design report.

4170 Turbo-Machinery (3) Basic principles of turbo-machinery; systematic methods or analysis, design, engineering majors.

4180 Energy Production and Utilization (3) Thermodynamics constraints on energy production; comparison of power generation methods; evaluation of new energy sources and concepts; energy conservation schemes.

4220 Environmental Noise (3) Basic principles of acoustics, introduction to control of noise in industrial and community environments.

4420 Heat Transfer (3) Heat transfer by free and forced convection, heat transfer with phase changes, heat exchanger applications.

4450 Lubrication (3) Hydrodynamic theory of lubrication; surface forces; application of Navier-Stokes equations to infinite and finite bearings; analytical and numerical solutions; applications to design.

4471-91 Experimental Mechanical Engineering (3, 3) Experimental methods and measurements of force, length, time, temperature, pressure, transport rates, and physical properties. Planning, conducting, analyzing, and reporting experimental tests run according to test standards and other specifications.

4510 System Dynamics (4) Analytical models of physical systems, linearization, Laplace transforms, linear characteristics and stability of systems, numerical simulations, and analog computer solutions. Not for departmental graduate credit.

4520-30 Creative Design (3, 3) Application of engineering principles to the solution of current problems with emphasis on design innovation.

4621 Manufacturing Processes (3) Comparison of machining methods; plastic production; metrology.

4622 Tool Design (3) Principles underlying tool design and die design, design of high-volume production tools and molds, work-holding fixtures.


4624 Manufacturing Engineering Systems Design (3) Design of complete manufacturing system for a particular product: manufacturing planning, tool and fixture design, selection of manufacturing operations, redesign of product to reduce cost.


4631 Energy Methods in Mechanical Design (3) Application of energy principles in complex beams and structures.

4660 Materials and Manufacturing Process (3) Selection of materials in design process, emphasis on relationship between strain analysis of material properties, environment, temperature, manufacturing technology and cost.

4670 Machine Elements (3) Application of strength and properties of materials, design factors, theories of failure to design machine elements, springs, and shafting, selection of sleeve and rolling element bearings.

4680 Machine Elements (3) Application of strength and properties of materials, design factors, theories of failure to design machine elements, springs, and shafting, selection of sleeve and rolling element bearings.

4710 Thermal Environmental Systems (3) Vapor compression and absorption cycles; heat pump systems; moist air properties; psychrometric processes.

4720 Thermal Environmental Systems (3) Design analysis of air washers, cooling towers and extended surface coils; solar radiation; building heat transmission; physiological effects.

4730 Thermal Environmental Systems (3) Design of heating ventilation and air conditioning systems.

4740 Solar Energy Utilization (3) Nature and availability of solar energy; selected heat transfer topics pertinent to solar energy collection and use; design analysis of solar energy collectors and method of storage; selected applications.

4810 Internal Combustion Engines (3) Thermochemical phenomena, internal combustion and propulsion engines. Combustion, detonation, equilibrium, dissociation. Analysis of internal combustion engines using real and real fluids.

4910-20 Selected Topics in Mechanical Engineering (3, 3) Problems related to developments and practice in mechanical engineering.

5000 Thesis (1-15) E

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

5110 Conduction Heat Transfer (3) Analysis of steady state and transient heat conduction by analytical and numerical techniques. Prereq: 3910, 4420 and Mathematics 3150.

5120 Convection Heat Transfer (3) Equations of free and forced fluid flow; energy equation; heat transfer analysis of internal and external flows including effects of variable heat flux, surface temperature, and fluid properties. Prereq: 5316 or equivalent.


5140 Phase Change Heat Transfer (3) Fundamental mechanisms, modeling and prediction of nucleate, transition and film boiling; critical heat flux; forced convection boiling and post dry-out heat transfer; two phase flow and pressure drop; condensation heat transfer. Prereq: 5120 or consent of instructor.

5210 Classical Thermodynamics (3) Macroscopic thermodynamics with emphasis on First and Second Law analyses, equilibrium criteria, and thermodynamics of phase relationships. Prereq: 3330.

5220 Microscopic Thermodynamics (3) Thermodynamic properties, kinetic theory and statistical mechanics. Prereq: 5210.

5230 Special Topics in Thermodynamics (3) Prereq: Consent of instructor.

5310 Intermediate Fluid Mechanics (3) Vector descriptions in fluid mechanics; derivation of basic equations; two dimensional potential flows; viscous flow; emphasis on boundary-layer theory. Prereq: 3410.


5410-20-30 Research in Mechanical Engineering (3, 3, 3) Design of experiments; data analysis; experimental investigation.

5510-20-30 Mechanical Engineering Design (3, 3) Design of mechanical engineering units and systems.

5540-50-60 Advanced Strength of Materials (3, 3, 3) Fundamental mechanisms, modeling and prediction of mechanical behavior of solids; design and analysis of engineering components. Shear, tension, compression, fatigue, fracture, failure, failure of composite materials; displacements, stresses, strains, and fracture mechanics. Prereq: 5314.

5601 Dynamics of Mechanical Systems (3) Computational techniques derived from Lagrangian mechanics and Eigenvalue analysis for application to complex mechanical systems. Prereq: 4631 or consent of instructor.

5602 Computer Aided Mechanical Design (3) Application of matrices and computational techniques
Aerospace Engineering

3610 Dynamics (3) Newton's Law: work-energy impulse-momentum, Lagrange equations, central force, gyroscopic effects. Applications to aerospace systems.

3620 Mechanical Vibrations (3) Free and forced vibrations of single and multiple degree vibrating systems, balancing of rotating machinery.

3630-40 Structural Analysis of Aerospace Vehicles (3, 3) Fundamentals of structural analysis as applied to configurations of aerospace interest. Introduction to aeroelasticity phenomena. Must be taken in sequence.

4110 Aerodynamic Fundamentals (3) Atmosphere, aerodynamic fundamentals, including perfect gases, fluid flow types, airfoil theory, wing theory, drag. For non-aerospace engineering majors only.

4120 Aircraft Propulsion and Performance (3) Propellers, propulsion systems for aircraft, static performance and specific performance problems, maneuvers, control surfaces, stability and control. For non-aerospace engineering majors only.

4210 Compressible Flow (3) One-dimensional isentropic flow, and expansion waves; friction and nonadiabatic flows.

4220 Low Speed Aerodynamics (3) Potential flow theory; kinematics and dynamics of perfect fluids; analysis and design of aerodynamic bodies.

4230 Viscous Flow (3) Boundary layer theory; laminar and turbulent flow; compressibility effects; numerical solution methods.

4240 Astronautics (3) Propulsion, trajectories, guidance, control, and atmospheric reentry of space vehicle systems.

4250 Propulsion (3) Principles of propulsion devices; turbojet, ram-jet, and rocket engines.

4260 System Design (3) Principles of system design, including formal presentations and design report.

4411-91 Experimental Aerospace Engineering (3, 3) Experimental methods and measurements of force, length, temperature, pressure, transport rates and physical properties. Planning, conducting, analyzing, and reporting experimental tests according to test standards and other specifications.

4510 Airplane Performance (3) Introduction to airfoil and wing characteristics, drag; propellers; static performance and maneuvering; theory and design of control surfaces.

4610 Selected Topics in Aerospace Science (3) Current problems in aerospace science; topics in science and engineering required for an understanding of the several areas of aerospace science.

5000 Thesis (1-15) E

5100-20-30 Rocket Propulsion System (3, 3) Rocket fuel, design. Chemical, electrical, and nuclear propulsion systems.

5440-50-60 Turbomachinery Systems (3, 3) Design, development, and systems integration of turbo- machinery components. Prereq: First year graduate standing and consent of instructor.

5610-30 Rocket Propulsion Propulsion System (3) Rocket fuel, design. Chemical, electrical, and nuclear propulsion systems.

5890 Special Topics in Mechanical Engineering (1-3) May be repeated.

6000 Doctoral Research and Dissertation (3-15) E

6110-20 Advanced Topics in Fluid Mechanics and Heat Transfer (3, 3) Advanced theory and applications of fluid mechanics and heat transfer; natural convection, two-phase flows; high speed reacting and non-reacting flows, advanced boundary layer techniques. Prereq: Consent of instructor.

6130-40 Advanced Radiation Heat Transfer (3, 3) Radiation heat transfer in absorbing, emitting and scattering media, interaction of thermal radiation with conduction and convection heat transfer; radiation heat transfer in hypersonic flow; radiative characteristic of luminous flames and nonuniform gases; scattering by planetary atmosphere. Prereq: 5110-20-30; Mathematics 4550.

6200 Selected Topics in Thermodynamics (3) Comparison of macroscopic and microscopic approach; equilibrium of pure substance; metastable states. Prereq: Consent of Instructor.

6350 Selected Topics in Thermodynamics (3) Linear and nonlinear single degree of freedom systems. Prereq: Consent of instructor.
5610 Applied Acoustics (3) Energy flow in acoustical systems, wave propagation in nonhomogeneous moving medium, sound waves due to turbulence, vortical sound, pseudosound, propagation and absorption of sound in ducts, instrumentation and measuring techniques. Prereq: Consent of instructor.

5620 Aerodynamics I (3) Special topics and recent research on aerodynamics. Hypersonic, supersonic, subsonic flows, boundary layers, aircraft noise, jet noise, and general theoretical developments, empirical equations. Prereq: 5610.

5810 Aviation Systems: An Overview (3) Aviation systems, present and future, emphasis on systems approach. Socioeconomic basis, aerospace and propulsion technology, meteorology, air traffic control, airport-community interface, and technological trends and developments pertinent to present status and future development of air transportation. For non-aerospace and non-mechanical engineering majors only. Prereq: 4120.

5820 Air Vehicles (3) Current capabilities and future requirements for air transport vehicles. Parameters significant for air vehicle type selection. Integration of aerospace into aviation system. For non-aerospace and non-mechanical engineering majors only. Prereq: 5810.

5900 Selected Engineering Problems (3-9) Selected problems in aerospace engineering to fulfill requirements of Problems Program. Enrolment limited to students in Problems Program. Prereq: Consent of advisor. May be repeated. S/NC only.

5950 Seminars (1) All phases of aerospace engineering including lectures on current research. The University of Tennessee, Knoxville. May be repeated. S/NC only.

5990 Special Topics in Aerospace Engineering Credit to be arranged; 3 hrs maximum each quarter.

6000 Doctoral Research and Dissertation (3-15) E 85


6320 Magnetohydrodynamics II (3) Continuum magnetohydrodynamic equations. Alfven and shock waves, exact solutions for magnetohydrodynamic channel flows, one-dimensional model of channel flow, magnetohydrodynamic boundary layer. Prereq: 6310, Mathematics 5620.

6330 Magnetohydrodynamics III (3) Engineering applications of magnetohydrodynamics, propulsion and power generation. Prereq: 6320, Mathematics 5630.

6410 Physical Gasdynamics (3) High-speed, high temperature flow of gas from molecular point of view; molecular concepts and simple kinetic theory; equilibrium properties of gases and gas mixtures from steady-state kinetic theory chemical thermo-dynamics, and statistical mechanics. Prereq: 5220 and Mechanical Engineering 5220.

6420 Physical Gasdynamics (3) Continuation of 6410; flows of gas mixtures in local thermodynamic and chemical equilibrium; physical and chemical basis of rate equations; flow with vibrational and chemical nonequilibrium. Prereq: 6410.

6510-20-30 Advanced Aerodynamics (3, 3, 3) Subsonic, transonic, supersonic, and hypersonic flows treated with particular emphasis on the unified manner with combined viscous/inviscid effects. Relationships among various regimes of fluid flows. Fundamental assumptions, limitations of approximations and consequences. Foundations of gas dynamics with emphasis on applications to aircraft, rocket, ground testing, jet propulsion. Discussion of special topics according to students' interest. Prereq: 5110, 5220, and 5240 or equivalent.

6810 Advanced Boundary Layer Theory (3) Derivation and critical review of governing equations. Approximate methods; boundary layer transformations. Approximate integral methods to include compressibility and heat transfer. Attached and separated flows; shock-wave-boundary layer interaction. Prereq: 5220, Mechanical Engineering 5120, and Physics 5630.

6910 Advanced Topics in Gasdynamics (3) Selection of topics based on particular interests of students, nonequilibrium gasdynamics, radiation gasdynamics, nonequilibrium gasdynamics, advanced kinetic theory, perturbation techniques. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs.

Nuclear Engineering

MAJOR DEGREES

Professors: P. F. Pasqua (Head), Ph.D. Northwestern, P.E.; H. L. Dodds, Ph.D. Tennessee, P.E.; J. B. Furseil, Ph.D. Georgia Institute of Technology; T. W. Kerlin, Ph.D. Tennessee; J. E. Matt, Ph.D. Minnesota; R. Perez, Ph.D. Madrid (Spain); J. C. Robinson, Ph.D. Pennsylvania; H. C. Roland, Ph.D. Tennessee; P. N. Stevens, Ph.D. Northwestern, P.E.

Associate Professor: L. Miller, Ph.D. Texas A & M, P.E.

Assistants: E. M. Katz, Ph.D. Tennessee; B. Upadhyaya, Ph.D. University of California.

The Department of Nuclear Engineering offers degrees at the Master of Science, Master of Engineering, and Doctor of Philosophy with concentrations in nuclear dynamics, nuclear reliability and risk, radiation transport, thermal hydraulics, and core analysis.

MASTERS OF SCIENCE PROGRAM

A graduate program leading to a degree of Master of Science is available to graduates of recognized undergraduate curricula in engineering and physics. Each applicant will be advised as to the necessary prerequisite courses before he/she enters the program. The student must complete a program of study which has been approved by the student's advisory committee and which includes the following:

1. A major consisting of a minimum of 18 quarter hours of graduate courses in nuclear engineering.
2. A minor of 9 quarter hours in mathematics, statistics or computer science.
4. Final examination covering the thesis and graduate course work.

An alternate program is available for the Master of Science degree which involves engineering practice rather than a thesis. The student must complete a program of study which includes the following:

1. Thirty-six quarter hours of course work similar to the requirements for the regular Master of Science program (see above).
2. Twenty-four quarter hours of Nuclear Engineering 5980. A student usually registers for 6 hours of Nuclear Engineering 5980 each quarter and investigates problems assigned by a member of the faculty. At the end of each quarter the student submits a written report and makes an oral presentation of the work.
3. Final examination covering graduate course work and practice school problems.

MASTER OF ENGINEERING PROGRAM

A graduate program in Nuclear Engineering leading to the degree of Master of Engineering is available to those graduates with an accredited engineering degree or one which satisfies A.B.E.T. basic level criteria.

In addition to Graduate School requirements the following degree requirements must be met:

1. Thirty-six quarter hours of course work, 18 of which must be in graduate nuclear engineering.
2. A minimum of 9 hours of design project, thesis, or 24 hours of Nuclear Engineering Practice (5980). Documentary proof of significant engineering experience may be submitted in lieu of the design project, thesis or Nuclear Engineering Practice, but in this case 45 hours of course work are required.
3. Nine hours of course work submitted must be from Nuclear Engineering.
4. A minimum of one-third of the program must be in design engineering, and one-third in one of, or a combination of, advanced math, computer science, basic sciences, or engineering.
5. A candidate must pass a final oral examination on all work presented for the degree.

THE DOCTORAL PROGRAM

Students in the field of nuclear engineering desiring to study for the degree of Doctor of Philosophy must have a Bachelor of Science or Master of Science degree from a recognized university, with a major in engineering or physics, and present at least a B average. All candidates will be required to demonstrate general competence in a comprehensive examination in the field of engineering science, mathematics, and physics. At the same time, all candidates will be required to demonstrate special competence in nuclear design.

Specific course requirements for the Ph.D. degree in Nuclear Engineering include:

1. A minimum of 72 quarter hours credit beyond the Bachelor's degree, exclusive of credit for the M.S. thesis or Nuclear Engineering Practice.
2. A minimum of 36 quarter hours of credit in doctoral research.
3. A minimum of 45 quarter hours in nuclear engineering courses numbered 5000 and above, or the equivalent, plus at least 12 quarter hours of 6000-level courses. These are exclusive of thesis or dissertation credit.
4. A minimum of 18 quarter hours in mathematics, computer science, or statistics in courses beyond nuclear engineering undergraduate requirements. Must be numbered 4000 or above.
5. A minimum of 9 quarter hours in courses numbered 5000 or above from a department other than nuclear engineering. The choice depends on the student's overall program and should expand his/her knowledge in a given field.
6. A reading knowledge of one foreign language will be determined by the student's doctoral committee.

4110-20-30 Introduction to Nuclear Reactor Theory (3, 3, 3) Nuclear structure, radioactive decay laws, neutron interaction; fission process, chain-reaction systems; diffusion equation, including multigroup diffusion theory, neutron moderation, reactivity coefficients; perturbation theory. Prereq: Physics 3730 or consent of instructor. F, W, Sp

4140 Thermodynamic Systems (3) Fusion reactions; properties of plasmas; plasma containment; advanced plasma diagnostic techniques. Prereq: Physics 3730. Mathematics 4550. F
4210-20-30 Nuclear Engineering Laboratory (3, 3, 3) Radiation detection and counting instrumentation; counting statistics, half-life and decay schemes; gamma spectrometry, cross-section measurements, analog computation, diffusion properties of neutrons, critical systems, control rod dynamics, control rod calibration, statistical weight, shielding, xenon poisoning, prompt critical reactor behavior, fission density and decay flux. Prereq or coreq: 4110 or equivalent. F, W, Sp


4710 Energy Transport (4) Development of differential and integral energy conservation equations; conduction, convection, and radiation heat transfer; applications to nuclear reactor fuel elements and heat exchangers. Prereq: 3730. F

4720 Reactor Thermal Design (4) Hydrodynamics and heat transfer in boiling systems; boiling crises; fuel element thermal design, steam generator design. Prereq. 4710. W

4730 Nuclear Reactor Design (3) First order reactor design, integration with non-nuclear heat transfer and power conversion system, economic evaluation; optimization procedures, description of typical systems. Coreq: 4130. Sp

4810 Radiation Shielding (3) Types of radiation sources, gamma ray and neutron attenuation, biological effects of radiation shielding. Prereq: Physics 3730, Mathematics 4550. Sp

4820 Reactor Kinetics and Controls (3) Derivation of kinetic equations; basic kinetic parameters; transient response of reactor feedback; control and protective systems. Prereq: 4110. W

4840 Nuclear Reactor Safety (3) Presentation of reactor safety concepts and criteria; credible accidents; fission product release and transport; containment systems; accident analysis; engineered safeguards. Prereq: 4120. Sp

4930 Nuclear Fuel Management (3) Discussion of problems associated with processing of nuclear materials; fuel cycle analysis; burnup calculation. Prereq: 4120. W

5000 Thesis (1-15) E

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

5110-20-30 Transport Processes In Nuclear Engineering (3, 3, 3) Momentum and heat transport; development of conservation equations; elementary theory of turbulence; heat transfer and flow through conduits; conduction; radiation; reactor core thermal analysis. Prereq: 4720 or equivalent. Mathematics 4710, 4550. F; W, Sp

5210 System Dynamics (3) Transient analysis, Laplace transforms, frequent response, stability (linear and non-linear), and sensitivity analysis by state variable methods. Dynamic analysis of distributed systems. Prereq: Consent of instructor. F

5220 Reactor System Dynamics (3) Application of methods of general system dynamics to reactor systems; state equations, non-neutronic processes. Dynamics, stability, and control of zero power reactors and power reactor systems. Prereq: 5210, 4130 or equivalent. W


5240 Reactor Instrumentation (3) Instrument components and systems for operation, control, and safety of nuclear reactors; role of instrumentation in public health and safety; engineered safeguards for nuclear power plants. Prereq: 4820, or consent of instructor. A

5310-20-30 Nuclear Systems Reliability (3, 3, 3) Systems reliability analysis as applied to nuclear systems. Qualitative and quantitative methods. Coreq: Statistics 3450. F; W, Sp

5410 Nuclear Fuel Cycle Analysis (3) Alternative fuel cycles, symbiotic reactor systems and appropriate reactor systems: resource utilization, potential growth rates and system design considerations. Impact of selecting alternative systems from technical and economical viewpoints. Prereq: 4130 or equivalent.

5420 Reprocessing and Waste Disposal (3) Basic processes related to solvent extraction of nuclear fuel isotopes. Reprocessing of light water reactor and advanced reactor fuels. Disposition of radionuclides: reprocessing, site selection and environmental effects. Prereq: 4130 or equivalent.

5510-20-30 Nuclear Systems (3, 3, 3) Various reactor types, flow diagrams, thermodynamic analysis, control methods, component descriptions of power systems using various reactor types and nuclear power economics. Prereq: 4610-20-30 or equivalent or consent of instructor.

5710-20-30 Nuclear Design (3, 3, 3) Analytical techniques for neutronistic aspects of nuclear reactor core design. Multigroup discrete ordinate theory, multi-group PN theory, integral transport theory, perturbation theory, and others. Generation of required multigroup constants formulated with available point data and Nordheim treatment in slowing down region and gas kernel in thermal region. Prereq: 4130 or equivalent. F; W, Sp

5740 Reactor Shielding (3) Application of analytic solutions of Boltzman transport equation to shield design problems. Spherical harmonics, moments methods, numerical solutions, adjoint calculations, and invariant imbedding cases studied. Prereq: 4810. F


5840-50 Fast Breeder Reactors (3, 3) Special characteristics of fast breeder reactors; emphasis on LMFBR. Need for breeders; neutron physics and thermal characteristics of reactor core; development status of engineering components; fuel cycle cost analysis; safety: coolants other than sodium; world status of development.

5970 Special Topics in Nuclear Engineering (3) Lectures and recitation on recent advances in nuclear engineering. Prereq: Consent of instructor. May be repeated with consent of department.

5980 Nuclear Engineering Practice (3-12) Experiences in solving and reporting on engineering problems. Prereq: Approval of Nuclear Engineering Department. May be repeated. Only Alternate Plan students may take this course. S/NC only. E

6000 Doctoral Research and Dissertation (3-15) E

6110-20-30 Selected Topics in Reactor Theory (3, 3, 3) Transport theory, control rod theory, and perturbation theory. Selected topics from literature. Prereq: Consent of instructor. F, W, Sp

6140 Radiation Shielding (3) Advanced topics in radiation shielding. Monte Carlo techniques and space radiation problems. Natural space radiators, energy-source radiators, dose conversion, probability. Selected neutron, gamma, and space-radiation shielding problems. Prereq: Consent of instructor. Sp

6150 Reactor Dynamics (3) Special topics in reactor dynamics and control. Prereq: Mathematics 5630. Su

6410 Selected Topics in Nuclear Systems Reliability Engineering (3) Advanced state-of-the-art topics in nuclear systems reliability engineering and risk assessment. Prereq: 5330 or consent of instructor.

6510 Nuclear Reactor Noise Analysis (3) Modern system theoretical methods for evaluating reactor performance descriptors from operating data. Prereq: 4610 and Electrical Engineering 5740 or equivalent.

6710 Two-Phase Flow and Heat Transfer (3) Pool boiling and flow boiling; hydrodynamics of two-phase flow, boiling crises, two-phase instabilities. Prereq: 5130 or equivalent. Su
College of Home Economics

Nancy Belck, Dean
Jay Stauss, Associate Dean, Graduate Studies and Research
Fran Andrews, Assistant Dean, Undergraduate Studies
Helen Grove, Assistant to the Dean

Graduate studies in Home Economics prepares the student for teaching, research and public service in colleges and universities or managerial positions in government and industry.

General requirements for graduate study are prescribed by The Graduate School and the student's department. Each student's application is reviewed by faculty, and students lacking adequate preparation may be required to take additional courses as prerequisites to graduate study.

APPLICATION FOR ADMISSION AND FINANCIAL AID

Requirements for admission to The Graduate School are on page 10 of this catalog. A College of Home Economics application and three Graduate School Rating Forms are required. These may be obtained at the Dean's Office, Jessie Harris Building, or write/call:

Jay Stauss, Associate Dean
for Graduate Studies and Research
College of Home Economics
The University of Tennessee
Knoxville, Tennessee 37916
Phone: (615) 974-5221

Graduate Record Examination scores for the aptitude test including the quantitative, verbal, and analytical sections are required for the Master's program in Nutrition and are residents of Alabama are eligible for in-state tuition in the Academic Common Market. Those who plan to enter The Master's program in Nutrition and are residents of Alabama are eligible for in-state tuition in the Academic Common Market.

PROGRAMS LEADING TO THE DEGREE OF MASTER OF SCIENCE

Thesis Option:
Child and Family Studies
Public Policy
Interior Design and Housing
Food Science
Food Systems Administration
Nutrition
Textiles and Clothing
Major (minimum of 9 hours of 5000 courses) 18 hrs
Thesis ...........................................9 hrs
Minor area(s) of study (minimum of 12 hours of 5000 courses) 18 hrs
Total 45 hrs

A minimum of 30 hours at or above the 5000-level is required. A minimum of 9 hours at or above the 5000-level is required. Some majors may require 9 hours in one minor area.

CONSUMER STUDIES AND HOUSING: PUBLIC POLICY

The Master of Science in Consumer Studies and Housing: Public Policy is offered through the Departments of Child and Family Studies (CFS) and Textiles, Merchandising and Design (TMD). Students choose either consumer studies (CFS) or housing (TMD) as the base area. A minor area comprising 12 credit hours is required; these hours are to comprise a related sequence of courses which support the student's program and may be drawn from any unit within the University. A minimum of 9 hours must be taken outside the College, and a minimum of 27 credit hours within the College. A minimum of 30 hours at the 5000-6000 level is required. Students must also take a 3-hour course in research methods or statistics. The thesis option requires 24 credit hours in the base area, including 9 hours of Thesis. The non-thesis option requires 21 credit hours in the base area, including 6 hours of practicum.

DOCTORAL PROGRAM

The doctoral program in Home Economics provides three options of study: interdisciplinary, food science, and nutrition. The interdisciplinary option is available in all departments in the College. The doctoral program requires:

1. A minimum of 96 quarter hours in courses beyond the Bachelor's degree exclusive of credit hours for the Master's thesis to include a minimum of 12 quarter hours of 6000-level courses.
2. Selection of an option and fulfillment of the requirements as directed by the major professor and approved committee.
3. The faculty committee for each doctoral student shall determine whether a reading knowledge of a foreign language is required.
4. Written comprehensive examination.
5. Doctoral research and dissertation (minimum 36 hours; maximum 48 hours) may be included in the 96 hours presented for the degree.

Field with 18 hours at the 5000 and 6000-level. A minimum of 30 hours of 5000 and 6000 level courses is required in the program. Some majors may require 9 hours in one minor area.

APPLICANTS ARE ELIGIBLE TO PARTICIPATE IN THE Academic Common Market. Those who plan to enter a Master's program in Food Systems Administration in the College of Home Economics and are residents of Arkansas, Kentucky, or West Virginia are eligible to enroll on an in-state tuition basis as Common Market students. Those who plan to enter the Master's program in Nutrition and are residents of Alabama are eligible for in-state tuition in the Academic Common Market.
problems of Society. As suggested by the innovative solutions of the multi-level integration and application of knowledge to approach that focuses on the development, provides an opportunity for advanced Philosophy degree in Home Economics interdisciplinary option of the Doctor of Interdisciplinary option: The in other colleges in the University) including consumption patterns and other behavior microeconomics and political development on human resources and decision-making processes in the use of Design; or Nutrition and Food Sciences): economic change development needs of individuals and cultural settings: interaction processes within families: community services and planning to meet development needs of individuals and families.

Physiological Development and Well-being (base department of Nutrition and Food Sciences): physiological response to nutrient intake: improvement of nutritional status through informed of the nutrition options. A Master's degree major in Consumer Studies and Housing: Public Policy is particularly suitable for students interested in home economics extension, although Master's programs may be planned in any subject matter area of home economics with agricultural extension education as a collateral area. Additionally, month-week courses are offered in February each year for students particularly interested in home economics extension.

GRADUATE PROGRAMS FOR HOME ECONOMICS EXTENSION Graduate programs at both the doctoral and Master's levels are available for students interested in home economics extension. At the doctoral degree level, programs of study may be planned in the interdisciplinary or in the food science and human development concentration. A Master's degree major in Consumer Studies and Housing: Public Policy is particularly suitable for students interested in home economics extension, although Master's programs may be planned in any subject matter area of home economics with agricultural extension education as a collateral area. Additionally, four-week courses are offered in February each year for students particularly interested in home economics extension.

Departments of Instruction

Child and Family Studies

MAJORS

DEGREES

Child and Family Studies M.S.

Consumer Studies and Housing: Public Policy M.S.

Home Economics Ph.D.

Professors P. L. Higbee, Ph.D. Iowa; N. Belick (Dean), Ph.D. Michigan State.

Associate Professors: J. L. Cunningham, Ph.D. Michigan State; D. B. Eastwood, Ph.D. Tufts; V. M. Nordin, Ph.D. Tennessee; J. Stauss (Associate Dean), Ph.D. Washington State; R. M. Swagler, Ph.D. Ohio State; S. Twardoczky, Ph.D. Kansas; F. White (Head), Ed.D. Tennessee.


4220 Conserving Time and Energy in the Home (3) Application of management principles to home-making activities; evaluation of equipment, work centers and work procedures in terms of time and energy demands. Adaptations for the handicapped.

4250 Adult Development and Aging (3) Adult life in our society. Adjustment to internal and environmental changes through middle and aged years. Prereq: 2110 or Home Economics 1510 or equivalent background in adult development or consent of instructor.

4350 Advanced Child Development (3) Survey of selected theories relevant to child development with emphasis on research literature and research methodology. Prereq: 4 hrs. psychology, and 6 hrs. child development or equivalent.

4420 Learning Experiences with Parents (3) Dynamics of parent-teacher interaction. Emphasis on a variety of techniques for developing communication and working relationships between parents and teachers through experiences in a variety of settings. Prereq: 3210 or Home Economics 1510. W.

4430 Family Relationships (3) Interpersonal relationships among family members and societal roles. Prereq: 3910 or 3915. Sp.

4510 Child in the Community (3) Needs of children; community agencies meeting these needs; visits to agencies contributing to the welfare of children. Prereq: 2110 or Home Economics 1510 or equivalent.

4620 Administration of Programs for Young Children (3) Planning for staffing, housing, feeding, scheduling, and financing child care facilities for young children: nursery school programs, and specialized programs for deprived preschool children. Prereq: 3550 or 4110.

4710 Contemporary Developments (1-3) Student or staff-initiated course for study of special topic(s) pertinent to the field; topics selected to be determined by students and instructor with departmental approval. Elective credit only. Prereq: Consent of instructor. May be repeated with departmental approval. Maximum 9 hrs.

4810 Afro-American Families (3) Historical background, contemporary family structure and relationships; emerging needs and programs. Prereq: 4 hrs. in social sciences.

4830 Consumers and the Market (3) Analysis of elements in marketplace which create problems for consumers. Special attention is given to consumer decision making, need for information and constraints and opportunities, associated with consumer protection of consumers. Prereq: Economics 2110. W. Sp.

5000 Thesis (1-15) E.

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

5060 Practicum (1-12) Field experience in selected agencies and organizations that focus on solutions to problems in consumer studies. Prereq: Consent of instructor. S/NC only.

5110 Field Work in Family Life (3) School and community programs related to education for family living. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs. S/NC only. E.

5140 Consumption and Standards of Living (3) Economic and welfare aspects of consumption. Analysis of factors associated with changes in the standard of living. Review of major consumption studies. Prereq: 4830 or 5170 or consent of instructor.

5160 Assessment of Family Behavior (3) Methods of measurement related to study of family. Current methodological issues. Prereq: 5410 or 5530 or consent of instructor.

Current trends and methods of research. Prereq: 4330 or consent of instructor.

5170 Consumer Economics (3) Consumer functions in economy; structure of consumer markets; government action relating to consumers; factors affecting prices of consumer goods.

5174 Public Consumption (3) Relationships between consumers and public sector. Market system failures from consumer perspective. Government reversionary expenditures in terms of their impacts on consumers. Effects of consumer oriented public agencies. Prereq: 5170 or consent of instructor.

5180 Family Financial Consultation (3) Analysis of family expenditure patterns, common financial difficulties, avenues by which families are assisted. Field experience with consumer consulting services. Prereq: 4210, 4830 or 5170. Sp.

5190 Standards in Consumer Protection (3) Product and performance standards in consumer protection. Theoretical and operational questions relating to standards: analysis of costs and benefits to consumers. Prereq: 4830, 5170 or consent of instructor.

5210 Theories of Child Development (3) Prereq: 4350 or equivalent. W.

5220 Family Life Programs (3) School and community programs in family life; survey and evaluation of programs. Students concentrate on type best suited to their experience and future professional orientation. Prereq: 3 hrs child development, 3 hrs family relations, 3 hrs sociology. 2 hrs and 1 lab.

5310 Theory and Research on Human Sexuality (3) Cultural, social, and psychological determinants of human sexuality. Major contributions from anthropological, sociological, and personality theory and research.

5410 Advanced Family Relationships (3) Problems in modern family life; individual adjustments, group relationships. Prereq: 3515, 4430, or consent of instructor.

5420 Parents and Children (3) Common problems of young children faced by parents and teachers; emphasis on methods available to modify problem behavior.

5430 Families in Crisis (3) Interpersonal transactions in disordered family behavior. Prereq: 5140 or equivalent. W.

5510 Survey of Research in Child and Family Studies (3) Research literature; locating, abstracting, reporting research studies. Prereq: 3515 or 4430 or consent of instructor.

5630 Research Methods in Child and Family Studies (4) Research procedures in child and family behavior; basic methodology of behavioral sciences. Requirements for student to be beginning thesis work in this area. Prereq: 9 hrs child and family studies. 3 lectures and 1 discussion.

5650 Learning in Preschool Programs (3) Description, analysis and evaluation of various preschool models and programs. Prereq: 6 hrs in child and family studies or preschool education. Sp.

5550 Supervision in Preschool Programs (3) Guidance of students working in nursery school and day care centers. Guiding students through seminar discussion, individual conferences, and various evaluation techniques. Prereq: 5540. 3 hrs and 1-2 hr. lab.

5610 Theories of Management in the Family Environment (3) Fundamental management concepts, development and application to current family situations.

5620 Nursery School Administration (3) Organization and operating schools and play groups for preschool children. Housing, staff, schedules, programs, financing. Prereq: 4110 or equivalent.

5630 Seminar in Infant Development (3) Theory and research relating to development during infancy. Prereq: 3260.

5640 Teaching Child and Family Studies (5) Seminar and practicum in techniques for teaching child development and family relationships. Prereq: Consent of instructor. S/NC only.


5720 Consumer Protection (3) Regulatory agencies, standards, information disclosure and other consumer oriented public agencies. Assumptions involved in these efforts and relative success of different strategies. Prereq: 5170, 5190, or consent of instructor.

5800 Problems in Child, Family and Consumer Studies (1-3) Advanced study of child development and family variables in family planning programs. In-depth analysis of advanced programs and clinic. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs.

5850 Children's Effects on Parents and Marriage (3) Theory and research about how children change parents and influence marital relationships. Prereq: 4430 or consent of instructor.

5900 Seminar in Child and Family Studies (1-3) Prereq: Consent of instructor. May be repeated. Maximum 9 hrs.

5910 Research Seminar (1-2) Required 1 hr for M.S. students, 2 hrs for Ph.D. students. S/NC only. F.


6250 Advanced Topics (3) Individual study and group discussion of current problems. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs.

6310 Individual and Family Development—Physiological Determinants (3) Family members' physiological potential, development, and status. Family's contribution to members' physiological potential for growth and development and to realization of human potential. Prereq: 6 hrs advanced child and family studies, 4 hrs nutrition, 4 hrs physiology, or equivalent. Sp.

6320 Individual and Family Development: Cognition (3) Processes through which human individuals learn to recognize their world. Cognitive processes involved in development across life span, focus on research findings and methodology. Prereq: 5210, 5530, 5630, or equivalent. W.

6330 Individual and Family Development: Socialization (3) Processes of socialization throughout life cycle. Family as primary socializing agent. Prereq: 5210, or consent of instructor. F, P, W.

6410 Theory Construction in Family Studies (3) Process and application of theory construction in contemporary research areas and family studies. Emphasis on understanding, criticizing and constructing theoretical models based on research findings. Prereq: 5410 or consent of instructor.

6450 Conceptual Frameworks for the Family (3) Theoretical perspectives for understanding families. Exploration and applications of frameworks on theoretical and research levels. Historical to contemporary development of family studies. Prereq: 5410 or consent of instructor. Sp.

6540 Seminar in Programs for Infants and Preschool Children (3) Research related to programs for infants and young children. Various program models for education of infants and young children. Methods of working with parents, and student training programs. Prereq: 5210, 5540 or equivalent.

6610 Applied Behavior Analysis in Natural Settings (3, 3) Individual supervision in application of applied behavior analysis in natural settings. Prereq: 5420 or consent of instructor.

6710 Elements of Consumer Choice (3) Analysis of consumer decision making, theory of consumer choice, psychological forces, and social factors, and consideration of dynamic aspects of consumer behavior, including roles of aspirations, expectations, uncertainty and information. Prereq: 5170 or consent of instructor.

6730 Urban Consumers (3) Focus on how consumers function in an urban economy. Urban growth and land use from consumer perspective. Relationship between consumers and local government. Prereq: 5170 or consent of instructor.

Home Economics

MAJOR

DEGREE

Home Economics

Ph.D.

6060 Practicum (1-12) Field experience in selected organizations that focus on interdisciplinary solutions to multilevel problems of society. Prereq: Consent of instructor. May be repeated. Maximum 12 hrs.

6100 International Studies (1-10) Student- or staff-initiated course for study in foreign country of topic(s) pertinent to field. Topic to be determined by student and instructor with department and college approval. May be repeated. Maximum 15 hrs.

6210 History and Philosophy of Home Economics (3) Historical development of home economics; survey of concepts and philosophy of component disciplines and analytic strategies; emphasis on projection of future developments.

6220 Development of Community Services Programs (3)

6230 Evaluation of Community Services Programs (3) Purposes of evaluation, clarification of objectives and procedures for determining progress.


6800 Problems in Community Services (1-3) Prereq: Consent of professor in charge of investigation. His or her credit to be arranged. May be repeated. Maximum 9 hrs.

5800 Seminar in Human Resource Development (1-3) May be repeated. S/NC only.

6000 Doctoral Research and Dissertation (3-15) E


6210 Professional Issues in Human Resource Development (3) Role and philosophy, and administrative procedures for human resource development. Prereq: 12 hrs of 5000-level courses representing 2 areas of home economics.

6310 Advanced Topics (3) Comprehensive individual study and group discussion of individual and family behavior, physiological development and well-being, environmental factors, and economic and social well-being. Prereq: 6110. May be repeated.

6500 Methodological Issues in Home Economics (3) Advanced methodology in home economics, interdisciplinary research methods and issues. Prereq: 1 graduate-level course in research methodology or consent of instructor.

6900 Seminar (1-3) May be repeated. S/NC only.

Home Economics Education

The graduate program in Home Economics Education is administered by the College of Education with home economics education being one of the five service areas within the
Nutrition and Food Sciences

MAJORS

Food Science
Nutrition
Food Systems Administration
Home Economics

DEGREES

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

Professors:
B. L. Beach, Ph.D. Wisconsin; R. E. Beauchene Ph.D., Kansas State; R. B. Carruth (Head), Ph.D.
Wisconsin; M. J. Hitchcock, Ph.D. Wisconsin; L. N. Odom, Ph.D. Wisconsin; J. R. Savage, Ph.D. Wisconsin; J. T. Smith, Ph.D. Missouri; A. A. Smith (Memphis), Ph.D. Tennessee.

Associate Professors:

Assistant Professors:
F. C. Andrew; Associate Dean), Ph.D. Ohio State; J. B. Blitte (Memphis), Ph.D. Tennessee; M. D. Brooks (Memphis), M.S. Alabama; G. W. Dainwater, M.S. Texas; R. R. Evans, M.A. Kentucky; J. D. Skinner, Ph.D. Oregon State.

Food Science

4000 Origin of Food and Foodways (3) Food origin and development of individual and group foodways. Prereq: 8 hrs social science or humanities, F, W

4010 Introductory Experimental Food Science (3) Physical and sensory evaluation in experimentation with fats, high protein foods, and batter and dough systems. Prereq: 3510. 2 hrs and 1 lab. W, Sp

4020 Experimental Food Science (3) Individual experimental and its relation to the research literature. Prereq: 4010, Nutrition 3320 recommended. 1 hr and 2 labs. Sp

4040 Food in Contemporary Society (2) Consumer's options, responsibility and potential influence with respect to food supply. F, Su

4100 Food Preservation (3) Application of basic principles and methodology in food preservation in home. Prereq: 1010. 4 hrs microbiology and Nutrition 3310 or equivalent. 2 hrs and 1 lab.

5000 Thesis (1-15) E

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

5140 Foods and Nutrition: Physicochemical Principles (3) Thermodynamics; physicochemical properties of proteins, carbohydrates and lipids; chemical kinetics; specialized kinetics of enzymatic processes. Prereq: Nutrition 3330 and Mathematics 1540 or equivalent. Sp, Su

5150 Food Texture (3) Classification of foods according to textural parameters; instrumentation in evaluation of texture. Prereq: 4010 or Food Technology 4920; Plant and Soil Science 3610 or equivalent; or consent of instructor. W

5550 Food Behavior of the Individual (3) Development of and changes in choices of food and food habits of individuals. Prereq: 3000, 3 hrs of nutrition, or consent of instructor. Sp, or Su

5560 Foodways in the United States (3) Current foodways of selected subcultures in United States and historical basis for their development. Prereq: 4000, 3 hrs of nutrition, or consent of instructor. W, Sp

5610-20 Advanced Food Science (3, 3) Biochemical and biological interactions in food. Prereq: 4010; Nutrition 3320 or equivalent, or consent of instructor. W, Sp

5630 Carbohydrates and Fats in Relation to Food Science (3) Physical and chemical characteristics of sugars, starches, and fats with emphasis on their behavior in food. Prereq: 4010, Nutrition 3320-30 or equivalent.

5640 Proteins in Relation to Food Science (3) Physical and chemical characteristics of the proteins of milk, eggs, flour, and meat with emphasis on their behavior in food. Prereq: 4010; Nutrition 3320-30 or equivalent.

5700 Current Programs and Trends in Food Science (1-3) Recent advances in food science; impact on curricular considerations, and implications for teachers, extension workers, and dietitians. Prereq: Consent of instructor. May be repeated.

5800 Problems in Food Science (1-3) Advanced study from the literature. Prereq: Consent of instructor. May be repeated.

5850 Field Experience (3-9) Field experience in food-related industry or agency under supervision of faculty member. Prereq: Consent of instructor.

5900 Seminar (1-3) Prereq: Consent of instructor. May be repeated. Maximum 3 hrs. S/NC only.

6000 Doctoral Research and Dissertation (3-15) E

6110 Advanced Topics in Food Science (3) Comprehensive individual study and group discussion of topics related to current problems in food science. Prereq: Consent of instructor. May be repeated.

6310 Food Preservation (3) Physical characteristics of solutions. colloidal dispersions, and suspensions in relation to treatments applied. Prereq: 5530.

6310-20 Structure of Food Plants and Animal Tissues (3, 3) Historical structure of food plants and animal tissues related to physical characteristics, impact and chemical properties of components. Prereq: 5630-40.

6510-20 Food and Sociocultural Change (3, 3) Crite- rion group evaluation and integration of factors affecting food intake and consumption patterns. Must be taken in sequence. Prereq: 5560 or 5540; or consent of instructor. F, W

6900 Seminar (1-3) May be repeated. S/NC only. E

Nutrition

3310 Organic Chemistry (4) Emphasis on subjects leading to 3320-30, Textiles and Clothing 4220. Prereq: General Chemistry. 3 hrs and 1 lab. Not for graduate credit to departmental majors. F, Sp

3320 Food Analysis (4) Elementary quantitative analysis; typical food analyses. Prereq: 3310 or equivalent. 3 hrs and 1 lab. Not for graduate credit to departmental majors. W, Su

3330 Physiological Chemistry (3) Metabolism of carbohydrates, lipids, and proteins. Role of vitamins and minerals in metabolism. Not for graduate credit to departmental majors. Sp, Su

3390 Physiological Chemistry Laboratory (1) Prereq: 3320; Cons: 3330. Lab. Not for graduate credit to departmental majors. Sp, Su

4010 Reproductive and Developmental Nutrition (3) Nutritional requirements for expectant mothers, infants, and preschool children. Prereq: 3020, 3050, or 3410. 2 hrs and 1 lab. F

4020 Nutrition for Children, Adolescents and Adults (3) Application of basic principles and research findings to nutrition problems in children, adolescents and adults. Prereq: 3020, 3050, or 3410. 2 hrs and 1 lab.

4030 Community Nutrition (3) Nutrition problems and services in the community; student experiences are integral part of the course. Prereq: 3020, 3050, or 3410. Sp

4110 Introduction to Nutrition Research (3) Discussion of principles and laboratory experiences. Prereq: 3410 or equivalent. 2 hrs and 1 lab. Sp

4230 Nutrition in Disease (4) Nutrition problems in diseases influenced by diet. Prereq: 3410. W, Su

4231 Clinical Experiences In Dietetics (1) Planned clinical experiences applying principles of nutrition in disease. Coreq: 4230. Su

4240 Nutrition in Disease II (3) Interdisciplinary lectures of proteins, carbohydrates and lipids; chemistry of normal and diseased organs and/or tissues and the dietary or behavior modifications required. Prereq: 4230. Designed for senior students in the coordinated undergraduate program in dietetics.

4430 Diet and Drug Therapy (3) Effect of drug therapy on absorption and utilization of nutrients, and effect of diet on absorption, utilization and toxicity of drugs. Prereq: 3410 or consent of instructor. W

5000 Thesis (1-15) E

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

5110 Advanced Physiological Chemistry (4) Bioenergetics and related metabolism of nutrients. Prereq: 3330. Sp

5120 Advanced Physiological Chemistry (3) Nutritional factors in relation to body fluids, gas transport, and endocrine function. Prereq: 3330. W

5140 Foods and Nutrition: Physicochemical Principles (3) Thermodynamics; physicochemical properties of proteins, carbohydrates and lipids; chemical kinetics; specialized kinetics of enzymatic processes. Prereq: Nutrition 3320 and Mathematics 1540 or equivalent. Sp, A


5230 Experimental Methods in Nutrition (3) Use of small animals in experimental nutrition. Prereq: 3320-30, 3410. 2 hrs and 1 lab. F

5240-50 Research Techniques (3, 3) Human metabolic balance experiments. Analytical methods for assay of food and biological materials. Prereq: 5250. 3 labs. A

5310 Community Nutrition (3) Nutrition problems and practices in community; supervised field work. Prereq: 3410 and consent of instructor. 3 labs. F

5320 Community Nutrition (3) Observations and participation in nutrition programs of local and state agencies. Prereq: 5310 and consent of instructor. 3 labs. W

5330 Community Nutrition (3) Nutrition programs of state and federal agencies; preparation of material for nutrition education; supervised field work. Prereq: Consent of instructor. 3 labs. Su

5340 Field Study in Community Nutrition (1-12) Personal participation in and analysis of state or regional community nutrition program. Location of in-depth study to be selected in consultation with instructor. Prereq: 5320 and consent of instructor. S/NC only. Sp

5350 Mental Retardation or Other Developmental Disorders of Childhood (3) Multidisciplinary core course required of all students. Prereq: Consent of director at Child Development Center, UT Center for the Health Sciences, Memphis. Prereq: Consent of department head. F, W, Sp
5410-20 Human Nutrition (3, 3) Functions of carbohydrates, proteins, fats, minerals and vitamins. Nutritional requirements of humans throughout life span and practical problems in meeting requirements. Prereq: 3410 and 5110. W, Su

5430 Physiological Bases for Diets in Disease (3) Developments in dietary treatment of disease in which nutrition plays a major role. Prereq: 5210 or equivalent. Su


5450 Survey Methods in Human Nutrition (3) Food collection, food practices and nutritional status of population groups. Prereq: 5210 or 5410-20. 2 hrs and 1 lab.

5460 World Food Supply and Human Nutrition (3) Food supplies and food practices as related to human nutrition throughout world. Regional, national and international agencies concerned with food and nutrition problems. Prereq: 5210 or 5410-20. Sp

5470 Nutrition and Aging (3) Nutritional problems of aging individuals; nutritional requirements, dietary intakes, and effect of nutrition on rate of biological aging. Prereq: 5210 or consent of instructor. W

5510 Nutrition in Mental Retardation and Developmental Disorders (1-12) Interdisciplinary diagnosis and treatment of developmentally handicapped child. Role of nutritionist; clinical experience and lectures at Child Development Center, Center for the Health Sciences, Memphis. Prereq: Consent of department head. E


5800 Problems in Nutrition (1-3) Advanced study selected from field of nutrition. Prereq: Consent of department head and professor in charge of investigation. May be repeated. Maximum 9 hrs.

5900 Seminar (1-3) Prereq: Consent of instructor. May be repeated. Maximum 3 hrs. S/NC only.

6000 Doctoral Research and Dissertation (3-15) E

6110 Proteins and Amino Acids (3) Lectures, reports, and discussions. Prereq: 5410-20. Sp, A

6120 Mineral Metabolism (3) Lectures, reports, and discussions on the mineral metabolism. Prereq: 5410-20. Sp, A

6130 Lipid Metabolism (3) Lectures, reports, and discussions. Prereq: 5410-20.

6140 Vitamin Metabolism (3) Lectures, reports, and discussions. Prereq: 5410-20.

6210 Advanced Topics in Nutrition (1-3) Recent advances, concepts, research techniques, and current problems. Prereq: 5410-20 or consent of instructor. May be repeated. Maximum 9 hrs. F

6500 Seminar (1-3) May be repeated. Maximum 9 hrs. S/NC only. E

Food Systems Administration

4130 Food Systems Administration (3) Functions of management applied to food service systems. Prereq: 3110. F

4140 Food Systems Personnel Development (3) Development of training programs for food systems personnel. Prereq: 4130 or consent of instructor. W

4150 Design and Layout of Food Service Systems (3) Design of physical facilities and selection and purchasing of equipment for food service systems. Prereq: 4130 or consent of instructor. Sp

4250 Food and Lodging Managerial Cost Control (3) Cost analysis for control. Use of financial statements for decision making for food and lodging systems. Prereq: 4130, Accounting 2130. W, Sp

4260 Food and Lodging Physical Plant, Planning and Maintenance (4) Feasibility, planning, development, and construction of new and existing facilities. Prereq: 4130, 5110, or equivalent. W, Sp

4270 Tourism, Food and Lodging Information Systems (3) Qualitative and quantitative analysis of information systems for decision making in food and lodging operations or other operations related to tourism industry. Prereq: 4130, 4250, Computer Science 1410. Sp

5000 Thesis (1-15) E

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

5110-20 Experimental Food Study (3, 3) Analysis of food production, holding environment, and service problems related to quality of food prepared in volume. Management resources. Prereq: 4130, 3110, or consent of instructor. F, Su

5210 Methods of Food Systems Research (3) Research methods applicable to food systems administration. Prereq: 4130, Statistics 5211 or equivalent. W, A

5220 Experimental Design of Food System Facilities (3) Environmental in which food is prepared, held, and served in volume. Prereq: 4150.

5230 Food Systems Evaluation (3) Management resources in food systems. Standards for control. Prereq: 4130, or consent of instructor. F


5310 Administration of Food Service Delivery Systems (3) Role and responsibilities of administrator in maintaining desired qualitative and quantitative standards in food service delivery system. Prereq: 3110 or consent of instructor. W, A

5500 Clinical Training in Health Care Agencies (3) Instructional and supervisory techniques in clinical settings by nurses and dietitians for training of entry-level health professionals. Prereq: Nursing 3760 or consent of instructor. Sp

5700 Current Programs and Trends in Food Systems Administration (1-3) Recent advances in food systems administration and implications for dietitians, school food service directors, and others in related fields. Prereq: Consent of instructor. May be repeated.

5800 Problems in Food Systems Administration (1-3) May be repeated.

5850 Field Experience (3-9) Planned administrative experience in food service system. Prereq: Consent of instructor.

5900 Seminar (1-3) Prereq: Consent of instructor. May be repeated. Maximum 3 hrs. S/NC only.

6000 Doctoral Research and Dissertation (3-15) E

6002 Practicum (1-12) Field experience in selected agencies and organizations that focus on solutions to problems in housing. Prereq: 4150. W, Su

6050 Practicum (1-12) Field experience in selected agencies and organizations that focus on solutions to problems in housing. Prereq: 4150. W, Su

6060 Seminar (1-12) Field experience in selected agencies and organizations that focus on solutions to problems in housing. Prereq: 4150. W, Su

6080 Seminar (1-12) Field experience in selected agencies and organizations that focus on solutions to problems in housing. Prereq: 4150. W, Su

6210 Manpower Planning and Training for the Food Service Industry (3) Identification of manpower needs by skill levels; programs for personnel in food service industry. Prereq: 4140, 5210 or consent of instructor. Sp

6310-20 Quantitative Methods to Control Real-Source Problems in Food Service Systems (3) Interrelationships of resources and evaluation of efficiency and effectiveness in food service systems. Prereq: 5210 or consent of instructor. Taken in sequence. Credit for 6310 contingent upon completion of 6320. F, A
planning and design of interior space; applications of research-oriented design in achieving design decisions. Prereq: Consent of instructor.

5410 Advanced Problems (3) Individual development of techniques and appreciation. Prereq: 9 hrs related art or equivalent.

5510 Environmental Factors in Interior Design (3) Human factors and associated research techniques related to design of interior architectural environments—derivation of design implications from analysis of human behavior, physical, and behavioral sciences. Prereq: 6 hrs behavioral science, and 6 hrs natural science or consent of instructor.

5520 Environmental Factors in Interior Design (3) Systematic design methodology as applied to design of microenvironments using human factors information—derivation of design implications from analytical research information in making design decisions. Prereq: Consent of instructor.

5530 Environmental Factors in Interior Design (3) Human factors and systematic design methodology applied to analysis, synthesis, and evaluation of research-oriented interior design projects. Comprehensive design research project by 2- or 3-member teams. Prereq: 6 hrs behavioral science, and 6 hrs natural science or consent of instructor.

5610 Furniture Design (3) Analysis of human factors and dynamic factors—static and task support, and storage furniture pieces and systems; production of construction drawings and scale models. Prereq: Consent of Instructor. Sp

5613 Housing Management (3) Role and functions of housing management--specialist in problems of private and assisted housing management. Prereq: 4320 or consent of instructor.

5614 Housing Regulations and Controls (3) Functional regulations and other control practices and mechanisms as determinants of nature, availability of housing in local communities by various user groups. Prereq: 4320 or consent of instructor.

5620 Experimental Methods in Household Equipment (3) Research methods and techniques in determination of properties of household equipment. Prereq: 2430 or consent of instructor. 1 hr and 2 labs.

5630 Environmental Requirements for Family Work Centers (3) Trend in planning work center areas--environmental factors in production and interference with individual productivity. Prereq: 5510-20-30 or equivalent and consent of department head and instructor in charge of investigation. May be repeated. Maximum 9 hrs.

5820 Interior Design (1-3) Advanced study in interior design. Hours and credit arranged. Prereq: 5510-20-30 or equivalent and consent of department head and instructor in charge of investigation. May be repeated. Maximum 9 hrs. E

5820 Advanced Topics in Housing Research (3) Various concepts, theories and methodologies of social sciences in housing research. Prereq: Consent of instructor.

6210 Environmental Design Analysis (3) Advanced methodology in psychology of environmental design, multidisciplinary research data and methods. Prereq: 5510-20-30.

6420 Perspectives in Interior Design (3) Historical influences related to contemporary concepts in interior design. Prereq: 5540, 6 hrs of graduate level art history, or consent of instructor.

Textiles and Clothing

4210 Elementary Textile Microscopy (3) Microscopic techniques as applied to the study of textile fibers and fabrics. Prereq: 4010. 1 hr and 2 labs. W, A

4280 Design Analysis: Functional Apparel (3) Systematic approach to apparel design integrating aesthetic, psychological, social and physiological aspects of apparel problems for special reference groups. Garment specifications translated for production. W

4410 Apparel Production Management (3) Management perspective of apparel production industry: production planning, process, and management of intran-resources. Plant tours and case studies on production problems. Field trips required, S

5000 Thesis (1-15) E

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

5110 Textiles Testing and Methods of Research in Textiles (3) Physical and chemical testing. Research methods. 3 labs. Sp

5120 Advanced Problems in Textiles and Clothing (3) Refreshes new developments in textiles. Selecting fabrics, agencies aiding consumer, and individual problems in textile field. 2 hrs and 1 lab. F

5130 Advanced Tailoring (3) Comparison of hand tailoring and trade methods used in making suits, coats, or costumes. 3 labs.

5150 Principles of Design Analysis (3) Application of flat pattern theory to garment design incorporating relationships of fabric geometry, texture, hand, and surface ornamentation to design. Prereq: Consent of instructor. 1 hr and 2 labs. W

5160 Review of Literature (3) Intensive survey and evaluation of recent literature: implications for further research. F

5170 Social, Psychological and Economic Aspects of Clothing (3) Clothing as it relates to human behavior. Prereq: 6 hrs or equivalent from each of following areas: sociology, psychology, economics. W

5180 Advanced Textile Economics (3) Economic problems or problem areas of current importance in textile and apparel industries—production, consumption, and governmental policy. Prereq: 3420, 6 hrs economics or consent of instructor. W

5210 Evaluation of Instructional Materials in the Field of Textiles and Clothing (3) Evaluating instructional materials in communicating information in various areas of textiles and clothing. 1 hr and 2 labs.

5220 Historic Textiles (3) Development of textile industry in world; fibers used, design, and color. F

5220 Practicum (1-9) Off-campus experience with businesses, industry, governmental agencies and civic groups; preplanned; supervised. Prereq: Consent of major advisor and department head. May be repeated. Maximum 9 hrs. S/N only.

5250-60-70 Problems in Textile Chemistry (4, 4, 4) Theoretical and experimental study of chemistry of textile fibers including polymerization, reactions, drawing, and finishing. 5250 must be taken first. 5260 and 5270 need not be taken in sequence. 5250—Emphasis on structure: property relationships and reactions of fibers. 5260—Emphasis on fabric finishes. 5270—Emphasis on dyes and dyeing. Prereq: 3420 or equivalent; 1 qr organic chemistry. 2 hrs and 2 labs.

5310 Fashion Analysis (3) Fashion as social and economic force, evolutionary theories of fashion operations. Prereq: 6 hrs each of sociology and economics.

5320 Problems in Historic Costume (3) Variable flow of styles in relation to cultural determinants. Prereq: 3480 or consent of instructor. May be repeated. Maximum 9 hrs. W

5610 Textile Processing (3) Methods and mechanics of processing continuous filament yarns, methods and mechanics of processing staple yarns, spinning system, composite yarns weaving, knitting, non-woven fabric formation. Prereq: Engineering Science and Mechanics 3311, Mathematics 2840. (Same as Polymer Engineering 5610.)


5700 Current Programs and Trends in Textiles and Clothing (1-3) Pertinent developments and trends in textiles and clothing and implications for new types of programs, techniques and/or curricula approaches. Content and emphasis vary according to changes in field and needs of groups served. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs.

5800 Problems in Textiles and Clothing (1-3) Advanced study selected from field of textiles and clothing. Prereq: Consent of department head and professor in charge of investigation. May be repeated. Maximum 9 hrs.

5900 Seminar in Textiles and Clothing (1-3) Prereq: Consent of instructor. May be repeated. Maximum 9 hrs. E

6012 Advanced Studies in Textiles and Clothing (3) Independent analysis of major philosophical theories, methods, and research. Prereq: 5160 or consent of instructor. May be repeated. Maximum 6 hrs.


5140 Selected Behavioral Theories in Clothing (3) Role of clothing in functioning of people, utilizing behavioral theories. Prereq: 5710, 6 hrs of graduate level sociology or psychology, or consent of instructor.

5150 Social-Psychological Theories of Clothing Consumption (3) Analysis and evaluation of social science theories of consumer behavior in relation to textiles and apparel. Prereq: 5160, 5170, 5250, or consent of instructor. May be repeated. Maximum 9 hrs.

5160 Textile Flammability (3) Factors affecting textile flammability as consumer issue. Standards, regulations, test methods, impact. Prereq: 5120, 5160, 5250, or consent of instructor.

5170 Physical Performance Behavior of Textile Structures I (3) Fundamentals of yarn and fabric structures; relationship of structure to physical characteristics of textile materials. Prereq: 5120, or consent of instructor.

5910 Seminar in Textiles and Clothing (1-3) May be repeated. Maximum 6 hrs.

5120, 5180, 5240, 5250, 5270, 5310, 5320, 5410, 5510, 5610, 5700, 5800, 5900, 6010, 6150, 6210, 6220, 6410, 6610, 6650, 6810, 6820, 6840, 6850, 6860, 6870, 6910
Aviation Systems

MAJOR
Aviation Systems

DEGREE
M.S.

Lead Professor:
M. A. Wright, Ph.D. Wales.

Professors:
W. Frost, Ph.D. Washington; W. F. Jacobs, Ph.D. Gottingen (Germany); A. A. Mason, Ph.D. Tennessee; J. M. Wu, Ph.D. California Institute of Technology; R. L. Young, Ph.D. Northwestern.

Associate Professors:
F. G. Collins, Ph.D. California (Berkeley); R. D. Kimberlin, M.S. Tennessee; J. R. Maus, Ph.D. California Institute of Technology; R. L. Young, Ph.D. Northwestern.

Assistant Professors:
W. B. Baker, Jr., Ph.D. Tennessee; V. K. Smith, III, Ph.D. Georgia Institute of Technology.

The University of Tennessee Space Institute offers a program leading to the Master of Science with a major in Aviation Systems. The Aviation Systems program is designed for those who possess a Bachelor's degree in engineering or science and who wish to study under a "systems philosophy" toward careers in research and development or administration in various phases pertinent to careers in research and development or administration in various phases pertinent to aviation. The program features 18 quarter hours major field credit in various aspects of aviation systems, 6 or more quarter hours credit in each of the areas of research, development and administration, and electives which permit further specialization to either area.

To qualify for admission to this program, the applicant must possess a Bachelor's degree in engineering or science from a recognized institution, show evidence of ability to pursue and benefit from the program, and fulfill The University of Tennessee Graduate School admission procedures and grade point standards. Subject matter prerequisite to the program includes basic knowledge of computer utilization as represented by Computer Science 3150 or equivalent, a background in statistics as represented by Statistics 3450 or equivalent, a basic understanding of aerodynamic fundamentals, aircraft propulsion and performance as represented by Aerospace Engineering 4110 and 4120 or equivalent, a background in accounting as represented by Accounting 5010 or equivalent accounting courses, a basic knowledge of economics as represented by introductory economics or equivalent.

Both thesis and non-thesis programs are available. The thesis program involves satisfactory completion of the following minimum requirements:

1. 18 hours in the major field of aviation systems.
2. For the research and development area, 6 quarter hours in Industrial Engineering 5700 and 5710; for the administration area, 6 quarter hours in Economics 5030 and Accounting 5810, for a total of 12 quarter hours.
3. 6 hours of electives selected from the major field, engineering and/or the areas in item 2.
4. 9 hours in Aviation Systems 5000, Thesis, hence demonstrating the ability to conduct and report on an independent investigation.

The non-thesis program will be permitted in special circumstances and involves satisfactory completion of the following minimum requirements:

1. 18 hours in the major field of aviation systems.
2. For the research and development area, 9 quarter hours in Industrial Engineering 5700, 5710, and 5720; for the administration area, 9 quarter hours in Economics 5030, Accounting 5810 and Finance 5010-20, for a total of 18 quarter hours.
3. 6 hours of electives in one of the areas in item 2.
4. 6 hours of electives in the major field, engineering and/or the areas in item 2.
5. Satisfactory completion of 3 quarter hours in Aviation Systems 5100, Project in Aviation Systems.
6. Satisfactory completion of a comprehensive final written examination on all course work submitted for the degree and defense of the project course paper.

The thesis program involves 45 quarter-hour credits minimum while the non-thesis program involves 51 quarter-hour credits minimum.

Courses suitable for credit in the major field include: Aerospace Engineering 5810 and 5820, Industrial Engineering 5840; Aviation Systems 5070, 5080, 5090, 5210, 5220, and 5370. Electives typical of those suitable for credit in the area of aviation systems, research and development include, Aerospace Engineering 5150-69-70; Computer Science 3510-20, 4550 and 5650; Industrial Engineering 4060, 4150, 4230, 5720, 5730, 6700, 6730; Mathematics 4225-35-45, 4510-20-30; Metallurgical Engineering 5810-20-30; and Statistics 3450.

Electives typical of those suitable for credit in the area of aviation systems, administration include: Accounting 5020; Business Law 5010; Economics 5020; Management 5130; Marketing 5010-20; Transportation 5050, 5130, 5210-20, and 5910.

5000 Thesis (1-15) E

5070 Airports and the Community (3) Structure of airports and their communities: Technology and economics of cargo, baggage, ticket and passenger handling. Airport management, economics and logistics. Interfaces with the community, collection and distribution, demand requirement analyses, types of developments and their projections. Prereq: Aerospace Engineering 5810.

5080 Collection and Distribution (3) Capabilities, technology, plans, programs and developments for collecting and distributing passengers and freight to and from various types of airports. Ground, water, air and mixed transportation networks, present and future; requirements analysis, and model analysis of the system. Prereq: Aerospace Engineering 5810.

5090 Governmental Policies for Aviation (3) Theoretical and legal basis for economic and governmental regulation of aviation. Historical and legislating development of aviation regulatory agencies, organizational structure and administrative and enforcement procedures. Prereq: Aerospace Engineering 5810.

5100 Project in Aviation Systems (3) In-depth study and formal report on aviation systems topic, normally performed during last quarter of work toward degree in non-thesis program. For aviation systems degree candidates only.

5210-20 Experimental Flight Mechanics (3, 3) Flight mechanics, experimental techniques. Special ly-equipped airborne laboratory allows active student participation in series of experiments demonstrating acquisition of flight test data. Tests con-
dutiful covering broad range of aircraft performance, stability, and control characteristics. Development of those necessary to support class experiments, test techniques, instrumentation and data reduction methods. 5210 emphasizes stability and control. 5220 emphasizes stability and control. Prereq: Aerospace Engineering 4120.

5970 Special Topics In Aviation Systems (3) Current problems in aviation systems. Prereq: Consent of instructor. May be repeated with consent. See also descriptions for Aerospace Engineering 5810, 5820, and Industrial Engineering 5840.

Comparative and Experimental Medicine

MAJOR DEGREES
Comparative and Experimental Medicine M.S., Ph.D.

Joint Graduate Coordinating Committee

H. Kitchen (Chairperson); C. C. Congdon; J. E. Fuhry; M. Holland; L. L. Mosher.

The Comparative and Experimental Medicine degree program (M.S. and Ph.D.) is a jointly administered graduate program intended to prepare students for teaching and/or research careers in the health sciences. This program emphasizes the comparative approach to the study of pathology, immunopathology, aberrant metabolism, oncology, and genetic disorders. The Ph.D. program is open to approved graduate students seeking training in this area and is especially useful for individuals with professional degrees. For the student with an undergraduate biological science background, the Comparative and Experimental Medicine program provides an unusual opportunity to study disease processes common in humans and animals from a multidisciplinary perspective. The scope of this intercollegiate program, which pools faculty resources from both veterinary and human medicine, is broadened by faculty members representing animal science and numerous areas of the life sciences. The interdisciplinary training environment includes such diverse support as facilities and personnel at the Veterinary Teaching Hospital; the Oak Ridge National Laboratory, Knoxville Zoological Park, Hemophilic Clinic, Birth Defect Clinic, Aberrant Metabolism Laboratory, and Hematology and Oncology services. For specific course listings please see College of Veterinary Medicine, page 31 and College of Medicine—Knoxville Unit, page 143 in this catalog.

ADMISSION REQUIREMENTS

General Requirements

Admission requirements of The Graduate School must be met. Additional requirements for The Graduate School of Veterinary Medicine are:

- Successful applicants will be scholastically qualified students with a baccalaureate degree in the life sciences and should have completed course work including chemistry through organic, mathematics through calculus, one year of physics, one year of basic biology, plus advanced studies in biology including courses such as biochemistry, anatomy, histology, cell biology, or others that are appropriate for individuals aspiring to research careers in the biomedical sciences. Students with professional degrees will have most of the above requirements so that entrance to graduate training usually will occur at the doctoral level.

- All applicants for M.S. programs, except those with a professional degree, will be required to present evidence of satisfactory performance on the Graduate Record Examination.

- Applicants for admission to a doctoral program will be expected to have a Master's degree in one of the biological sciences or a professional degree in one of the medical sciences.

- Selected individuals with strong backgrounds in the physical and biological sciences who have the baccalaureate degree may be admitted upon presenting evidence of satisfactory performance on the Graduate Record Examination and, in addition, must obtain the approval of the Joint Graduate Coordinating Committee of the Comparative and Experimental Medicine programs.

Exceptions to the above requirements may be made at the discretion of the Joint Graduate Coordinating Committee if the minimal requirements of The Graduate School have been met by individuals who are admitted to graduate programs but who are lacking in course requirements will be required to correct these deficiencies early in their graduate programs as directed by the Joint Graduate Coordinating Committee.

For additional information, see sections in this catalog on College of Veterinary Medicine and College of Medicine—Knoxville Unit, or write to Office of Research and Graduate Programs, P.O. Box 1071, Knoxville, Tennessee 37901.

Ecology

MAJOR DEGREES

D. L. Bunting, Chairman, Ph.D. Oklahoma State University

The Graduate Program in Ecology offers Master of Science and Doctor of Philosophy degrees. This interdisciplinary program provides advanced courses in contemporary ecology for students from undergraduate programs in basic and applied biology, social sciences, mathematics and engineering.

Research opportunities in both fundamental and applied ecology are intended to prepare students for academic careers as well as professional positions in industry or government. The Environmental Sciences Division of the Oak Ridge National Laboratory, the National Park Service, and the Tennessee Valley Authority provide additional research facilities. The Great Smoky Mountains, Cumberland Plateau, valley and ridge topography, TVA lakes and wild rivers provide locally a spectrum of natural habitats and consequent biological diversity that is truly unique. In addition, faculty research programs provide opportunities for student research elsewhere on this continent and abroad.

ADMISSION REQUIREMENTS

Requirements for admission to this program are:

1. admission to The Graduate School;
2. at least 12 quarter hours of college biology, 9 quarter hours of college mathematics, and 4 quarter hours of ecology at the upper division level;
3. departmental application and 3 rating forms;
4. the Graduate Record Examination.

Application forms and examination scores must be obtained from The Graduate School. Inquiries concerning the admission requirements should be addressed to the Chairperson, Graduate Program in Ecology, University of Tennessee, Knoxville, Tennessee 37916.

ADVISORS

Advisors are selected from ecologists on the shared faculty of the University who have competence in the area in which the student expects to work. Entering students should consult early with the chairperson of the program on the choice of a faculty advisor who will become the chairperson of the student's faculty committee.

THE MASTER'S PROGRAM

The minimum 45 quarter hours of graduate credit must include 18 hours of ecology courses (exclusive of thesis), of which 6 hours shall be in Ecology 5210-20-30 and at least 8 additional hours in ecology courses numbered above 5100; 9 hours of thesis in Ecology 5000, and 18 additional hours in ecology or supporting courses. To insure an interdepartmental program, the required minimum 45 hours shall include no more than 18 hours of non-thesis courses from any one department of instruction.

The general requirements for this Master's degree are listed on page 18. A minor in ecology is available.

THE DOCTORAL PROGRAM

The requirements for this degree are in general the same as those of The Graduate School. The doctoral program must include Ecology 5210-20-30 and a minimum of 9 quarter hours of courses numbered above 6000. A student cannot enroll for dissertation until the research proposal has been prepared and discussed and approved by the doctoral committee. A foreign language is required.

Shared Faculty

Management. They are designed to prepare students for personnel, managerial, and organizational research, for university teaching, and for consulting relationships with industry. Admission to the program is based upon applied research utilizing a thorough theoretical background, including classical and modern organizational theory, organizational behavior, psychology, and management. The programs are administered by a joint committee of the two departments, appointed by the Vice Chancellor for Graduate Studies and Research on recommendations from the two departments.

It is intended that students entering the program will represent widely different undergraduate and graduate backgrounds including psychology, business administration, engineering, science, and liberal arts. The first-year program provides the opportunity to take courses which will assist the student to attain a reasonable level of sophistication in areas of deficiency.

ADMISSION PROCEDURE

Applicants for admission should request forms and materials from both the Graduate Office and the Committee on Industrial and Organizational Psychology Program, 413 Stokely Center for Management Studies, Knoxville, Tennessee 37916.

Two separate applications must be completed for application for admission to The Graduate School (apply for major in "Industrial and Organizational Psychology") and one application for admission to the Industrial and Organizational Psychology Program. Deadline: For fall entrance, all materials should be received by the Graduate Office no later than March 1st. If financial assistantship consideration is desired. Standards: At least 9 quarter hours of college mathematics and one course in statistics are required. Ordinarily, an undergraduate grade-point average of 2.5 or above is required, with no evidence of special weakness in mathematics and physical sciences.

Test scores on each section of the aptitude portion and the Advanced Psychology portion of the GRE are required. Customarily, those students who are not admitted to the program have performed at or above the 63rd to 65th percentile on the aptitude tests. (This corresponds to a raw score of approximately 500 on each of the tests.) The GRE Advanced Psychology score will be used in making admission decisions, although special consideration will be given in the case of non-psychology majors.

THE MASTER'S PROGRAM

I. Course Requirements (Currently under review and subject to change for Fall 1982 entrants)

A. Management or Psychology 5170, 5180, 5190.
B. Statistics 5050-60-70 and 3 hours of applied psychometrics.
C. Eighteen hours of additional course work to be selected primarily from among the 5000-level course offerings in management and psychology (e.g., Management 5110, 5220, 5230).
D. Nine hours of Psychology or Management 5000 (Master's Thesis).

II. Program Requirements

A. Completion of a comprehensive examination in general psychology within no more than two years of entry by attaining a score of 630 or the 85th percentile on the GRE Advanced Test in Psychology.

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

THE DOCTORAL PROGRAM

I. Course Requirements (Currently under review and subject to change for Fall 1982 entrants)

A. Minimum course requirements:
   1. Management or Psychology 5170, 5180, 5190.
   3. Minimum of three 6000-level seminars to be selected from Psychology or Management 5250, 5260, 6270, 5280, and Psychology 5380.
   4. 36 hours of Psychology or Management 6000.
B. Recommended electives:
   1. For preparation for advanced section
   2. GRE: Psychology courses as appropriate.
   3. For students who require preparation in psychometrics: Applied psychometrics.
   4. For students who wish to pursue special research interests aside from their dissertation: Management 5250, 5260, Management 5280, Psychology 5300.
   5. Courses available in areas related to industrial and organizational psychology:
      a. Through College of Business Administration
      b. Through College of Liberal Arts
      c. Others as approved by advisor.

II. Program Requirements

A. Attainment of a B average** in Management or Psychology 5170, 5180, 5190.
B. Completion of a comprehensive examination in general psychology within no more than two years of entry by attaining a score of 650 or the 85th percentile on the GRE Advanced Test in Psychology.
C. Completion of a comprehensive examination in scientific methodology before beginning the third year of study. This examination covers the following specific areas: statistics, psychometrics, experimental design.
D. Completion of a special comprehensive examination in the area of the student's major research and professional interest. A student is expected to take this examination by the end of twelve quarters. This examination may be repeated once, normally no later than six months after the first attempt, at the discretion of the student's doctoral committee.
E. By the end of nine quarters a student is expected to choose a major advisor (Chairperson of Doctoral Committee).

*May be repeated for additional credit.
**Any student in the doctoral program may be required to prepare a Master's thesis by the Industrial and Organizational Psychology Committee. This policy will be implemented by the committee at such time as a review of the student's record suggests that additional data on the qualifications for pursuing a Ph.D. are required.

*See program handbook for definition of a B average.
Life Sciences

MAJOR DEGREES
Life Sciences M.S., Ph.D.

Coordinating Council:

The programs leading to the M.S. and Ph.D. degrees in Life Sciences are interdepartmental and intercollegiate programs which augment the programs of individual departments.

The graduate program in Life Sciences supports study and research in the following concentrations: animal physiology, cellular and molecular biology, environmental toxicology, ethology, plant physiology/biochemistry, and reproductive and developmental biology. Students interested in any of these areas should contact either the chairperson of Life Sciences or the director of the area of interest. Each concentration area is overseen by a committee and may have unique admission and graduation requirements above the minimums for the overall program.

GENERAL ADMISSION REQUIREMENTS
1. A Bachelor's degree with a major in a biological, behavioral or physical science.
2. GRE (aptitude) scores.
3. Three letters of recommendation.
4. Course work including a year of calculus (differential and integral), one year of chemistry, and a year of physics. Specific course deficiencies may be corrected during the first year.

GENERAL PROGRAM REQUIREMENTS
The program requirements are in general the same as those of The Graduate School. The Master's program requires 45 hours of study approved by the student's committee, a thesis, and a comprehensive oral examination. The minimum requirements for the doctoral program include at least 9 hours above the 6000 level, 36 hours of course work above the 6000 level, a pattern of courses approved by the student's committee, a comprehensive examination, a doctoral dissertation, and a final examination. Individual concentration areas may have additional requirements.

AREAS OF CONCENTRATION
Animal Physiology: The inter-departmental program in physiology includes research in the areas of regulatory, reproductive, comparative, exercise, cellular, developmental, muscle, or neuro-physiology.
Cellular and Molecular Biology: The inter-departmental program in cellular and molecular biology includes research in structural or functional aspects of cells or subcellular components, or the interactions between cells.

Environmental Toxicology: The toxicology program provides intensive training in basic toxicological principles and techniques. Courses and research expose trainees to mechanisms of intended and unintended interactions between living systems and potentially toxic agents from the point of view of biochemistry, physiology, ecology, public health, environmental law and regulation, pest management, pollution control and repair, and testing and residue analysis of toxicants.
Ethology: Ethology is the naturalistic study of normally occurring animal and human behavior. The program provides intensive training in basic ethology with specialized studies available in the development, evolution, and physiology of behavior; human ethology; and behavioral ecology and sociobiology.
Plant Physiology/Biochemistry: This program provides the opportunity for intensive training and research experience in areas transcending the usual boundaries of botany, biochemistry, and agricultural plant sciences. It devotes itself to seeking solutions of problems concerning the interactions of energy and agriculture, primarily at the biochemical and physiological level.

Reproductive and Developmental Biology: The inter-departmental program includes research in animal and plant development, reproductive endocrinology and control of reproductive function, gene regulation and cellular interactions in development.

Management Science

MAJOR DEGREE
Management Science M.S.

Committee:
R. S. Garfinkel (Chairperson); Management Science: R. W. Boling, Management; J. S. Bradley, Mathematics; E. Glustoff, Economics; J. K. Ho, Management Science; W. J. Morse, Accounting; R. E. Rosenthal, Management Science; R. E. Shrieves, Finance; C. C. Thigpen, Statistics; M. G. Thomason, Computer Science; C. R. Wooliam, Management.

THE MASTER'S PROGRAM
The M.S. program in Management Science is designed as preparation for a career in the application of quantitative techniques for the solution of management problems in large organizations. The program's flexibility also makes it appropriate as preparation for doctoral study in Management Science.

Management Science course work will expose students to both the theoretical development of quantitative techniques and their application to managerial decision making. In addition to the development of sufficient mathematical maturity for creative use of quantitative skills, the program requires concentrated study in a supporting area. Supporting areas are available in other departments of the College of Business Administration (excluding statistics) as well as in computer science, public administration, ecology and other areas, subject to approval by the Management Science Committee.

Applications are encouraged from all majors, but mathematics background equivalent to the completion of at least two years of college calculus and proficiency in a computer language (e.g. Computer Science 3150) is required. The program is designed to be completed in one calendar year by full-time students entering in the fall quarter. However, students may start the program in any quarter and may pursue an M.S. degree in Management Science on a part-time basis.

Course Requirements

<table>
<thead>
<tr>
<th>Course</th>
<th>Quarter</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Management Science 5310-20-30-35-40</td>
<td>14</td>
<td></td>
</tr>
<tr>
<td>Applied concentration area (approved by advisor)</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>Statistics 5110</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Statistics elective (5000 level or above)</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Mathematics (4000 level or above)</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Electives selected from mathematics, statistics, computer science, or management science</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Electives in any area approved by advisor</td>
<td>6</td>
<td></td>
</tr>
</tbody>
</table>

Total: 50

A thesis option is available which substitutes 9 hours of thesis credit for the following 14 hours of course work: Management Science 5335-40, and one 3-hour course in the applied concentration area and 6 hours of electives in any area. The Management Science Committee will work closely with the student in tailoring a program to his/her needs. The committee must approve a tentative overall program during the student's first quarter and must approve all courses on a quarter-by-quarter basis.

Recognizing the diverse backgrounds and needs of Management Science M.S. students, the Management Science Committee is prepared to waive some of the above requirements on an individual basis. For example, an undergraduate mathematics major with a strong background may be allowed to take 6 additional hours of electives in place of the mathematics requirements. On the other hand, a student lacking experience in rigorous senior-level mathematics courses will be asked to take such courses to fulfill the 6-hour mathematics requirement. The total course load will remain 50 hours for all non-thesis students and 48 hours for all thesis students; however, the number of hours of electives can be reasonably expected to vary between 6 and 18 as a function of prior background.

For course listings and description of the Ph.D program in Management Science, refer to p. 42.
individual under the direction of a faculty member. Students who wish to do such independent work should obtain the approval of the faculty members and the departments concerned prior to embarking upon their study. Credit per quarter will vary from 1-12 hours. The maximum credit which may be applied toward a degree in the College is established in each individual case by the department in which the student is working.

COLLEGE OF SCIENCE AND ENGINEERING

Robert G. Landen, Dean
Charles O. Jackson, Associate Dean
Paul Huray, Associate Dean for Research and Resource Development
Harry Jacobson, Associate Dean for Student Academic Affairs

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

FOREIGN STUDY COURSES

Foreign study courses offered in some departments of the College provide an opportunity to undertake independent study outside the United States. Prior to departure the student must have a plan of study approved by the department head and a supervising faculty member of the department concerned. Credit will be given only upon fulfilling all requirements set by the department and may vary from 1-12 hours. The maximum credit which may be applied toward a degree in the College is established in each individual case by the department in which the student is working.

INDEPENDENT STUDY

Recognizing that learning is not restricted to formal classroom situations, the College provides for students to earn credit toward graduation for approved off-campus study. Such study may be undertaken only with prior approval of the faculty member and the department concerned. It may include certain kinds of work experiences, community involvement, working in political campaigns, etc. Credit per quarter will vary from 1-12 hours. The maximum credit which may be applied toward a degree in the College is established in each individual case by the department in which the student is working.

DEPARTMENTS OF INSTRUCTION

Anthropology

MAJOR

Anthropology

DEGREES

M.A., Ph.D.

Professors:

W. M. Bass (Head), Ph.D. Pennsylvania; C. H. Faughtner, Ph.D. Indiana; A. K. Guthe, Ph.D. Michigan; R. L. Jantz, Ph.D. Kansas; P. W. Parmalee, Ph.D. Texas A. & M.

Associate Professors:

J. E. Harrison, Ph.D. Syracuse; M. H. Logan, Ph.D. Pennsylvania State; F. H. Smith, Ph.D. Michigan.

Assistant Professors:


The Department of Anthropology offers the Master of Arts and the Doctor of Philosophy degrees with concentrations in physical anthropology, cultural anthropology, archaeology, zooarchaeology, and folk culture.

THE MASTER'S PROGRAM

The formal requirements for the Master's degree include:

1. A minimum of three quarters of residence at The University of Tennessee, Knoxville.
2. A minimum of 45 quarter hours for graduate credit, including preparation of thesis. Thirty-six of these 45 hours must be in anthropology. 9 hours may be taken in closely related disciplines (at least one-half of the courses must be at the 5000 level).
4. A thesis. In addition to the two (2) copies required by The Graduate School, one bound copy of the thesis is to be presented to the department and one bound copy to the student's thesis advisor.

THE DOCTORAL PROGRAM

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

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

3070 Genetics and Society (3) (Same as Botany 3070.)

3410 Principles of Cultural Anthropology (3) Basic concept and objectives in study of culture. Range of cultural phenomena and approaches to its study. Recommended prerequisite: 2530. F or W.

3440 Religion of Primitive Peoples (3) Religions of nonliterate peoples. Place of religion in their social and cultural systems. Recommended prerequisite: 2530. (Same as Religious Studies 3440.) F or Sp.

3450 Community Studies in Complex Culture (3) Review of cross-cultural comparative urban and village communities and methodologies used in community studies. Recommended prerequisite: 2530. A

3510 Peoples and Cultures of Mainland Asia (3) Ethnographic survey of the indigenous cultures of...
3530 Peoples and Cultures of Africa (3) Ethnographic survey of the aboriginal cultures of sub-Saharan Africa. Cultural diversity and human ecology in area perspective. Recommended prereq: 2530.

3540 North American Indian (3) An ethnographic survey of cultures of Arctic, Subarctic, Plains and Eastern Regions. Emphasis on cultural differences of peoples occupying these areas during precolonial period. Recommended prereq: 2530. F or Sp

3550 Cherokee Ethnohistory (3) Survey of sociopolitical aspects of Indian affairs and external relationships from first European contact to present. Emphasis on eighteenth and nineteenth centuries.

3570 Afro-American Anthropology (3) Anthropological perspectives on Blacks in New World; examination of African Americans via anthropological theories and methodology.

3580 Peoples and Cultures of Mesoamerica (3) Ethnographic survey of aboriginal peoples and post-conquest changes in Indian cultures. Emphasis upon analysis of small rural communities using modern village studies as source material. Recommended prereq: 2530.

3610 Archaeology of United States and Canada (3) Survey of prehistoric peoples north of Mexico from initial occupation to European contact. Recommended prereq: 2530. F

3620 European Prehistory I (3) Cultural development during Paleolithic, Mesolithic, and Neolithic. Recommended prereq: 2520. W, A

3620 European Prehistory II (3) Cultural developments during Metal Ages. From the close of Neolithic through Iron Age. Recommended prereq: 2520. 3620 and 3630 should be taken in sequence. W, A

3640 Ancient Civilization of Mesoamerica (3) Introduction to the archaeology of areas of advanced Indian culture in Mexico and Central America beginning with earliest cultures and proceeding to contact with Europeans. Recommended prereq: 2520.

3660 Prehistory of Tennessee (3) History of archaeological research in Tennessee and survey of prehistoric American Indian cultures identified through research. Sp

3670 Principles of Archaeology (3) Research strategies in archaeological excavation, interpretation, and explanation. Prereq: 2520 or consent of instructor. A

3700 Forms of Folklore (4) Introduction to the anthropological study of folklore.

3710 Survey of European Folk Cultures (3) Material and other aspects of folk life as expressed in beliefs, art, and folklore, under changing historical and social conditions. Sp

3800 Language and Culture (3) Relationship between linguistic categories and patterns of culture. Prereq: 2540 or consent of instructor. Recommended: 2530.

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

3900 Human Osteology (4) Intensive examination of the human skeleton. Prereq: 2510 and consent of instructor. 3 hrs and 1 lab. F


3930 The Biology of Races of Man (3) Processes of racial differentiation; criteria of significant differences among existing stocks; influence of biology and culture in race formation; analysis of studies concerning blood groups, race mixture, constitution growth and nutrition. Recommended prereq: 2510.

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

4200 Contemporary North American Indian (3) Survey of Indian cultures from initial Euro-American contact to present; emphasis on culture change, U.S. Government Indian policy, reservation life. Prereq: 2530 or consent of instructor. A

4210 Ethnographic Research Techniques (3) Methods of observing, recording, and utilizing data. Prereq: Consent of instructor. A

4240 Applied Cultural Anthropology (3) Applications of anthropological theory; methods and findings in programs of community and national development, public health, international aid, and military assistance. Emphasis on the roles of anthropologists, question of adaptation and analytical framework, and of organization of planned changes in applied programs. Intensive analysis of selected case studies. Prereq: 2630.

4260 Medical Anthropology: Lecture (3) A survey of medical anthropology. Emphasis on Western and non-Western cultural aspects of health, disease, treatment, death, and related concepts. Focus on analyses and descriptions of anthropological fieldwork. Sp

4259 Medical Anthropology: Laboratory (3) Fieldwork in medical anthropology. Emphasis on cultural aspects of health, illness, care, and health in industrial societies and folk medicine systems which coexist with Western, technical medicine. Coreq or prereq: 4250. A

4300 Readings in Anthropology (1-9) Intensive reading, problem oriented. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs. E

4340 Field Work in Archaeology (3-9) Practicum work surveying, excavating, processing, and analyzing of data. Prereq: 2510-20-30 and consent of instructor. May be repeated. Maximum 9 hrs.

4360 Field Work in Physical Anthropology (3-9) Practicum work in identification and analysis of human biological data. May include either skeletal or living populations. Prereq: 2510-20-30 and consent of instructor. May be repeated. Maximum 9 hrs.

4400 Cultural Ecology (3) Survey of concepts and methodologies in ecological studies. Factors, cultural influences and interaction as they relate to cultures in environments. Topics include ecological theory, methods of analysis, and application from selected case studies. Prereq: 2520, 2630, 3410 or consent of instructor. A

4420 Dynamics of Culture (3) Culture change: innovation, diffusion and acculturation; cultural continuity and stability. Prereq: 2530 or consent of instructor. A

4430 Personality and Culture (3) Analysis of relation among individual, society and culture. Application of psychological techniques in cross-cultural studies. Cultural differences and their influence on group behavior. Prereq: 2530 or consent of instructor.

4440 Urban Anthropology (3) Survey of theoretical and methodological issues anthropologists encounter researching cross-cultural urban settlements. Focus on anthropological perspective and urban problems and planning. Prereq: 3460 or consent of instructor. A

4480 Current Trends in Anthropology (3) Analytical integrative review in symposium of the current debates, research directions, theories, fieldwork methods, and general assumptions of the four subfields of anthropology: archaeology, physical anthropology, linguistics, and cultural anthropology. Sp

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

4500 Peoples of China II: Chinese Society After 1839 (3) Anthropological survey of Chinese society and culture in the period of intense Western penetration, rejection of the West, and development of modern, communist Chinese society and culture. Prereq: 2530 or consent of instructor. Recommended prereq: East Asian course.

4550 Indians of the Southeastern United States (3) Survey of Southeastern Indian cultures; emphasis on aboriginal adjustment to environment; middle and late Southeastern Mound groups prior to Euro-American contact. Prereq: 2530, 3540 or consent of instructor.

4560 Cherokee Ethnology (3) Intensive survey of ideology and material aspects of Cherokee culture existing at time of first European contact.

4570 Peoples of Southeast Asia (3) Survey of representative ethnic groups and indigenous cultures of mainland and island Southeast Asia. Problems of contemporary culture changes. Prereq: 2530, consent of instructor or an East Asian course.

4580 Asians in the Americas Since 1800: Anthropological Perspectives (3) Character, factors, and motivations in Asian immigration to North, Central and South America. Assimilation pattern and enclave communities are major topics. Major focus on United States.

4590 Peoples of Japan (3) Analysis of the culture diversity and unity of peoples of Japan. Prereq: 2530 or consent of instructor. Recommended: 3510 or an East Asian course.

4600 Method and Theory in American Archaeology (3) Historical development of New World archaeology with emphasis on theory and field techniques. Prereq: 2520 or consent of instructor. F

4610 African Prehistory (3) Survey of cultural history in Africa, south of the Sahara, from earliest evidence of human activity to time of European contact. Prereq: 2520 or consent of instructor. A

4640 Zoarchaeology (3) Basic osteological studies of vertebrate classes; emphasis on aboriginal human's utilization of native animals in subsistence and culture. Identification, analysis, and interpretation of archaeologically derived molluscan and vertebrate remains. F

4650 Archaeology of Southeastern United States (3) Intensive study of prehistoric American Indian: Special emphasis on Tennessee prehistory. Prereq: 3610 or consent of instructor. W, A


4720 American Folklore (3) Anthropological perspectives of folklore of geographical regions and ethnic groups of the United States. Prereq: 3700 or consent of instructor.

4740 Southern Appalachian Folk Culture (4) Research-oriented course dealing with range of traditional culture in Southern Appalachia: settlement patterns, folk housing, economy, clothing, belief, speech, art, song, dance, and oral traditions and customs. Prereq. Consent of instructor. May be repeated.

4750 Mexican Folklore (3) Anthropological perspectives of folklore of Mexico and Spanish-speaking southwestern United States. Prereq: 3700 or consent of instructor and a reading knowledge of Spanish.

4770 Italian Folklore (3) (Same as Romance Languages 4760.)

4780 Cherokee Language (3) Linguistic survey of structure of the Cherokee language.

4930 Physical Growth and Constitution (3) Examination of sex roles and sex behavior (3) Examination of sex roles and sex behavior from cross-cultural and diachronic viewpoints. Draws disparate and scattered studies together and attempts to answer questions as to how sex roles are learned, the parameters of acceptable sexual behavior and degrees of tolerance for sexual deviation in various cultures.
4940 Biology of Native Americans (3) American Indian origins and evolution from standpoint of skeletal remains and morphology and genetics of living populations. Emphasis on North American Indians. Prereq: Consent of instructor. A
4950 Primate Studies (3) Survey of field and laboratory investigations of comparative anatomy and nonhuman primate behavior. Prereq: 2510 or consent of instructor. F
4960 Primate Paleontology (3) Survey of fossil primate forms: origin and evolution of major primate lineages, emphasizing the earliest Hominid and related forms. Prereq: 2510. Recommended prereq: Zoology 4360. W
4975 Human Paleontology Laboratory (1) Detailed examination of casts and other materials pertinent to study of human paleontology. Prereq or coreq: 4970. Sp
5000 Thesis (1-15) E
5010 Graduate Research (1-9) Independent investigation of special problems in anthropology. May be repeated. Maximum 18 hrs. E
5100 Seminar in Cultural Anthropology (3-9)
5101 Foreign Study (1-12) See page 97.
5102 Off-campus Study (1-12) See page 97.
5103 Independent Study (1-12) See page 97.
5140 Seminar in Zooarchaeology (3) Approaches to analysis and interpretation of archaeological faunas. Intensive reading, evaluation and discussion of major faunal studies, guides to identification, methods of presenting faunal data. May be repeated. Maximum 6 hrs. A
5149 Laboratory Studies of theVertebrate Skeleton (4) Examination and comparison of skeletons of major groups of fish, amphibians, reptiles, birds, mammals. Oriented toward identification of archaeologically derived faunas. May be repeated. Maximum 8 hrs. Sp, A
5159 Laboratory Study of the Mollusca (4) Examination and identification of terrestrial and fresh-water mollusks of eastern U.S. Emphasis on living and archaeologically derived pelecypods. Prereq: 4640. 1 hr and 3 labs. Sp, A
5160 Seminar in Archaeology (3-9) Theoretical and practical issues central to contemporary archaeology. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs. Sp, A
5200 Special Topics in Archaeology (3) Lecture and/or seminar course for advanced students on selected topics of current interest to field of anthropology as a whole. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs.
5210 Community Anthropology: The Local Community (3) Ethical issues, researcher models and research methods on local community. Prereq: 4440 or consent of instructor. A
5340 Fieldwork in Archaeology (3-9) Practicum work surveying, excavating, processing, and analyzing of data; intensive reading. Prereq: 9 hrs of introductory anthropological consent of instructor. May be repeated. Maximum 9 hrs.
5400 History of Anthropological Theory (3) Theoretical contributions of more influential anthropologists. Prereq: Consent of instructor. A
5440 Peasant Societies (3) Critical analysis of theories and theories regarding rural/hurban polarities, interactions, and different cultural manifestations of agricultural populations. Prereq: Consent of instructor. A
5450 Comparative Social Organization (3) Social structure in literate societies. Kinship, age, sex, locality, and other factors in determining relations between individuals and groups. Prereq: At least one area course. A
5460 Quantitative Methods in Anthropology (3) Application of quantitative methods to anthropological data. Correlation and derivative procedures, distance analysis, discriminant analysis, and implementation of computer routines. Prereq: Statistics 2100 or equivalent. F
5470 The Healer in Cross-cultural Perspective (3) Graduate seminar dealing with socialization, methods of diagnosis, and therapeutic modes of healers in predominantly non-European milieus. Prereq: 4250. W
5510 Education in Cultural Perspective (3) (Same as Curriculum and instruction 5511.) F
5511 Non-Western Education: Anthropological Approaches (3) Analysis of traditional educational practices among non-Western peoples, problems from application of Western models of education among American Indian, African tribal groups and Asian cultures. (Same as Curriculum and Instruction 5511.) W
5600 Theory in Archaeology (3) Review of development of archaeological theory. Coverage up to and including recent systems approaches. F
5610 Problems in North American Archaeology (3) Seminar to explore specific research problems in North American archaeology. Research topics on prehistoric cultural and settlement patterns in North America. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs. A
5620 Problems in Old World Archaeology (3) Selected topics and research problems in European, Asian and African prehistory investigated in depth. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs. (Same as Classics 5520.)
5630 The Maya (3) Intensive survey of Mayan culture of Yucatan and Guatemala from pre-Columbian times to present. Prereq: 3580. A
5640 Archaeological Resource Management (3) Theory and practice—public, conservation, contract, and salvage/research archaeology. Legislation; contracts, responsibilities, and certification; agencies and policies; project design, administration, and logistics; standards of field work, analysis and publication; archaeology and public; conservation archaeology as career. May be repeated. Maximum 6 hrs. W
5660 Seminar in Prehistoric Lithic Technology (3) Analysis of techniques employed in production of prehistoric stone industries; raw materials employed, resultant implements, morphology and function; typological and technological attributes utilized in archaeological analysis. Prereq: Consent of instructor.
5670 Seminar on Aboriginal Lithic Resources (3) Training and research in stone materials utilized by prehistoric stone industries; raw materials employed, resultant implements, morphology and function; typological and technological attributes utilized in archaeological analysis. Prereq: Consent of instructor.
5680 Seminar in Prehistoric Lithic Technology (3) Training and research in stone materials utilized by prehistoric stone industries; raw materials employed, resultant implements, morphology and function; typological and technological attributes utilized in archaeological analysis. Prereq: Consent of instructor.
5700 Theory in Folk Culture Studies (3) Seminar analyzing major theoretical viewpoints of European and American folklore and folk life study trends from inception to present.
5710 Problems in Folk Culture Studies (3) Topical seminar dealing with selected problems and aspects of traditional behavior in Euro-American culture. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.
5900 Dental Anthropology (3) Dental anatomy, theories of dental evolution, genetic and environmental influences controlling primate morphology, comparative primate dental morphology, dental trait analyses, use of dentition for skeletal aging, and dental casting. Prereq: 3510. A
5910 Measurement of Man (3) Techniques of measuring and describing skeletal material and human subject with emphasis upon practical applications to growth, nutrition and human engineering. Prereq: Consent of instructor. A
5920 Advanced Physical Anthropology (3) Intensive investigation of theory and problems in physical anthropology.
5930 The Human Skeleton in Forensic Medicine (3) Application of physical anthropology to problems in human identification. Determination of age, race, and sex of skeleton and examination of reports for legal medicine. Prereq: 3950. Sp
5940 Skeletal Biology of Early Human Population (3) Practical and theoretical approaches to analysis of prehistoric human skeletal populations. Demography, vital statistics, pathology, nutrition, and measures of biological relationships as they relate to population as adaptive unit. Prereq: 3950. F
5945 Comparative Primate Anatomy (3) Laboratory-oriented course dealing with functional anatomy of primates. Musculoskeletal system and evolution of various primate adaptive patterns. Prereq: Osteology and one dissection course in zoology.
5950 Paleopathology (4) Identification and descriptive analysis of pathological conditions affecting human skeleton. Roentgenological, histological, and gross visual examination of skeletal material. Prereq: 3900 and/or consent of instructor. Lecture and lab.
5960 Dermatoglyphics (3) Methods of dermatoglyphic analysis; genetics and population variation of various dermatoglyphic elements; forensic applications; relationships to various genetic and chromosomal abnormalities. Prereq: Consent of instructor.
5970 Emergence and Early Evolution of Man (3) Ancestry and evolutionary significance of Australopithecine species. Prereq: 4970 or consent of instructor. W, A
5980 Neanderthal Man and Evolution (3) Morphology, distribution, and evolutionary relationships of Neanderthals. Prereq: 4970 or consent of instructor. W, A
5990 Human Variation (3) Nature of human biological variation with emphasis on microevolutionary processes responsible for establishing and maintaining variation and relationship of variation to population structure. Prereq: 3930 or consent of instructor. A
6000 Doctoral Research and Dissertation (3-15) E
6410-20-30 Seminar in Cultural Anthropology (3, 3, 3) Seminar is offered each quarter primarily for doctoral candidates. Prereq: 4970.
6610 Selected Topos in Archaeology (3) May be repeated. Maximum 9 hrs.
6910 Selected Topics in Physical Anthropology (3) May be repeated. Maximum 9 hrs.
6970 Seminar in Human Paleontology (3) Prereq: 4970 or consent of instructor.

Archaeology—Greek and Roman

See Classics

Art

MAJOR

DEGREES

Art

M.A., M.F.A.

Professors:

Associate Professors:
S. J. Blain, M.F.A. Wisconsin; R. D. Dvore, M.F.A. Wisconsin; J. F. Darrow, Ed.D. Illinois State; W. C. Kenney, M.F.A. Wisconsin; R. LeFevre,
DEGREE REQUIREMENTS FOR M.F.A.

1. Successful completion of 30 hours of studio in concentration area. Inter-area studies must normally be approved by the faculty no later than the third quarter in residence. Fifteen hours of the major must be in second year courses.

2. Twelve hours of art history for graduate credit.

3. Seminar in Art History (4 hours) and Seminar in Art Criticism (4 hours)

4. Ten hours of electives which may consist of any committee-approved combination of graduate credit courses outside the student's departmental concentration.

5. First year evaluation: At the end of the first three quarters in residence the student must present work for evaluation by the faculty and receive permission to continue in the program.

6. Second year evaluation: With completion of all course work the student must present work for evaluation by the faculty and receive permission to register for Projects in Lieu of Thesis (Art 5999).

7. Art 5999, Projects in Lieu of Thesis (30 hours) is a third year of semi-independent study.

8. Exhibition and oral examination: With the completion of all requirements for the M.F.A. the student must produce an exhibition, and, in the presence of the work, must satisfactorily complete an oral examination.

GRADUATE MINOR IN THE HISTORY OF ART

A graduate minor in Art History may be arranged with the consent of the student's committee, the instructors involved, and The Graduate School. Prerequisite is an undergraduate major in Art History, or its equivalent, and reading knowledge of French, German, or Italian, unless waived by the art history faculty.

3516 Typography (4) Theories and techniques of typesetting and printing as fine art medium. Creative work required. May be repeated. Maximum 12 hrs.

3517 Airbrush (4) Technique of airbrush. Emphasis on skill and creative applications. For art majors only. F, Sp

3704 Medieval Art (4) Byzantine and western art of Middle Ages. Illumination, mosaics, Romanesque pilgrimage church, Gothic cathedral. F

3705 Northern European Painting: 1350-1600 (4) From courtly art of late Middle Ages to Northern Renaissance. Jan van Eyck, Roger van der Weyden, Bosch, and Durer; early printmakers. A

3715 Early Italian Renaissance Art: 1300-1450 (4) Development and exploration of naturalism. Revival of antiquity and development of theories of perspective in Early Renaissance. Duccio, Giotto, Masaccio, Donatello, Botticelli, A


3725 Art of Southern Europe and New World, 1550-1830 (4) Concentration on late Mannerism, Baroque, Rubens, Rembrandt, Georges de La Tour, Vermeer, Poussin and Hals. W

3726 The Art of Northern Europe, 1550-1675 (4) Concentration on Bruegel, Rubens, Rembrandt, and Dutch Baroque art. W

3735 History of Nineteenth-century Painting in Europe and America (4) Emphasis on France; Neoclassicism, Romanticism, Constable, Turner, Corot and Barbizon landscapists, Hudson River Group, pre-Raphaelite Brotherhood, Manet, Courbet, Impressionism, Eakins, Homer, Seurat, through Cezanne W

3739 History of Twentieth-century Painting in Europe and America (4) Fauvism, Die Brucke, Cubism, Der Blaue Reiter, Futurism, Dada and Surrealism, geometric abstraction, social commentary painting, Abstract Expressionism in the U.S.A. and parallels in Europe, Pop, Op, Minimal, and Concept Art, F

3745 History of Modern Architecture in Europe and America (4) Survey of nineteenth-century styles, Sullivan and skyscraper. Twentieth century: Viennese leaders, the Bauhaus, Gropius, Van der Rohe, Le Corbusier, and Wright. Aalto to Kahn, Tange and Metabolism, Archigram, Søren, and Venturi, F, W

3746 History of Modern Sculpture in Europe and America (4) From 1800 to 1900. Neoclassicism to Rodin. From 1900 to present: emphasis on Cubism, Constructivism, Expressionism, Assemblage, Pop, Primary Forms, Environments, and Earthworks. Sp

3763 Crafts in America (4) Craft movement; growth and development. Educational, social, economic, and aesthetic values. Role of designer in society as producer and teacher.

3765 History of North American Art (4) Survey of landmarks in painting, architecture, sculpture, and design from prehistory to 1900. F

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

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

3776 Chinese Art (4) F

3777 Japanese Art (4) F

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


4006 Special Topics in Drawing (1-4) Student or instructor-initiated course offered at convenience of department. Prereq: Determined by department. May be repeated. Maximum 16 hrs.

4015 Individual Problems (1-4) Prereq: Consent of instructor. May be repeated. Maximum 12 hrs.

4106 Special Topics in Painting (1-4) Student or instructor-initiated course offered at convenience of department. Prereq: Determined by department. May be repeated. Maximum 16 hrs.

4115 Drawing IV (1-4) Individualized pursuit of personal drawing techniques and concepts; individual and group critiques; weekly life drawing sessions. Prereq: 12 hrs 3115. May be repeated. Maximum 12 hrs. E

4119 Advanced Design Studio (2-4) To explore strengths, structural variability and form potentials of design materials, aesthetic potential. Prereq: Senior or graduate standing or consent of instructor.

4206 Special Topics in Painting (1-4) Student or instructor-initiated course offered at convenience of department. Prereq: Determined by department. May be repeated. Maximum 16 hrs.

4215 Painting IV (1-4) Individual concepts of personal expression with varied media on canvas. Prereq: 12 hrs 3215 for art majors; consent of instructor for non-majors. May be repeated. Maximum 12 hrs. E

4256 Special Topics in Fiber and Fabrics (1-4) Student or instructor-initiated course offered at convenience of department. Prereq: Determined by department. May be repeated. Maximum 16 hrs.