The College of Education

Richard Wisniewski, Dean
C. Glennon Rowell, Associate Dean for Instructional Programs
Thomas W. George, Assistant Dean for Support Services
Madge M. Phillips, Director, School of Health, Physical Education, and Recreation
Charles M. Peccolo, Director, Bureau of Educational Research and Service

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

The College of Education holds membership in the American Association of Colleges for Teacher Education. All certification and degree programs through the doctoral level are fully accredited by the National Council for Accreditation of Teacher Education, the Southern Association of Colleges and Schools, and the Tennessee State Department of Education.

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

Masters of Science

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

Specialist in Education Degree

This degree may be earned in Educational Administration and Supervision, in Educational Psychology and Guidance, in Curriculum and Instruction, in Safety Education and Service, or in Vocational-Technical Education.

Doctoral Degrees

The College of Education offers programs of advanced study leading to the Doctor of Philosophy degree in the major areas listed on page 8, and to the Doctor of Philosophy degree in Health Education.

The Ph.D. program with a major in Education provides five options for study in the departments of Curriculum and Instruction, Educational Administration and Supervision, Educational and Counseling Psychology, Physical Education, and Vocational-Technical Education. The program requirements and the options and emphases are:

The Program

Research Area

<table>
<thead>
<tr>
<th>Area</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>General Core Requirements</td>
<td>21 Hours</td>
<td></td>
</tr>
<tr>
<td>Foreign or Computer Language</td>
<td>0-9 Hours</td>
<td></td>
</tr>
<tr>
<td>Philosophy of Education</td>
<td>6 Hours</td>
<td>Minimum</td>
</tr>
<tr>
<td>Curriculum Theory and Administrative Theory</td>
<td>3 Areas</td>
<td>Minimum</td>
</tr>
<tr>
<td>Trans-college seminar—four consecutive quarters</td>
<td>4 Hours</td>
<td>Minimum</td>
</tr>
</tbody>
</table>

Specialization:

Major Option—A minimum of 24 hours normally selected from one or two emphases within the major option

Supporting Emphasis—A minimum of 12 hours selected from an emphasis other than those emphases selected in the major option. (May be selected from any one of the five options but not a combination of options.)

Cognate—A minimum of 9 hours selected from outside the College in addition to the designated research courses.

Dissertation 9 Hours Minimum

Options and Emphases

Option I. Administrative Theory and Practice
The Administration of Higher Education
Contemporary Economics and Educational Finance
Educational Planning
Facility Planning
Maintenance of School Plants
Organizational Theory
Personnel Administration
The Politics of Education
The Principalship
School Law
The Superintendency
Supervision

Option II. Theories of Curriculum Development and Foundations of Education
Anthropological, Historical, Philosophical, and Sociological Bases for Educational Planning and Curriculum
Principles and Models for Planning, Developing, and Evaluating Educational Programs
Research Design for Educational Programs

Option III. Instructional Theory and Practice
Principles and Models for Instructional Improvement
Subject Areas of Instruction and Practice: i.e., English, Foreign Languages, Mathematics, Science, Social Studies, etc.
Elementary and Early Childhood Instruction and Practice
Learning Media Services
Physical Education Instruction and Practice
Adapted Physical Education
Vocational-Technical Fields of Instruction and Practice
Option IV. Theories and Practice of Educational and Personal Adjustment
Assessment (Educational, Vocational, Personality)
Behavioral Interventions
Career Development
Cognitive and Motor Learning
Consultation for the Helping Professions
Counseling Psychology
Diagnosis and Remediation of Cognitive and Motor Learning and Behavioral Problems
Educational Measurement and Research
Design
Ethnic and Sex Fairness in Counseling
Group Processes
Human Development
Learning Theory and Application
Psychological Interventions in School and Community Settings
Student Personnel Work
Training and Supervision of Counselors

Option V. Foundations of Human Movement
Factors Influencing the Learning of Motor Skills
Philosophical and Sociological Foundations of Sport and Physical Education
Physiological Factors Related to Fitness and Performance

Bureau of Educational Research and Service
Four major types of activities—research, development, educational services, and publications—are channeled through the Bureau of Educational Research and Service (BERS), located in Claxton Education Building. The research activities relate to the development of research proposals, conducting research, and assisting others in development of research proposals in the College of Education. Developmental activities relate to change efforts in curricular content and instrumental methodology. Educational services include a wide list of activities such as in-service educational programs, consultant services, and administrative training programs. Official publications of the College of Education are developed through the Bureau. A limited number of graduate student assistantships are available.

Departments of Instruction
Art and Music Education
C. H. Ball, Head

Art Education

MAJOR
Art Education

DEGREE
M.S.

Professors:
J. W. Robertson, Ed.D. Columbia, (Area Coordinator); H. N. Hilt, Ed.S. Peabody.
Associate Professor:
J. P. Watkins, M.S. Tennessee.

The Master of Science degree in Art Education is offered for art teachers, supervisors, and art-trained persons holding the baccalaureate degree. The program provides both thesis and non-thesis options. Moreover, it is possible to achieve Tennessee Certification in art while pursuing the Master's degree program.

The thesis option requires 45 quarter hours as follows:

<table>
<thead>
<tr>
<th>Quarter hours</th>
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</thead>
<tbody>
<tr>
<td>1. Art Education 5310, 5320 and electives</td>
</tr>
<tr>
<td>2. Curriculum and Instruction 5710, and electives</td>
</tr>
<tr>
<td>3. Minor (selected with committee)</td>
</tr>
<tr>
<td>4. Thesis (Art Education 5000)</td>
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</tbody>
</table>

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

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

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

All courses in art education are offered regularly each quarter, so the student should plan his or her program carefully with a faculty advisor.

4350-60-70 Problems in Art Teaching (3, 3, 3) Prereq: Consent of instructor. E

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

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

5210 Organization, Administration, and Supervision of Art in the School Program (3) W

5310 Art in Education (3) Historical background, current philosophy, theory, and trends; nature and function of aesthetic behavior in visual arts; relationships to psychology, sociology, and anthropology. F

5320 Program Development in Art Education (3) Objectives, organization, content selection, facilities, and equipment; supervision; evaluation; professional growth; leadership and community relationships; art for special student. Sp

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

Music Education

MAJOR
Music Education

DEGREE
M.S.

Professors:

Associate Professors:

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

Music electives

Professional education courses including Curriculum and Instruction 5710

Music Education 5000

Prerequisite preparation: undergraduate degree or equivalent in music education.

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

Requirements for thesis program:

<table>
<thead>
<tr>
<th>Quarter hours</th>
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</thead>
<tbody>
<tr>
<td>Music Education 5210, 5220, 5230 and electives</td>
</tr>
<tr>
<td>Music electives</td>
</tr>
<tr>
<td>Professional education courses including Curriculum and Instruction 5710</td>
</tr>
<tr>
<td>Music Education 5000</td>
</tr>
</tbody>
</table>

Total 45

Requirements for non-thesis option:

<table>
<thead>
<tr>
<th>Quarter hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Course requirements</td>
</tr>
<tr>
<td>a. Music Education 5210, 5240, 5250, 5710, one seminar, and electives numbered 5000 and above</td>
</tr>
<tr>
<td>b. Music electives at 3000, 4000, and 5000 levels (not to include required undergraduate curricula courses)</td>
</tr>
<tr>
<td>c. Professional education electives including Curriculum and Instruction 5610, Educational Counseling and Psychology 4760, and Educational Counseling and Psychology 5050, 5320, or other appropriate course</td>
</tr>
</tbody>
</table>

Total 51

2. Evaluation (in addition to routine examinations in courses):

a. Written comprehensive examination in major and minor fields.

b. The student shall elect one of the evaluation procedures below (with approval of advisor and committee):

1) Oral examinations in major and minor fields.

2) A public recital in principal instrument, piano, or voice.

3) The presentation in public performance of an original musical composition accepted by the committee as music suitable for school music performing groups.

4) Plan, rehearse and conduct a full public performance of music by junior or senior high school music groups. This shall be worked out as a long-term project under the supervision of the student's committee.

3. 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 education. Prereq: Consent of instructor. F, W, Sp

4450 Music in Special Education (3) Techniques and materials for exceptional children. Prereq: 3110-20. Su

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

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

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

5150 Studies in Secondary School Music (3) Development of understandings regarding growth pat-
5840 Seminar (3) Music teaching in vocal, theoretical, historical, and appreciation area of the secondary school curriculum. Survey of research, professional literature and development of bibliography. Laboratory activities. Projects. Prereq: Admission to M.S. program. Su, A

Continuing and Higher Education

MAJOR

DEGREE

Adult Education

College Student Personnel

M.S.

M.S.

Professors:

M. C. McKinna, Jr. (Head), Ph.D. Florida State;

W. H. Coffield, Ph.D. Iowa; J. P. Gootkind, Ed.D.

Tennessee; K. O. McCullough, Ph.D. Florida State;

J. M. Peters, Ed.D. North Carolina State;

E. M. Ramey (Emeritus), Ed.D. Columbia.

Assistant Professor:


The Master of Science degree in Adult Education is offered for teachers, administrators, counselors, and community education specialists. The degree program has two options: (a) requiring a minimum of 45 hours, and a non-thesis option requiring a minimum of 51 hours. For each option, 9 hours must be completed in the behavioral sciences. The Master of Science degree in College Student Personnel is designed for individuals interested in entering the field of student personnel administration in colleges and universities and in community or junior colleges. The program has both a thesis and non-thesis option. A minimum of 60 hours, which includes 9 hours of practicum experience, is required in each option. For further information write the Department of Continuing and Higher Education.

5454-55-56 Student Leadership Workshops (1, 1, 1) Small group and individualized experiences to develop knowledge and skills in leadership roles; for resident assistants, student government leaders, student activities, other student organizations. Prereq: Consent of instructor. S/NC only.

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

5002 Non-Thesis Graduation Completion (3-15) Required for the non-thesis student not otherwise enrolled in an academic program. Prereq: Consent of instructor. Maximum 9 hours. May be repeated with consent of instructor. E

5990 Practicum in College Student Personnel (3) Supervised practice in selected areas of instruction or administration of continuing or higher education programs. S/NC only. E

5860 American Higher Education (3) Purposes, functions, organizations, and programs. F, Sp

5450 Instruction in Higher Education (3) Problems, procedures, and techniques. W

5460 Adult Development (3) Changes in characteristics of the aging, the life span and implications for adult education. F

5470 The Community-Junior College (3) Background, content, and organization of instructional programs, trends and evaluation procedures, including accreditation activities.

5510 Governance of Colleges and Universities (3) Development, change, trends, process, and structure of collegiate governance. F

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

5560 Program Planning in Continuing and Higher Education (3) Theory and method for planning adult education programs. W

5750 Student Personnel in Higher Education (3) Philosophy and scope.

5770 Case Studies in College Student Personnel (3) Prereq: 5750 or consent of instructor.

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

5955-65-75 Practicum in Continuing and Higher Education (1-3, 1-3, 1-3) Supervised practice in selected areas of instruction or administration of continuing or higher education programs. S/NC only. E

5960-70-80 Seminar in Continuing and Higher Education (1-3, 1-3, 1-3) Problems and issues confronting professionals in fields of adult or higher education. E

5990 Practicum in College Student Personnel (3) Prereq: 5750, 5770. Educational Psychology 5560, or consent of instructor. May be repeated with consent of instructor. Maximum 9 hrs. E

4590 Advanced Seminar in Program Planning (3) Concepts and theories related to program planning in continuing and higher education. Prereq: 5660 or equivalent.

See also course listings under the Departments of Curriculum and Instruction, Educational Administrators and Supervision, and Educational and Counseling Psychology.

Curriculum and Instruction

MAJORS

DEGREES

Curriculum

M.S.

Ed.S., Ed.D.

Elementary Education

M.S.

English Education

M.S.

Foreign Language Education

M.S.

Instructional Media and Technology

M.S.

Mathematics Education

M.S.

Reading Education

M.S.

Science Education

M.S.

Social Science Education

M.S.

Ph.D.

Professors:

J. J. Bellon (Head), Ed.D. California (Berkeley);

Alexander, Ed.D. Kentucky; C. A. Allison, Ph.D. Oklahoma; K. J. Blank, Ph.D. Ohio State;

B. L. Brown, Ed.D. Tennessee; W. B. Butler, Ed.D. Texas Tech; M. A. Christiansen, Ph.D.

Kansas; E. S. Christenberry (Emeritus), Ph.D.

B. Allison, Ed.D. Ohio State;

D. J. DeSart, Ph.D. Maryland; E. D. Doak, Ed.D.

Colorado; M. Frandsen, Ph.D. Illinois; R. L. French,

Ph.D. Ohio State; L. O. Hailey (Emeritus), Ed.D.

Columbia; R. Howard, Ph.D. Ohio State;

J. J. Belton, Ed.D. Oklahoma; L. N. Knight, Ph.D.

A. Malik, Ed.D. Columbia; A. M. Naylor, Ph.D.
Southern Illinois; W. C. Murphy, Ph.D. Alabama;
Tennessee, C. E. Roeake, Ph.D. Ohio State;
C. G. Rovell, Ed.D. George Peabody;
R. S. Thurman, Ed.D. Georgia Peabody;

Associate Professors:
L. C. Cagle, Ed.D. Georgia; C. A. Chance, Ph.D.,
Ohio State; C. L. Faires, Ph.D. Kent State;
B. S. Heathington, Ed.D. Tennessee;
R. T. Hodges, Ed.D. Texas; P. E. Huff, Ph.D. Ohio State;
B. M. Kolker, Ed.D. Indiana; T. K. Ryon, Ed.D. Ball State;
A. A. Van Fleet, Ph.D. Florida.

Assistant Professors:
D. A. Hendricks, Ph.D. Alabama; A. M. Rutherford,
M.A. Virginia; C. A. Washboon, Ph.D. Maryland;

Graduate programs are designed to improve scholarship and educational competence in a number of areas leading to the Master of Science degree, the Specialist in Education degree, the Doctor of Education degree, and the Doctor of Philosophy in Education degree.

THE MASTER'S PROGRAM

For the Master of Science degree, thesis and non-thesis options are available in the following majors: Curriculum, Elementary Education, English Education, Foreign Language Education, Instructional Media and Technology, Mathematics Education, Reading Education, Science Education, and Social Science Education. The non-thesis option requires the completion of 51 quarter hours of course work.

THE SPECIALIST PROGRAM

The Educational Specialist degree program with a major in Curriculum and Instruction encompasses concentrations in the following areas: curriculum, elementary education, English education, foreign language education, instructional media and technology, mathematics education, science education, social science education.

THE DOCTORAL PROGRAM

The Ed.D. program in Curriculum and Instruction may include emphasis upon the following concentrations: Curriculum Foundations, educational research, elementary education, English education, foreign language education, mathematics education, science education, social science education. The Doctor of Philosophy degree with a major in Education includes options and emphases as listed on page 51.

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

4150 School Library Administration (3) (Same as Library and Information Science 4150.)
4230 Introduction to Diagnosis and Correction of Classroom Behaviors (3) Classroom strategies for diagnosis and correcting arithmetic difficulties grades 1-8. Prereq: 3350 or 3751 or equivalent.
4240 Classroom Instructional Organization (3) Developing understandings and skills relating to grouping, individualization, space utilization, organization, instruction, integration, and achieving an effective social environment. For elementary classroom teacher. Prereq: Senior standing.
4300 Developmental Reading in Secondary School and Community College (3) Approaches and materials for teaching basic reading skills and organizing reading classrooms and/or laboratories at middle school, secondary school, and community college level. Prereq: Consent of instructor.
4304 Developing Reading Skills in Content Fields (3) Approaches and techniques for teaching reading skills in content areas of school program. Emphasis on middle school and secondary school programs. Prereq: Consent of instructor.
4400 Problems in Improvement of Instruction (1-3) Special conferences, workshops, or in-service programs designed for improvement of instruction. May be repeated. Maximum 9 hrs. S/NC only.
4410 Educational Sociology (3) (Same as Sociology 4410)
4450 Teaching in Kindergarten: One view (3) Relationship of kindergarten to elementary school program; goals; historical settings and current developments.
4451 Teaching in Kindergarten: Program Development (3) Curriculum planning and organization; classroom management. Prereq: Consent of instructor.
4564 Methods and Materials in Environmental and Science Education (3) Instructional methods, materials, curricular programs and current issues in environmental and science education for classroom teachers. May be offered for letter grade or S/NC. E
4750 Utilization of Instructional Media (3) Introduces the basic communications process, need for instructional media, instructional development, selection and utilization of media, and basic software production techniques. (Same as Library and Information Science 4750 and Vocational-Technical Education 4750) E
4860 Programmed Learning (3) Theories of learning as related to technology of programmed instruction; techniques and applications of programming. Prereq: Psychology 3210, or consent of instructor. (Same as Psychology 4860) 2 hrs and 1 lab.
4870 Applications of Computers for Instructional Purposes (3) Computer concepts for teachers at all grade levels; computer operation; applications of computers for teachers; and current classroom uses of computers. Prereq: 3303 or consent of instructor.
5000 Thesis (1-15) P/NP only. E
5002 Non-Thesis Graduation Completion (3-15) Required for the non-thesis student not otherwise registered during any quarter when such a student wishes to receive his/her degree. May be used toward degree requirements. May be repeated. S/NC only. E
5040 Studies and Theory in Language Development (3) Studies and the theory of language development in children. Prereq: 1 elementary school language arts course or consent of instructor.
5070 Seminar in Intercultural Education (3) Analysis of problems and innovations in intercultural education and communication. Prereq: At least one course in history or consent of instructor.
5090 Special Topics (1-6) Topics to be assigned. May be repeated. May be offered for letter grade or S/NC. E
5091 Independent Study (1-6) Topics to be assigned. May be repeated. May be offered for letter grade or S/NC. E
5092 Supervised Readings (1-6) Topics to be assigned. May be repeated. May be offered for letter grade or S/NC. E
5100 History of European Education (3) Education in Western Culture. Prereq: 1 course in history and philosophy of education, or western civilization.
5111-12 History of American Education (3, 3) Changing goals and processes in education. Different historical interpretations of role of school and relationships to other societies. 5111-Colonial through common school movements. 5112-Reconstruction to present.
5120 Principles of Education (3) Philosophic approach to living and writing of influential educators, Friede, Housman, Pestalozzi, Comenius. Prereq: Consent of instructor.
5140 Comparative Philosophies of Education (3) Educational theory and policy proposals of the major philosophies of schooling of thought. Prereq: Consent of instructor.
5141 Pragmatism in Education (3) Effects of American pragmatist tradition on educational policy and practice. Prereq: At least one course in history or philosophy of education.
5142 The Existential Student (3) Literature of existentialism as source for humanizing student's 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.
5180-90-200 Seminar Educational Specialist Research and Thesis (3, 3, 3) P/NP only.
5210 Seminar in International Education: Asia and Africa (3) Historical, philosophical, and sociological foundations; special reference to Japan, China, India, and Nigeria.
5211 Instructional Strategies in Elementary School Social Studies (3) Specific teaching methods and instructional strategies for organizing social studies learning. Prereq: Undergraduate social studies course or equivalent.
5212 Programs and Materials in Teaching Elementary School Social Studies (3) Analysis of new and innovative social studies program materials with attention to methods of diversifying teaching, using materials, and to analyses of program structure. Prereq: 3270 or equivalent or consent of instructor.
5230 Advanced Study and Practicum in Diagnosis and Remediation of Arithmetic Difficulties (3) Assessment and practicum experience with students having corrective and remedial arithmetic needs. Prereq: 4230 or equivalent, F, Su
5240 Creative Thinking and Expression in the Elementary School (3) Gives students opportunity to examine development of creative potential across academic curriculum of elementary school. Prereq: Consent of instructor. Sp, Su
5250 Secondary School Instruction (3) Persistent instructional problems in secondary schools. Sp
5260 Philosophy of Education (3) Truth, knowledge, and valuation in relation to work of schools. Prereq: 4010. 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: 12 hrs English or related courses or consent of instructor.
5281 Teaching Social Studies in the Elementary School (3) Trends in methods, materials and content. Not available for credit to persons completing recent elementary social studies course. Prereq: 12 hrs in social science or consent of instructor.
5282 Teaching Science in the Elementary School (3) Trends in methods, materials and content. Not available for credit to persons completing recent elementary science course. Prereq: 12 hrs in science or consent of instructor.
5283 Programs and Materials in Teaching Elementary Science (3) Analysis of new and innovative science program materials; methods of diversifying teaching, using materials, and analyses of program structure. Prereq: 3720 or equivalent, or consent of instructor.
Seminar in Early Childhood Education (3) Analysis of research in early childhood education (K-3) with emphasis on application to programs and materials in kindergarten. Prereq: 5450 or equivalent, or consent of instructor. May be repeated. Maximum 6 hrs. W

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

Social Studies and Science in Early Childhood Education (K-3) (3) Integrative approaches to and substantive classification systems of content areas of social studies and science for early childhood years. Emphasis on selection of appropriate social studies and science content and approaches for the young child. Prereq: 3270 and 3272 or equivalent. F, Su

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.

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.


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

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

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

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

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

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

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

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

Problems in Lieu of Thesis (2, 3, 3) S/NC only.

Directing the Forensic Program (4) (Same as Theatre 5912.)

Teaching in Secondary School (3) Nature of mass media and importances to American education and life. Sp

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

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

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

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

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

Problems in Lieu of Thesis (2, 3, 3) S/NC only.

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

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

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

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

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.

The Teaching of the Social Studies (3) Su

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

Experimental Research and Dissertation (3-18) P/NP only. E

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

Seminar in Teaching the Social Studies (3) Problems associated with classroom instruction in junior and senior high schools. Prereq: 3270 and 3272 or equivalent. F, Su

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

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

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 5379 and 5304) in reading education or consent of instructor.

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

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

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

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

Special Topics (1-4) Topics to be assigned. May be repeated. May be offered for letter grade or S/NC. E

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

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

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

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

Programs for Curriculum Improvement (3) W

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

Seminar in History of Education (3) May be repeated with consent of instructor.
MAJOR: Educational Administration and Supervision  
DEGREES: M.S., Ed.D., Ph.D.

Programs are planned for (1) students preparing for administrative positions normally found in the educational structure of the state; (2) students preparing for the position of supervisor of education; (3) administrators and supervisors in service who wish to improve their professional competence; (4) students and teachers preparing for teaching positions involving administrative responsibilities; and (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 Educational Administration) 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 51.

5500 Thesis (1-15) P/NP only. E

5502 Non-Thesis Graduation Completion (3-15) Required for the non-thesis student not otherwise registered during any quarter when such a student uses university facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. S/NC only. E

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) P/NP only. 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, Sp, Su

5230 Seminar in the Behavioral Sciences in Educational Administration (3) Key behavioral science concepts, constructs and their application in administration such as semantics, communication, leadership, change process, organizations and organizational behavior, motivation and morale, role theory. F, 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. F, Sp, Su

5310 School Administration and Civil Rights Issues (3) Students will be introduced to legal responsibilities and resolve problems stemming from civil rights legislation pertaining to race, sex, and the handicapped. A

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

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

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

5450 Organization of the School Program (3) For principals and superintendents; 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; fair employment practices and dismissal; and conflict administration for both professional and supporting staff. Sp, Su

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

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

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


5560 Seminar in Communication Skills for Educational Administrators (3) Identification, development and use of interpersonal and group related communication skills. Sp, Su

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

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

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

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

5715 Problems in Administrative and Supervision: Community Education (3) Independent study of administrative problems. May be repeated. E

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

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

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

5754 Problems in Educational Administration and Supervision: Business Management (3) May be repeated. E

5755 Problems in Educational Administration and Supervision: Organization and Structure (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: Organizational Behavior (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. F, Su

5850-50-70 Independent Study in Educational Administration (3, 3, 3) Prereq: Consent of instructor. E

5900 Special Topics (3) May be repeated. E

5910-20-30 Problems in Lieu of Thesis (3, 3, 3) S/NC only. E

5950 Elementary Administrators Seminar (3) For in-service training of elementary school administrators. Developments, problems, programs, and trends of elementary schools and management skills of elementary school administrators. Prereq: Presently an elementary school administrator or consent of instructor. May be repeated. S/NC only. F

5960 Middle School Administrators Seminar (3) For in-service training of middle school administrators. Developments, problems, programs, and trends of middle schools and management skills of middle school administrators. Prereq: Presently a middle school administrator or consent of instructor. May be repeated. S/NC only. F

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

6040 Seminar in Educational Administration and Supervision (1) Required three consecutive quarters. S/NC only. F

6100 Internship in Educational Administration (3) May be repeated as discretion of student's committee. Opportunity for doctoral students and advanced graduate students to gain experience in performance of critical tasks of educational administration under supervision of practitioner and University representative. E

6110 Administrator Update (3) Current topics of concern to practicing school administrators, selected each quarter and presented by specialist. Prereq: Presently a school supervisor or administrator, or consent of instructor. May be repeated. S/NC only. E

6150 Administration in Higher Education (3) Development of conceptual understanding of administrative theory and practice in higher education. F, Su
6220 Programs for the Professional Preparation of Education Administrators and Supervisors (3) A
6340 Current Trends in School Law (3) Logical arrangement of case and statutory material for public school administration and supervision. May be repeated. W, Su
6380 Instructional Supervision—School District (3) Definition and analysis of instructional supervision at the school district level. Supervisory operations including goal development; curricular development; instructional support, help, and service for teachers and administrators; personnel development; program evaluation. W, Su
6420 School Board-Superintendency Relationships (3) The local unit of school administration, school district and its governing body, board of education or school board. Sp
6440 School Business Management (3) Emphasizes superintendent team concept; planning, processing and utilization of fiscal resources. F, Su
6450 Grant and Contract Proposal Preparation (3) Grants and contracts processes in education. Basic concepts applicable to other special agencies. A
6460 School Personnel Administration (3) Personnel 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, Su
6480 Special Topics in School Personnel Administration (3) Human problems in school personnel administration; staff planning, record systems, personnel policy development; collective bargaining in education; and staff evaluation. May be repeated. Maximum 12 hrs. W, Su
6530 Futuristic Educational Planning Methods (3) Methods for describing alternative futures. A
6540 Contemporary Economics and Educational Finance (3) Contemporary educational finance policies and their influence on educational service and program, national economy, welfare of individuals, and the 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, rules and regulation-making process, grants and contracts and inter-level policy instruments. F, Su
6560 Legal Foundations of Public Education (3) Legal framework and theoretical concepts that impinge upon the operations of schools within present legal structures of the United States. A
6580 Seminar in Managing Conflict (3) Learning about and experiencing various forms of conflict. W, Su
6750-60-70 Independent Studies in Educational Administration and Supervision (3, 3, 3) Prereq: Consent of instructor. May be repeated. E
6900 Administration of Complex Educational Organizations (3) Concepts and theoretical formulations to understand, analyze, evaluate, and change complex educational organizations. W, Su
6870 Advanced Study in School Facility Planning (3) In-depth experiences in development of educational specifications and techniques of leadership in creation of quality educational facilities. A
6900 Special Topics (3) May be repeated. E
6911 Specialized Seminar: School Operation (3) E
6922 Specialized Seminar: Higher Education (3) Current policy development; organizational relations, and administrative issues in higher education. Sp
6933 Specialized Seminar: State School Administration (3) E
6944 Specialized Seminar: Preparation Programs (3) E
6960 Specialized Doctoral Seminar in Politics of Education (3) Political theories and practices as they affect operation of public school system. Appropriate political discussions based on literature and research from education, sociology, and political science. One field inquiry. Prereq: 5290, 5610 or equivalent or consent of instructor. W
6991 Specialized Seminar: Theory (3) E
6992 Specialized Seminar: Finance (3) E
6994 Specialized Seminar: Business Management (3) E
6995 Specialized Seminar: Personnel (3) E
6996 Specialized Seminar: School Plant (3) Theory and practice in planning and operating educational facilities: related research in education and other disciplines; implications for further research; application of existing knowledge to known school facility settings. Prereq: Consent of instructor. A
6997 Specialized Seminar in Organization and Structure (3) Organizational theories in education including systematic review of status of organizational and leadership research in education and related disciplines; implications for further research; application of existing theory and research to known educational settings. Prereq: Consent of instructor. A
6998 Specialized Seminar: School Law (3) E
6999 Specialized Seminar: Supervision (3) A

Educational and Counseling Psychology

MAJORS DEGREES
Guidance M.S.
Educational Psychology M.S., Ed.D.
Educational Psychology and Guidance Ed.S.
Education Ph.D.


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 degrees have concentrations in educational psychology, school psychology, counselor education. Professional emphases within the above programs are offered in applied behavioral analysis, educational measurement and research, career development, human development, learning-teaching instructional theory and applications, personality assessment, and sex fair counseling and teaching.

The Doctor of Philosophy degree with a major in Education includes options and emphases as listed on page 51. Appropriate courses taken in this department 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 14 and April 11; Ed.S. and M.S. deadlines are October 15, February 14, April 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 minimum background in behavioral sciences. F, Su

4130 Mental Health (3) Studies and exploration of positive mental health. Application of mental health criteria to a study of one's self based on a battery of personality assessment instruments. F, Su

4320 Self-Management for Personal and Professional Development (3) Applications in career, social, emotional, and physical developmental processes and experiential activities. Prereq: Introductory course in psychology or consent of instructor. Letter grade or S/NC. W, Su.

4500-60-70 Special Topics and Problems (1-6, 1-6, 1-6) May be repeated. S/NC or letter grade.

4440 General Evaluation Procedures for Public Schools (3) Prereq: 3430 or equivalent. A

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

4650 The Construction of Classroom Tests (2) Concerned with teacher-made classroom tests; instructional objectives, principles of test construction, item analysis, evaluating a test's reliability and validity, interpretation of test scores, relationship between testing and grading. W, Su.

4780 Advanced Child Study (3) Prereq: 3430 or 3610 or consent of instructor. F, Su

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

4810 Psychoeducational Aspects of Appalachian People (3) Exploration of psychology of people of Appalachian region through examination of history, culture, and role of education. Sp.


4899 Differential Psychology (3) Nature and sources of individual differences in behavioral characteristics, and differences between racial, ethnic, socioeconomic, sex, and other groups. A

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

5022 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

Ph.D. Ohio State; J. A. Wiberley 2, Ph.D. Syracuse; R. L. Williams, Ph.D. George Peabody.


**Special Education and Rehabilitation**

**MAJORS**

- Special Education
- Vocational Rehabilitation Counseling

**DEGREES**

- M.S.
- M.Ed.

**Professors:**


**Instructors:**

- M. Griffin, M.S. Tennessee
- S. M. Benner, Ph.D. Georgia

**Assistant Professors:**

- M. C. Hannum, M.S. Pennsylvania; D. D. McCampbell, M.S. Tennessee; N. E. Tedder, M.S. Minnesota; G. D. Tyler, M.S. Tennessee; K. M. Warden, M.S. Tennessee

**Associate Professors:**


**Lecturers:**

- Z. H. Brody, M.A. Tennessee; H. L. Byrd, Jr., M.S. Tennessee; L. Coleman, M.S. Tennessee

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

Course sequences may be planned in specialized areas to include (1) hearing impaired; (2) gifted; (3) learning disabilities; (4) mentally retarded; (5) multiple disabilities; (6) socially or emotionally maladjusted; (7) rehabilitation counseling; (8) special education; (9) general special education and rehabilitation.

Programs lead to the master of Science degree in Special Education with an emphasis in one of the specialized areas.

Under the sponsorship of the Office of Special Education and Rehabilitative Services (R.S.A.), a specialized institute for the preparation of professionals to adapt their skills to working with hearing impaired and deaf people is provided.

For further information write the department head.

**EDUCATION OF THE HEARING IMPAIRED**

4000 Rehabilitation Praxis (3) Evaluation of client data practicing rehabilitation prognosis. Prereq: 4230. F, Sp

4190 Speech Development of Hearing Impaired (3) Anatomy and physiology of speech system. Relation of hearing to speech development. Theories and techniques of speech development and improvement; for hearing impaired children. Prereq: Audiology and Speech Pathology 3050. (Same as Audiology and Speech Pathology 4190.) F, Su

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

4210 Language Development of Hearing Impaired I (3) Systems by which formal language is presented. Prereq: Admission to Teacher Education. (Same as Audiology and Speech Pathology 4210.) F, Su

4220 Language Development of Hearing Impaired II (3) Techniques; various systems by which formal language is presented. Prereq: 4210 or consent of instructor, admission to Teacher Education. (Same as Audiology and Speech Pathology 4220.) F, Su

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

4231 Communication Processes for Hearing Impaired II (3) Intermediate course in manual communication. Observations and practicum. F, Sp

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

4250 Introduction to the Psychology and Education of the Hearing Impaired (3) For those planning to enter field of teaching deaf and hard-of-hearing. Review of history of education of deaf. Research studies relating to psychology, social adjustment, and learning of deaf. Survey of professional literature in area of deaf child and adult. (Same as Audiology and Speech Pathology 4250.) E

4280 Curriculum Development in Elementary and Secondary Schools for Hearing Impaired (3) Adaptation of curriculum development and methods in public school education; present needs of deaf and hard-of-hearing students in residential and integrated settings. Prereq: Admission to Teacher Education. W, Su

4290 The Teaching of Reading to Hearing Impaired Children (3) For those planning to enter field of teaching deaf and hard-of-hearing. Review of history of education of deaf. Research studies relating to psychology, social adjustment, and learning of deaf. Survey of professional literature in area of deaf child and adult. (Same as Audiology and Speech Pathology 4290.) E

4780 Student Teaching with Hearing Impaired Children (9) Supervised practicum with preschool, day school, and residential pupils. SI/NC only. F, W, Sp

4781 Practicum in Hearing Impaired Children (6) SI/NC only. F, W, Sp

5230 Linguistics in the Education of the Hearing Impaired (3) Recent research and developments in linguistics related to hearing impaired. F, Su

5240 Seminar in Language Remediation for the Hearing Impaired (3) Current and recent developments in educational methodologies and to research pertaining to teaching language to hearing impaired. Research and materials current in use of various sign language systems and adaptations. Emphasis on approaches which accommodate and assist integration of hearing impaired children in regular classrooms. W, Su

5280 Seminar on Educational Implications of Language Deficiency (3) Readings, discussion, and projects on impact of language deficiency on educational programming for children with language deficiency. Sp, Su

5310-20-30 Manual Communication (2, 2, 2) Basic and advanced skills in fingerspelled and signed forms of communication. Emphasis on ability to express and receive the manual forms. Prereq: Consent of instructor. Must be taken in sequence. F, Sp;

5490 Educational and Vocational Guidance of the Deaf and the Hard of Hearing (2) Techniques for diagnosis and guidance; social and personality adjustment; occupational opportunities. F, Sp

5520 Curriculum Development Applied to Programs for the Hearing Impaired (3) Current curriculum trends adapted for hearing impaired individuals. New curriculum options in education of these children. Current education theories for programs for hearing-impaired children. Prereq: Curriculum and Instruction 5580 or equivalent and consent of instructor. Sp

**EDUCATION OF THE MENTALLY RETARDED**

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

4120 Education of the Mentally Retarded Child (3) Philosophy and rationale underlying teaching and guidance of mentally retarded. Methods and materials in special and regular classes. Prereq: 4110. Admission to Teacher Education.

4440 High School Program for the Mentally Retarded (3) Trends, issues and research relating to core and work study programs. Prereq: Admission to Teacher Education.

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

4811 Student Teaching Mental Retardation (9) Prereq: Major in education of mental retardation. SI/NC only. F, W, Sp

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

5110 Psychology of Mental Retardation (3) Intellectual functioning; psychological theories and learning interrelations and theoretical and educational implications emphasized. Prereq: 4110. F, Su

5112 Psychology of the Severely Mentally Retarded (3) Observation and supervised practicum. SI/NC only. E

5113 Advanced Curriculum for the Mentally Retarded (3) Educational models, methodologies, and curriculum in education of mentally retarded children and adults. Emphasis on varied curriculum alternatives to retarded child's education. Sp, Su

**MULTIPLE DISABILITIES**

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

4150 Education of Children with Crippling and Special Health Conditions (3) Medical and educational characteristics; appropriate educational modifications and associated services. Prereq or coreq: 3333 or consent of instructor, admission to Teacher Education.

4840 Educational Problems of the Cerebral Palsied Child at Home and School (3) Physical, social, and educational needs of cerebral palsied; evaluative techniques; related services. A

4921 Student Teaching in Crippling and Special Health Conditions (3) Observation and supervised practicum in home, hospital, and classroom. SI/NC only. E

**EDUCATION OF THE EMOTIONALLY DISTURBED**

4610 Nature and Characteristics of Learning and Behavior Disorders (3) Forms of academic and socially disturbing behavior, degrees of severity, possible causes, and appropriate educational modifications and treatments. Relationships with 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
5140 Practicum in Public School Systems Serving Children with Learning and Behavior Problems (3) Academic tutoring in a teacher/aider capacity with regular classrooms. Particular emphasis and practice in individual and group 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

5240 Student Teaching of the Emotionally Disturbed (3-9) Tutoring and classroom observation and teaching of the emotionally disturbed individual. Prereq or coreq: Curriculum and Instruction 4720 or 4620. 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; relation to programs of allied agencies, rehabilitation teams; facilities and programs in hospitals, industry, federal agencies, and service groups. Attention to specialization in disability categories such as mentally ill, mentally retarded, and blind. A

5115 Caseload Management in Rehabilitation (3) Techniques and procedures involved in management of caseloads in state rehabilitation agencies and public and 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 aspects and psychological impact of major disabilities; rehabilitation processes including implications for disability. A

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

5130-40 Seminar in Rehabilitation (3, 3) Prereq: Consent of instructor. A

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

5142 Prognostic Vocational Evaluation in Rehabilitation (3) Process, principles, and techniques used to determine and predict work behavior and vocational potential. Includes rationale underlying selection and use of occupational exploration programs, work samples, situational tests, 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 for the interpretation of vocational evaluation data to handicapped adults, to referral agency, and to facility staff. Interpretation of data through the faculty staff conference, vocational counseling report writing, and follow-up. Prereq: 5141 and 5142. Su
5830 Seminar: Issues and Theories in the Education of the Exceptional Child (3) Current trends in education of exceptional child, application of philosophical approaches to education; analysis of current theories of integration as applied to exceptional child. Current research concerning education and/or rehabilitation of exceptional persons. Prereq: Curriculum and Instruction 5800 or Educational Psychology 5210 and consent of instructor. A

5910-20-30 Problems in Lieu of Thesis (3, 3, 3) E, S, N/C only. A

5970 Juvenile Delinquency and the School (3) Responsibilities of school in studying sources of maladjustment; school function in community programs for children's welfare; curriculum adjustments; directed study of socially maladjusted children, environment, and programs for meeting needs. A

Vocational-Technical Education

MAJORS

Agricultural Education

Business Education

Industrial Education

Vocational-Technical Education

EDU DEGREES

M.S. Education, M.S., M.A., M.C.

Ph.D.

Associate Professors:


Associate Professors:


Assistant Professors:

Industrial Education: R. Pierce, Ph.D. Ohio State; T. L. Powell, M.S. Oklahoma.

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, general vocational-technical education, home economics education, industrial education, and technical education. Requirements are:

Concentration\(^1\):

- Concentration: 18 hrs
- Research: 6 hrs
- Electives: 12 hrs
- Thesis Option: 9 hrs
- Course Option\(^2\): 15 hrs

Total 45-51 hrs

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

\(^1\)Student must meet the service area entrance requirements for the concentration selected. General vocational-technical education requires at least 6 hrs Vocational-Technical Education 5015 and 5010.

\(^2\)9 hrs course work approved by graduate advisor in area of emphasis outside of area of concentration.

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 respective areas. Research MACT is available in the business education area.

THE SPECIALIST PROGRAM

The Ed.S. degree 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: cognitive 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 51.

General

4510 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) P/NP only. E

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

5005 Problems in Lieu of Thesis (3) May be repeated: S/N/C only.

5100 History and Organization of Vocational-Technical Education (3) Vocational and technical education in public schools through analysis of social, forces, legislation, and organization models.


5200 Placement, Follow-up and Evaluation Procedures in Occupational Education (3) Methods and procedures in establishing placement programs, curriculum revision.

5300 Organization and Operation of Area Vocational-Technical Schools (3) Area vocational-technical school concept: administration and supervision of vocational and technical education programs in area schools.

5400 Guidance and Pupil Personnel Services in Education (3) (Same as Educational Psychology 5400.)

5500 Supervision of Vocational-Technical Education (3) Program planning, coordination, instruction, roles and functions of supervisors.
Agricultural Education
4230-31-32 Problems in Agribusiness Education (1-6, 1-6, 1-6) May be repeated. Maximum 9 hrs.
4240-41-42 Seminar in Agricultural Education (1, 1) Prereq: 4350 or consent of department head.
5210 Supervision of Student Teaching In Agricultural Education (3)
5220 Teaching Agricultural Mechanization in Vocational Agriculture (3) Prereq: 4350.
5230-31-32 Special Problems in Agricultural Education (3, 3, 3) May be repeated. Maximum 18 hrs.
5240 Current Literature in Agricultural Education (1-3) May be repeated. Maximum 6 hrs.
5250-51 Agricultural Education In Off-Farm Agricultural Occupations (3, 3) Developing occupational experience programs; course planning, teaching procedures. Prereq: 4350.
5260 Agricultural Education for First-Year Teachers (3) Adjustment to situation in which employed; group meetings in selected centers, and visits by instructor. Prereq: 4350.
5270 Adult Education in Agriculture (3)
5290 Supervised Occupational Experience in Agriculture (3) Prereq: 4350.

Business Education
5305 Methods and Materials for VOE Programs (3) Development of instructional aids, recent developments and research, individualized instruction, occupational clusters.
5306 Organization and Management of VOE Programs (3) Developing office occupations, guidelines in cooperatives, laboratory, and model office programs, physical facilities, instructional aids, related instructional activities (clubs), enrollment, instructor and advisory committees.
5307 Measurement in Business Education (3) Evaluative methods and tools for all courses in business education and related areas of study in secondary and postsecondary business education.
5309 Evaluation of Research in Business Education (3) Prereq: Curriculum and instruction 5610 or equivalent.
5310 Graduate Seminar in Business Education (3) Review of techniques for research and preparation of proposal for thesis or problem/project.
5311-12 Special Topics in Business Education (1, 1)
5313-14-15 Practicum in Business Education (2, 2, 2)
5320 Improvement of instruction in Basic Business Courses (3) Issues, research findings, methods, and materials for improved instruction at both secondary and postsecondary levels.
5330 Improvement of Instruction in Typewriting and Clerical Programs (3) Research, principles of learning, issues and materials.
5340 Improvement of Instruction in shorthand/Secretarial Subjects (3) Principles of learning, issues, research findings, and materials on secondary and postsecondary levels.
5350 Improvement of Instruction in Accounting and Data Processing Programs (3)
5360 Improvement of Instruction in Business Communications and Word Processing Programs (3) Basics and strategies for teaching written communications, word processing, and oral communications.
5390 Problems in Business Education (1-9) Variable topics. May be repeated. Maximum 9 hrs.
5430-31-32 Current Issues in Business Education (3, 3, 3)
6330-40-50 Advanced Studies in Business Education (3, 3, 3)
6360 Higher Education for Business (3)

Distributive Education
4440 Supervised Distributive Experience (3) Minimum 200 hours experience for each 3 credit hours in approved distributive business; concurrent analytical project. May be repeated. Maximum 9 hrs.
4450 Areas of Distribution (3) Marketing, product or service technology, social skills, basic skills, and distribution as they affect distributive education curriculum in secondary and postsecondary programs.
4460 Organization and Operation of Distributive Education Programs (3) Background and development needs, federal and state legislation, curriculum implications; establishing, evaluating, reporting, and improving programs.
4470 Methods and Materials in Distributive Education (3) Prereq: 4460 or consent of instructor.
4480 Coordination Techniques in Distributive Education (3) Selecting training agencies; job analysis; selecting and briefing training supervisors; advising committees; adult and community services. Prereq: 4460, 4470.
5410 Administration and Supervision of Distributive Education (3) Operation of distributive education programs; concurrent analytical project. Understanding and appreciating problems from high school principal's and department heads point of view. Trends in distributive education; community surveys, state plans, teacher-coordinator qualifications, changing curriculum.
5416-26-36 Problems in Distributive Education: Retailing (3, 3, 3)
5420 Organizing and Teaching Adult Distributive Education (3) Planning, organizing, teaching, and evaluating continuing education programs in distributive education; utilizing trade associations, employer agencies, business groups, and advisory committees in implementation.
5430-31-32 Special Problems in Distributive Education (3, 3, 3) Individual research, conferences, and/or workshops in teaching and supervising high school, postsecondary, and adult programs.

Home Economics Education
5510 Curriculum in Home Economics (3) Development of home economics educational programs. Prereq: 4420 or equivalent.
5515 Evaluation in Home Economics Education (3) Purpose of evaluation in development of home economics programs; techniques used in evaluation. Techniques for determining progress of students; individual problems of evaluation.
5530-31-32 Problems in Home Economics Education (1-3, 1-3, 1-3) May be repeated. Maximum 9 hrs. per course.
5540 Teaching Family Relationships and Parenthood Education (3) Customizing, applying, and evaluating curricular objectives in family relationships and parenthood education. Prereq: Consent of instructor.
5545 Home Economics Related Occupational Programs (3) Advanced study in planning, establishing, and evaluating home economics programs.
nomenics related occupational programs. Prereq: 4509 or consent of instructor.

5550 Home Economics Adult Education (3) Development and administration of community-based home economics programs for adults. Prereq: Consent of instructor.

5555 Supervision of Home Economics in the Public Schools (3) For teachers with successful experiences in vocational home economics preparing for supervisory positions in vocational education. Program planning, organization, and administration. Field contacts with urban and rural programs.

5570 Seminar in Home Economics Education (3, 3) Research literature and techniques. Prereq: Consent of instructor.

5580 Teaching Home Economics in College (3) Methods, organization, and evaluation.

5581 The Problem Method of Teaching Home Economics (3) Underlying philosophy, skills and techniques, observation and discussion.

5582 Furthering Good Human Relationships in the Classroom (3) Relationships between problems in human relations, basic needs of individuals, techniques of interpersonal relations and social values in developing more effective teacher education programs.

Industrial Education

3830 History and Philosophy of Industrial Education (3)

3840-41-42 Part-Time Programs in Cooperative Industrial Training (3, 3, 3) Principles of organization, methods, and materials.

3850 Shop Organization and Management (3)

3860-51 Materials and Methods for Teachers of Shop and Related Subjects (3, 3)

3870 School Shop Safety (3)

4620 Special Topics in Drafting (3) Industrial practices in specialized areas of drafting selected for the individual student. Prereq: 6 hrs drafting.


4670 Manufacturing Processes (3) The manufacturing processes of industry and their relationship to careers of interest. 3620, 2641, 2960, 3651, or consent of instructor.

4671 Materials and Processes (3) Organic and inorganic materials and processes used to produce finished products. Content, curriculum and techniques of laboratory operation. Prereq: Consent of instructor.

4682 Power and Energy (3) Development, control, transmission, conversion, interrelationship of power sources; content, curriculum, and techniques of laboratory operation. Prereq: Consent of instructor.

4820 Foremanship Training by the Conference Method (3)

4830-31 Job Analysis (3, 3) Principles, practice, instructional methods.

4850-51 Curriculum Building in Trade and Industrial Subjects (3, 3) Course material in trade subjects, results of job analysis, checking sheets and individual job sheets in both trade and related subjects. Prereq or coreq: 4830.

4890-91-95 New Developments in Industrial Education (3, 3, 3) Developments, pressing problems, and recent trends in industrial education as presented by a coordinating instructor in conjunction with knowledgeable resource personnel.

5810-11-12 Administration and Supervision of Industrial Education (3, 3, 3) Principles of vocational education; relationships with general education and trade and labor organizations; administering and supervising schools and classes under federal vocational education acts.

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

5840 Methods of Research in Industrial Education (3)

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

5860 Advisory Committees and Apprentice Training (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 technical related information.


5895 New Developments in Industrial Technical Education (3) Prereq: B.S. in Industrial Education and teaching experience.

School of Health, Physical Education, and Recreation

Madge M. Phillips, Director

Graduate programs are available to students preparing for (1) teaching and research positions in colleges, high schools and elementary schools; (2) administrative and supervisory work in athletics, health education, physical education, public health, and recreation; (3) recreation specialist positions in various public, voluntary, private, and commercial institutions and (4) public health positions in community health education, health planning and administration, and environmental health.

THE MASTER'S PROGRAM

Four programs leading to the Master of Science degree are available: Physical Education, Recreation, Safety Education and Service, and School Health Education. Forty-five quarter hours are required for the M.S. Approximately 30 quarter hours of work selected from courses numbered 5000 and above in industrial education. M.S. requirement. Course selections shall be made according to each student's professional interests in health, physical education, safety, or recreation with the approval of the major professor.

Non-thesis options are available in all M.S. degree programs. A 3 quarter-hour course in research techniques and/or statistics and/or a seminar in research will be required. Each non-thesis degree candidate will take a final comprehensive examination.

Programs leading to the Master of Public Health are also available in community health education, health planning/administration, and occupational/environmental health and safety. Fifty-four quarter hours are required for the M.P.H. degree. One full quarter of field practice is required. During field practice, no student shall hold a full-time job except by special permission of the division chairperson. Students may be placed in all parts of this country.

DOCTORAL PROGRAM

The Doctor of Education and the Doctor of Philosophy degrees are offered in the School of Health, Education and the Doctor of Education in Physical Education. See further description under Health Education and Physical Education.

The basic requirements for admission are:
(a) A minimum of 40 (physical education) or 50 (health education) quarter hours.
(b) Submission of satisfactory scores on the aptitude section of the Graduate Record Examination is required for all doctoral and specialist programs.
(c) A superior grade point average.
(d) Submission of satisfactory references relating to training, employment, and character.
(e) Evidence of successful teaching or potential for success in the major area of study.

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

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

Assistantships are made available by local schools, agencies and the School of Health, Physical Education, and Recreation in return for part-time services rendered. The services may consist of teaching health, physical education, public health, safety education, and recreation to qualified women and men who are graduates of accredited colleges or universities. These assistantships are open to students in the Master's and doctoral programs.

Assistantships are made available by local schools, agencies and the School of Health, Physical Education, and Recreation in return for part-time services rendered. The services may consist of teaching health, physical education, public health, safety classes and recreation classes, leading recreational activities, supervising public health or recreation field work students, and/or directing or helping to manage extracurricular programs. Students interested in these opportunities should file their applications before February 1. Letters should be addressed to: The School of Health, Physical Education, and Recreation, The University of Tennessee, Knoxville, Tennessee 37996-2700.

Departments of Instruction

Division of Health and Safety

MAJORS

Health Education

Safety Education and Service

School Health Education

DEGREES

Ed.D., Ph.D.

M.S., Ed.S.

Professors:

B. C. Wallace (Head), Ed.D. Colorado State; J. Gorski, Dr.P.H. California (Los Angeles); R. H. Kirk, H.S.D. Indiana.

Associate Professors:

M. A. Mittiker (Emeritus), M.A. Yale; R. J. Purpuse, Ph.D. Iowa; A. F. Thompson, Ph.D. Michigan State

The Health and Safety Division offers the following degree programs:

Master of Science degree with a major in School Health Education or Safety Education and a minor in a discipline 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.

Safety

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


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

4420 Advanced Driver and Traffic Safety Education (5) Development of competence in teaching of driver education through use of simulation, multimedia, and multiple-car driving range. Emphasis placed on teaching skills and supervision. Prereq: 4410. F, Sp, Su

4430 Sports Safety (5) Accident prevention and injury control in sports activities; philosophy of sports safety; human environmental factors and interference in sports injury and control; risk-taking and decision solution strategies; and contributions of sports medicine to safety. 3 hrs and 2 labs. Sp

4720 Workshop in Safety (3-5) Deals with special safety education problems. For advanced undergraduate students, graduate students, teachers, supervisors, and administrators. May be repeated. Su

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

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

5320 Behavioral Problems in Safety Education and Accident Prevention (3) Problems of behavior, causes of accidents and local level 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 and personnel attack by alien countries. Sp

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


Extensive reading and critical analysis of safety literature. E

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

6010-20-30 Internship and Research in Safety (3, 3, 3) Allows the student opportunities for engaging in field experiences in safety-related positions. Each experience will be identified, researched, and reported in an acceptable form. E

School Health

3000 Foundation of Health Science (3) Personal health and contemporary health problems, i.e. mood modifying products, consumer health, industrial health, personal health practices, reciprocal relationships involving humans, disease, and environment. F, Sp

3120 First Aid and Emergency Care (4) Theory and practice, medical self-help. Leads to Red Cross Certification in Advanced First Aid and Emergency Care. (Applicant must be at least 18 years of age for certification.) E

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

3420 School Health Services (3) Development, maintenance, and application of health of students; including examination, screening, special services, communicable disease control, emergency care, and school health care certification. W

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

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

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

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

4120 Alcoholism and Alcohol Education (3) Emphasis on factors which make alcoholism a serious health and safety problem. Instructional/educational and interventional programs. F, W, Sp

4130 Suicide and Suicide Intervention (3) Emphasis on recognition and prevention. Required for elementary teachers. Prereq: 3510 or Public Health 1110 or Nutrition 1230. E

4140 Death, Dying and Bereavement (3) Theories of death, dying and bereavement. F, W, Sp

4140 Consumer Health and Safety Education (3) Major consumer health and safety problems; selecting, purchasing, and financing of safety and medical services. (Same as Public Health 4410.) F, W, Sp

4111 Instructor's Advanced First Aid and Emergency Care (3) Satisfactory completion qualifies one for American National Red Cross Certification as Advanced First Aid for Emergency Care Instructor. (Applicant must be at least 21 years of age for certification.) Prereq: 3210 or valid Advanced First Aid and Emergency Care Certificate. E

4121 Cardiopulmonary Resuscitation (2) Theory and skills to implement basic cardiac life support following cardiac arrest due to heart attack, drowning, electrocution, suffocation, poisoning, drug intoxication, vehicular and other accidents. Educational and preventive aspects of controlling cardiovascular disease. F, W, Sp

4420 Drug Abuse Education (3) Problems and suspected causes; pharmacology of drugs and effects on society and methods of drug abuse education. E

4430 Women's Health (3) Factors influencing women's health and wellness of consumers of nation's health service delivery systems. E

4500-10-20 Field Practice in Health Education (3-3, 3-3, 3-3) Off-campus health education internship or field practice in educational or other agency with qualified professional. E

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

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

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

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

5100 Problems and Practices in School Health (3) Comprehensive study and analysis of the principles, problems, systems, and trends of and in school health. F

5310 Teaching of Sex Education and Human Sexuality (3) Analysis and explanation of theory, methods and materials for planning, organizing and teaching sex education and human sexuality in schools and other community settings. Sp

5310 Curriculum Construction in School Health Instruction (3) Analysis of school health instruction programs in the intermediate and secondary schools. Planning and construction of health curriculum to meet needs, interests, and abilities of pupils. W

5520 Evaluation in School Health Instruction (3) Principles of objective tests construction; place of behavioral and attitude scales, check lists, questionnaires, surveys, and inventories in evaluation of health instruction. Includes criticism of several commercially prepared tests and construction and standardization of test. W

5530 School Health Program Surveys (3) Techniques and standards used in surveying total school health program; relative contribution of health instruction, health services, and healthful environment as each contributes to well being of individual students. Survey of existing school health program. W

5620 School Health Administration and Supervision (3) Analysis of various types of administrative control; budgetary problems; education-public health relationships; responsibilities of school health personnel. Resource materials include case studies of on-going school health personnel. Resource materials include case studies of on-going school health programs. Sp

5630-40 Workshop in School Health Education (3-3, 3) Designed for graduate students, in-service teachers, and other health professionals. Emphasis in any workshop to be placed on one critical health issue. Su

5720-30-40 Graduate Workshop in Health Education (3-3, 3-6, 3-6) Deals with specific health problems. Designed especially to explore specific health problems in a concentration. Su


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

6020 Critical Analysis of Writing and Research in Health Education (3) F

6050-60 Seminar in Health Education (3, 3) W, Sp

6110 Health Aspects of Gerontology (3) Biological, psychological, and sociological aspects of aging relating to health of individual. (Same as Public Health 6210.)
### Division of Physical Education

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<th>MAJOR</th>
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#### Professors:
- J. E. Acker, M.D. Tennesse; G. F. Brady
- (Emeritus), Ph.D. Iowa; E. R. Caper (Emeritus), Ph.D. Iowa; B. D. Franka (Emeritus), Ph.D. Illinois;
- E. T. Howley, Ph.D. Wisconsin; J. J. Kozar, Ph.D. Michigan;
- N. E. Lay, Ph.D. Florida State; W. P. Lemborn, 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. J. Cressky, M.F.A. Southern Methodist;
- R. E. Jones (Charpentier), Ph.D. Toledo;
- B. J. Meulenberg, M.A. Iowa State; M. L. Noonan, Ph.D. Minnesota;
- C. A. Wrisberg, Ph.D. Michigan.

#### Assistant Professors:
- P. A. Bovik, M.S. Tennessee; T. J. Donovan, Ed.D. Houston;
- C. W. Fox, M.F.A. Southern Methodist; D. R. Kellaf, Ed.D. Georgia State;
- J. L. Lewis, Ed.D. Tennessee; M. G. McCutchen, Ed.D. North Carolina (Greensboro);

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 51.

3000- and 4000-level courses require a different level of performance of those registered for graduate credit.

#### 4005 Advanced Ballet Technique
- Styles and methods of advanced classical ballet technique: multiple pirouettes, battements, epaulement and advanced pointe work. Prereq: 4000. Available to dance majors and minors or with consent of instructor. May be repeated. Maximum 6 hrs.

#### 4110 Adapted Physical Education
- 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
- Relationship of measurement and evaluation in physical education. Administration and critique of appropriate measures of physical fitness, sports skills and knowledge. W, Sp, Su

#### 4150 The Teaching of Creative Dance
- Theory, methods, materials, and practical experience in presentation and integration of creative dance in grades K-6. P, A

#### 4550 Methods of Teaching Dance
- Principles and practical application in mini-teaching experience. Prereq: Upperclass or graduate standing and consent of instructor. Sp, A

#### 4560 Movement Notation
- Fundamentals with emphasis on notation and reading of elementary movement studies. Sp, A

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

#### 5002 Non-Thesis Graduation Completion
- Required for the nonthesis student not otherwise registered during any quarter when such a student uses university facilities and/or faculty time before degree is completed. Not to be taken toward degree requirements. May be repeated. S/NC only. E

#### 5110 Administrative Problems in Health and Physical Education

#### 5120 Problems in the Curriculum in Physical Education

#### 5130 Methods in Physical Education
- Characteristics of different school age levels, and applications of learning procedures in physical activities at these levels. Sp

#### 5140 Advanced Philosophy of Sport
- Critical examination of most rigorous and sophisticated essay pieces concerning metaphysical, epistemological, and axiological status of sport. Prereq: Consent of instructor. W

#### 5150 Systematic Philosophical Analyses of Sport
- Critical examination of most comprehensive, systematic, and revealing accounts of metaphysical, epistemological, and axiological status of sport. Prereq: Consent of instructor. W

#### 5220 Readings in Physical Education
- Comprehensive review of literature in physical education and related areas. Sp

#### 5280 Motor Behavior: A Theoretical Perspecti
- Motor behavior from information processing perspective and current research to support theoretical base. Prereq: Undergraduate course in general psychology or consent of instructor.

#### 5290 Motor Behavior Laboratory
- Experience in methodology and instrumentation for assessing factors influencing motor learning/ performance. Prereq: 5280, 4140, and/or 5320 or consent of instructor.

#### 5310 Analysis of Basic Motor Skills
- Mechanical analysis of basic motor skills, emphasizing application of these skills to physical education and athletics. W

#### 5320 Seminar in Research Techniques in Physical Education
- Evaluation of appropriate research techniques for assessing factors influencing motor learning. Prereq: 5310, 5500 and Physics 2210 or equivalent. May be repeated with consent of instructor. S/NC only.

#### 5330 Advanced Motor Behavior
- Theoretical issues of contemporary significance in human motor behavior. Prereq: 5340 or consent of instructor. Sp

#### 5410 Practicum in Kinesiology
- 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.

#### 5420 Independent Research
- Selection of topic, development of procedure, and conduct of study including final writing of research paper. S/NC only.

#### 5430 Adapted Physical Education
- Teaching behavior in sport and physical education. Prereq: 4890 or consent of instructor. W

#### 5410-20 Specialization Study in a Selected Physical Education Area
- Advanced comprehensive study in selected specialized area within general fields of physical education. Prereq: Consent of instructor. E

#### 5500 Advanced Kinesiology
- Action of muscles involved in fundamental movements, calisthenics, sports, and gymnastics. Prereq: 5320 or equivalent, Sp

#### 5510 Selected Topics in Anatomy
- Intensive study of various systems of human body. Prereq: 5600 or equivalent. May be repeated with consent of instructor. S/NC only.

#### 5550 Advanced Adapted Physical Education
- Laws and regulations, theoretical bases for remediation or adaption, programming implications. Prereq: 4110 or W

#### 5580 Physical Activity and Health
- Relationship of physical exercise to longevity, weight control, cardiovascular diseases, low back pain and other disorders, mental health, growth, and aging. Application for maintenance of health. Prereq: Course in physiology of exercise or consent of instructor. 5 lectures per week. (Same as Public Health 5580.) Sp

#### 5600 Physical Education
- 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. F

#### 6100 Advanced Exercise Physiology
- Principles of energy transfer in humans with special emphasis on integration of organ systems in adapting to required muscular output. Prereq: Zoology 4940 or equivalent. Recommended: 1 yr of chemistry, physics, and mathematics. 3 hrs and 1 lab. W

#### 6120 Experimental Techniques in Applied Physiology
- Laboratory course in experimental methods with instrumentation. Requirements of advanced gas analysis, human calorimetry, blood chemistry, and pulmonary function tests. May be repeated with consent of instructor. S/NC only.

#### 6580 Social-Psychological Dimensions of Physical Activity
- Examination of social-psychological factors which influence performance in physical activity with emphasis on research. Prereq: Psychology 3120 or equivalent. F

#### 6590 Seminar in Physical Education
- Current issues and problems in physical education with emphasis on outstanding studies and research in field.

#### 5900 Graduate Seminar in Physical Health
- Current issues and problems in physical education with emphasis on outstanding studies and research in field. (Same as Public Health 5900, Nursing 5900, Nutrition and Food Science 5910, and Social Work 5900.) S/NC only.

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

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

#### 6010 Seminar in Physical Education
- Research topics in literature related to physical education. May be repeated with consent of instructor. S/NC only. E

#### 6220 Independent Research
- Selection of topic, development of procedure, and conduct of study including final writing of research paper. S/NC only.

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

#### 6410 Practicum in Kinesiology
- 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.

#### 6510-20 Problems and Issues in Physical Education
- Critical examination and evaluation of current issues and problems in physical education. W

#### 6610 Seminar in Applied Physiology
- Prereq: S610. May be repeated with consent of instructor. S/NC only. F, Sp

#### 6640 Research Participation in Applied Physiology
- Advanced research techniques under supervision of faculty member whose research area
coincides with interests of student. Prereq: Consent of instructor. May be repeated with consent of instructor. S/NC only. F

6810-20 Practicum (2, 2) Intern experience in areas of major interest. S/NC only. E

Division of Public Health

MAJOR DEGREE M.P.H.

Public Health

Professors: C. B. Hamilton (Chairperson), Dr. P. H. Oklahama; J. Gonpi, P. H. California (Los Angeles); B. C. Wallace, Ed. D. Colorado State.

Associate Professor: J. L. McGuire, Ph. D. Michigan; R. J. Purseley, Ph. D. Iowa.

Assistant Professors: J. V. Carnes, M. Tennessee; V. W. Presley, Ed. D. Tennessee; S. F. Spear, Ph. D. Iowa.

Lecturer: M. Duffy, M. D. Pennsylvania.

Master of Public Health degree with a major in Public Health. Option in community health education is available. Option in Education for Public Health. Options with specialization in health planning/administration or occupational/environmental health and safety are available.

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. F, Sp

4210 Urban and Industrial Health (3) Health problems created by a burgeoning population and the megacities; 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 in logical progression of the problems of translating health information to practitioners: communications among members of the modern health teams, among health agencies, and use of media mass for transmitting health information. F

4410 Consumer Health and Safety Education (3) (Same as School Health 4410).

4700-10 Field Practice in Public Health (3, 3) Field practice in public health under supervision of public health profession. S/NC only. E

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

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

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

5010-20-30 Workshop in Public Health (3-6, 3-6, 3-6) Designed to deal with specific public health problems in short or extended period of time. Su

5070-80-90 Field Practice and Seminar in Public Health (3-5, 3-5, 3-5) Field work in public health under professional supervision in public health. S/NC only. E

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


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

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

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

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

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

5440 Methods and Materials in Public Health Education (4) Theory and practice in use of communication techniques and materials in community health education. 3 hrs and 2 labs. W

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

5550 The Public Health Educator in Community Organization and Development (4) Overview of health organizations and agencies in the community premises exploration of conflicting theories and divergent styles of practice in community organization and development. Laboratory to delineate a community health care map and to 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 of education and motivation and differences between health education service and health education program for community learning levels. 1-2 hr lecture-symposium 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

5735 Emergency Medical Services (3-5) Su

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

5755 Health Facilities Administration (3-5) W

5760 Health Services Administration (3-5) F

5785 Occupational Health Unit (3-5) Sp


5900 Graduate Seminar in Public Health (1-2) Scope of public health as discipline and interrelatedness to other academic and professional disciplines. Speakers both internal and external to UTK. Prereq: Baccalaureate degree in health-related field or consent of instructor. May be repeated. Maximum 6 hrs. (Same as Nursing 5900, Nutrition and Food Sciences 5900, and Social Work 5900.) S/NC only. F, Sp

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

6210 Health Aspects of Gerontology (3) (Same as School Health 6210.)

6220 Seminar on the Nation's Health (3) (Same as School Health 6220.)

6230 International Health (3) (Same as School Health 6230.)

Division of Recreation

MAJOR DEGREE Recreation M.S.

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

Associate Professor: K. L. Krick, Re. D. Indiana.

Assistant Professor: M. D. Blandon, Re. D. Indiana.

The Recreation Division offers the following degree program:

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

4130 Recreation Administration (3) Introduction to recreation administration, including planning, personnel, facilities and services, program services, finances, and public relations. Prereq: 3140, 3200, 3880, or consent of instructor. F, Sp

4200 Survey of Recreation for Special Populations (3) Responsibility of recreation profession to minority groups whose leisure opportunities and needs may require special servicing. Prereq: 3140, 3200, 3880, or consent of instructor. F

4310 Camp Administration (3) Program planning and organization, personnel management, camp site development and maintenance, camp operation for administrators and supervisors. W

4500 Specialized Study in a Selected Area of Recreation (1-15) P/NP only. E

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

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

5140 Leisure Service Delivery Systems (3) Various systems—public, private, and commercial—involved in provision of leisure services for community at large. Prereq: Consent of instructor. F

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

5240 Therapeutic Recreation (3) Role of recreation in lives and treatment of persons with disabilities—mental, physical and medical. Possibilities for help
ing ill and disabled realize their fullest potential. Pre-
req: 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 com-

munity agencies. Prereq: 4200 or consent of instruc-
tor. Sp

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

5300 Seminar in Recreation (1-6) Application of re-
search methodology and computer literacy in
selected areas of recreation related research. Pre-
sentations of students' research studies. May be re-

5340 Management and Operation of Recreation Funds (3) De-
velopment and management of budgets for recrea-
tion agencies with special emphasis on obtaining
federal funds appropriated specifically for recreation,
management of revenue received, and exploration of
funding alternatives. Prereq: 4430. 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 processes as it pertains to
operation of recreation facilities. F

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

5450 Specialized Study in Recreation (1-9) Ad-
vanced comprehensive study in selected specialized
area within leisure and recreation field. Prereq: Con-
sent of instructor. May be repeated. Maximum 9 hrs.
E

1. A major consisting of 18 to 27 quarter
hours of graduate courses in chemical
engineering, metallurgical engineering, or
polymer engineering. The polymer
engineering major must include Polymer
Engineering 5110, 5230, 5310, 5410, and
5120.2

2. One or two minors or collateral work, 9 to
18 hours total in engineering, chemistry,
mathematics, physics, or other related fields.

3. Master's thesis, 5000, totaling 9 to 18
quarter hours.

relations, chemical thermodynamics,
corrosion, welding metallurgy and materials
joining, solidification, microscopy (electron
and optical), chemical process metallurgy,
failure analysis, mechanical behavior of
materials and structure analysis.

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

3620 Industrial Process Control (3) Design theory
and practice. Experimental process modeling (pro-
cess identification), feedback control, cascade con-
trol, feedforward control, degrees of freedom, stabili-
ity analysis, controller tuning. Control systems for
number of typical industrial unit operations. Prereq:
3610.

4110 Chemical Engineering Data Analysis (3) Analytical and experimental identification of system
extremals; statistical properties of samples and
source systems; empirical modeling of processes;
statistical process control. Prereq: 3420 and Mathemat
ics 3150.
College of Engineering

W. T. Snyder, 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

Since 1966, the College of Engineering has made use of electronic communication techniques to reach students beyond the confines of Knoxville classrooms. These remotely-taught classes make the specialized talents of engineering college faculty available to students at off-campus centers and industrial sites. This effort makes use of videotapes prepared from a regular on-campus class in specially-equipped classrooms. The tapes contain a visual and audible record of a professor's lecture and discussions with the on-campus classes and are played back at remote locations.

Telephone contact is established periodically between the professor and the off-campus class to allow full discussion and questions. Occasional visits by the professor are made to each remote class and students visit the Knoxville campus at selected times.

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

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

YEAR-IN-JAPAN M.S. PROGRAM

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

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

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

Engineering Experiment Station

W. 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.

Departments of Instruction

Chemical, Metallurgical and Polymer Engineering

MAJORS

Chemical Engineering
Metallurgical Engineering
Polymer Engineering

DEGREES

M.S., Ph.D.

Professors:

Associate Professors:

Assistant Professor:
F. Weber, Ph.D. Minnesota.

Lecturers:


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, in Metallurgical Engineering, and in Polymer Engineering.

THE MASTER'S PROGRAM

Minimum departmental requirements include the satisfactory completion of:

1. Alumni Distinguished Service Professor.
2. Space Institute, Tullahoma.
specialization within the program may be compatible with their backgrounds. Areas of chemical engineering, mechanical engineering, and metallurgical engineering faculty concerning Prospective students should consult consultation with the faculty committee. 

5. Final examination covering thesis, related fields, and graduate course work.

THE DOCTORAL PROGRAM

Applying for entrance into the doctoral program must display concrete evidence of ability to perform and report independent research to the satisfaction of the department. The Master's thesis may be offered as such evidence. Department requirements consist of the satisfactory completion of:

1. Graduate courses in chemical engineering, metallurgical engineering, or polymer engineering in the first quarter, totaling to approximately 36 quarter hours, at which least 12 of which must be in 6000 series courses. The polymer engineering major must include Polymer Engineering 5110, 5210, 5230, 5310, 5410, or 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 chemistry, mathematics, physics, and engineering.

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. All examination must meet the above requirements, pass a special written examination in polymer science and engineering, and complete an additional academic program to be specified by the student's committee.

M.S. and Ph.D. degrees in polymer science and engineering are available to students and a UTK committee acts on them. Special written examination in polymer science and engineering are available to students. Resident students must register for the appropriate 5010 every quarter offered.

5. Final examination covering thesis, related fields, and graduate course work.

relationships, chemical thermodynamics, corrosion, welding metallurgy and materials joining, solidification, microscopy (electron and optical), chemical process metallurgy, failure analysis, mechanical behavior of materials and structure analysis.

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) as an emphasis to a thesis, and a second in a joint program with the Chemistry Department having a chemical emphasis.

The specialization program in the department includes a Ph.D. 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 complete the above requirements, pass a special written examination in polymer science and engineering, and complete an additional academic program to be specified by the student's committee.

M.S. and Ph.D. candidates 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 in polymer science and engineering, and complete all the above requirements.

Chemical Engineering

3410 Flow of Fluids (4) Differential and overall momentum balances, mechanical energy balances; flow in tubes, piping systems, and packed beds; metering devices, pumps. Prereq: Chemical and Metallurgical Engineering 2020, Mathematics 3150. 3 hrs and 1 lab.

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

3440 Stagewise Operations (3) Analytical and graphical methods applied to stagewise separation operations.

3450 Diffusional Operations (3) Diffusion, simultaneous heat and mass transfer, applications including humidification, gas absorption, extraction. Prereq: 3420. Chemical Engineering 3040.

3610 Introduction to Process Dynamics and Control (3) Process models and introduction to control system design. Mathematical models for several industrial processes from mass, component and energy balances. Prereq: Introduction to Polymer Science and Engineering (CHEM/ME 5230), Probability and Statistics (Math 251), and an introductory course in polymer science and engineering. Prereq: Chemical and Metallurgical Engineering 2020, Mathematics 2840.

3620 Industrial Process Control (3) Design theory and practice. Experimental process modeling (process identification), feedback control, cascade control, feedforward control, design of control systems for industrial processes, and industrial and laboratory data. Model linearization, Laplace transfer analysis, block diagram algebra, transfer function models, industrial sensors and valves. Prereq: Chemical and Metallurgical Engineering 2020, Mathematics 2840.

4110 Chemical Engineering Data Analysis (3) Analytical and experimental identification of system characteristics, statistical analysis of experimental and source systems; empirical modeling of processes; statistical process control. Prereq: 3420 and Mathematics 3140.

4120 Probabilistic Chemical Engineering Systems (3) Experiment design, simulation of stochastic systems, predictive techniques, and analysis of networks in the process industries. Prereq: 4110.

4130 Introduction to Optimization (3) Principles and applications of optimization techniques in chemical process design; unconstrained optimization, equality constrained optimization, inequality constrained optimization, and dynamic programming. Prereq: Mathematics 2840.


4430 Special Problems in Design and Economics (4) Extension of 4420 for student participation in the American Institute of Chemical Engineering annual contest problem; other advanced design projects. Prereq: 4420.

4450 Hydrocarbon Processing (3) Study of specialized characterization of physical properties of fossil fuel raw materials and products, and of processes for conversion of fossil fuel raw materials into products needed in industrial energy, industrial raw material and consumer markets. Prereq: 3440.

4470 Sulfur Removal from Coal and Associated Problems (5) Chemical and physical properties of domestic coals, sulfur distributions; beneficiation by both physical and chemical methods; fluidized bed combustion with both natural and synthetic SOx sorbents; stack gas SOx scrubbing. Prereq: Consent of instructor.

4480 Coal Processing to Liquid Fuels (3) Characterization of various methods; modeling of conversion processes and extraction of water and oxygen requirements; pyrolysis; catalytic hydrogenation; reactor design considerations; review and critique of selected articles from both the current literature and patents. Prereq: Consent of instructor.

4530 Chemical Engineering Reaction Kinetics (3) Chemical reaction rates in closed and flow systems; interpretation of laboratory and pilot plant data; reactor design. Prereq: 3420, Chemistry 3430.

4540 Fluid-Solid Operations (3) Heat and mass transport in fixed and fluidized beds; applications include absorption, ion exchange crystallization. Prereq: 3440-50.


4730 Mass and Energy Flow in Biological Systems (3) Basic physiological, biochemical and metabolic principles applicable to biological systems. Derivations of general equations of biomass and energy transfer, thermodynamics, and systems analysis in biological systems. Discussion of Volterra's equation and biological clocks. Prereq: Consent of instructor.
4740 Introduction to Transport Phenomena in Biological Systems (3) Application of principles of transport phenomena to biological systems. Transfer of chemical energy, and cellular active transport; structure and morphology 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 biotechnological preparation methods; classroom demonstrations, design of production and analytical systems. Prereq: Consent of instructor.

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

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

5050 Engineering Analysis (3) Analytical formulation and solution of chemical, metallurgical and polymer engineering problems involving deformation of solids, heat transfer and motion of fluids. (Same as Micro/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, simulation of diffusion of momentum and heat. Prereq: 5050.

5130 Methods of Optimization (3) Principles and applications of various mathematical programming techniques; search, linear, nonlinear and variational method, maximum principle, dynamic programming, and geometric programming. Prereq: 4130.

5210 Process Dynamics (3) Analysis of recycle operational steady state simulation and optimization of typical processes.


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

5320 Statistical Thermodynamics (3) Basic concepts of statistical mechanics and application to evaluation of thermophysical properties. Prereq: 5510.

5510 Chemical Reactor Design (3) Nonideal flow patterns, flow patterns and mixing in two phase systems; introduction to heterogeneous catalysis and reactor stability. Prereq: 4530.

5610 Stagnwise Mass Transfer Operations (3) Equilibrium stage, concepts applied to mass transfer operations, emphasizing nonisothermal and multi-components systems.

5620 Differential Mass Transfer Operations (3) Differential mass transfer operations, falling film, packed tower and bubble column contacting devices; nonisothermal and multicomponent systems; current theories of mass transfer; mass heat and momentum transfer analogies. Prereq: Mathematics 2840.

5810 Mechanics of Viscous Flow (3) (Same as Engineering Science and Mechanics 5220.)

5900 Special Topics in Chemical Engineering (3) Special topics of current interest to chemical engineers. May be repeated. Maximum 9 hrs.

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

6130 Process Optimization (3) Optimization of chemical process equipment and systems by various techniques; static and dynamic systems. Prereq: 5130.

6210 Advanced Diffusional Operations (3) Fixed and fluidized bed operations, stagewise and differential mass transfer bed concepts. Prereq: Consent of instructor.

6250 Venture Analysis in the Process Industries (3) Intensive study of transport line functions of typical chemical company in application of modern decision theory and mathematical models to achieve optimum product and investment decision in face of external competition. Prereq: 5250.

6310 Thermodynamics of Irreversible Processes (3) Thermodynamic treatment of irreversible chemical processes; characteristics of equilibrium, computer planning of chemical phenomena, with special emphasis on topics and methods of interest to engineering and bioengineering students. Prereq: 5310.

6510 Applied Chemical Reaction Kinetics (3) Chemical reactions in gas and liquid phases, heterogeneous catalysis, catalyst effectiveness and role of transport in kinetics. Emphasis on development of phenomenological description although mechanistic models are discussed. Prereq: 5510.

6520 Catalytic Reactor Design (3) Principles of kinetics, heat and mass transfer applied to design and analysis of heterogeneous catalytic reactors. Prereq: 6510.

6710 Process Dynamics (3) Development of dynamic models of process equipment from conservation and rate laws; testing of models by frequency, step, and pulse response methods. Prereq: Consent of instructor.

6900 Advanced Topics of Chemical Engineering (3) Advanced topics of current interest to chemical engineers. May be repeated. Maximum 9 hrs.

Metalurgical Engineering

3050 Production Metallurgy (3) Roasting, smelting, and refining, Gas liquid equilibria, slags-metal processes and solution behavior, correlation with phase constitution. Kinetics of reactions, rate laws, activated complex theory, adsorption and catalysis and applications. Prereq: 3040, Chemical Engineering 3410 and 3420 or equivalent. 3 hrs 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 2110 or 3110 with emphasis on control of mechanical properties of materials and their relationships to composition, thermal, and mechanical treatment; correlation of resultant properties with service performance. Suggested for mechanical, civil, and industrial engineering students.

3130 Engineering Materials III (3) Extension of 2110 or 3110 with emphasis on control of electrical and magnetic properties of materials by specification of composition, thermal, and mechanical treatment; correlation of resultant properties with service performance. Suggested for electrical engineering students.

3140 Engineering Materials IV (3) Extension of 2110 or 3110 with emphasis on materials processing, specification and evaluation. Suggested for mechanical and industrial engineering students.

3150 Engineering Materials V (3) Extension of 3130 to include explorations and applications of reaction engineering materials with aqueous, nonaqueous, and gaseous environment. Prereq: 3110 or equivalent.

3160 Engineering Materials VI (3) Extension of 2110 or 3110 with emphasis on materials of significance in nuclear engineering; nuclear reactor construction materials, nuclear fuel specifications, interaction of radiation with solids to produce changes in engineering properties. Suggested for nuclear and mechanical engineering students.


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

3310 Biomedical Applications of Materials for Life Scientists (3) Principles of engineering materials for dentists, orthodontists, and pharmacists, working with fabrics of components; corrosion; applications of prosthetic devices and dental materials. Prereq: Chemistry 1110-20-30 or equivalent.

3520 Materials Behavior and Chemical Process Equipment Design (3) Mechanical, metallurgical and chemical considerations in design of chemical processing equipment, Prereq: Chemical and Metallurgical Engineering 2030 or equivalent; 3150; and Chemical Engineering 3420.

3710 Metallurgical Applications in Manufacturing Technology (3) Fabrication methods and principles of mechanical and thermal processes for forgings and semifinished articles; casting, powder metallurgy; plastic forming; joining, heat treatment. Prereq: 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. Prereq: 3050 or consent of instructor.

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

4510 X-Ray Diffraction and Its Application (4) Basic principles and application of X-ray diffraction from materials. Theory, principles, interpretation of lattice, crystal, and mechanical properties, and analysis of resultant phases. 3 hrs and 1 lab.

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

4730 Mechanical Metallurgy I (4) Elastic behavior; description of stress, strain, and stress-strain relations; plane stress and strain loading; failure by yielding; stress concentration and notch sensitivity; ductile fracture; brittle fracture; fatigue and fracture. Prereq: First course in Materials Science and Engineering Science and Mechanics 3311. Also suggested for mechanical engineering students.

4740 Mechanical Metallurgy II (4) Brittle fracture due to metallurgical and environmental factors; fatigue, residual stresses; creep and stress rupture; effect of microstructure, environment, and stress-strain relations; fabrication by forging, rolling, drawing, forging testing. Prereq: 4730 or Mechanical Engineering 3450 and First course in Materials Science, or consent of instructor. Suggested for engineering science and mechanical engineering students.

4860 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. Prereq: 3120 or 3230. 3 hrs or 2 hrs and 1 lab.

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

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

5050 Engineering Analysis (3) As Chemical Engineering 5050.

5110 Dislocations (3) Theoretical and experimental analysis of displacement and interactions in solids. Prereq: 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. Prereq: 5110.
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.

6240 Polymer Engineering Applications of Statistical Mechanics (3) Modern concepts of new polymeric engineering materials: highly integrated engineering and chemical approach. Prereq: Consent of instructor.


6510 Advanced Industrial Polymer Chemistry (3) Chemistry and properties of new polymeric engineering materials; highly integrated engineering and chemical approach. Prereq: Consent of instructor.

5910-20-30 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 DEGREES
Civil Engineering M.E., M.S., Ph.D.
Environmental Engineering M.S.
Environmental Science M.S.

Emeritus Professor:
C. R. Walker, S.M. Massachusetts Institute of Technology, P.E.

Professors:

6510 Advanced Industrial Polymer Chemistry (3) Chemistry and properties of new polymeric engineering materials; highly integrated engineering and chemical approach. Prereq: Consent of instructor.

5910-20-30 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.

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Civil Engineering

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5910-20-30 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 DEGREES
Civil Engineering M.E., M.S., Ph.D.
Environmental Engineering M.S.
Environmental Science M.S.

Emeritus Professor:
C. R. Walker, S.M. Massachusetts Institute of Technology, P.E.

Professors:

6510 Advanced Industrial Polymer Chemistry (3) Chemistry and properties of new polymeric engineering materials; highly integrated engineering and chemical approach. Prereq: Consent of instructor.

5910-20-30 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

4120 Concrete Design (3) Reinforced concrete continuity and beams floor slabs footings and retaining walls. Prereq: 4030 and 4410. Sp

4220 Foundations (3) Subsurface investigations and stability of foundations and cohesive and cohesionless soils. Foundations on rock. Prereq: 3320 and 4410. 2 -hr sections. W, Sp

4240 Photogrammetry (3) Methods of plotting maps from aerial photographs stereoscopic plotting instruments. Prereq: 2360 or Forestry summer camp for forestry majors F, W

4340 Structural Design I (3) Reinforced concrete columns beams and connections. Prereq: 3110 and 3310. W, Sp

4430 Construction Methods and Equipment (3) Fundamental operations in construction and selection of equipment; production rates, balancing of equipment, and total social, political, economic and technical implications. Prereq: 3320 and 4410. F, W

4510-20 Advanced Structural Design I, II (3) Plastic design in steel in 4510 design of typical short span steel highway bridges in 4520. Prereq: 3230 for 4510; 4520 and 4110 for 4520. 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. W

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

4560 Behavior of Reinforced Concrete Members (3) Behavior of various reinforcement system for design. Prereq: 3230. W

4570 Soil Mechanics-Seepage (3) Saturated flow through embankments filter design criteria seepage through clay soils. Consolidation theory. Coreq: 4220

4590 Stabilization of Soils (3) Mechanical stabilization of soils with admixtures waterproofing and modifying soils with additives. Prereq: 3310. 2 hrs and 1 lab. W

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

4640 Traffic Engineering (3) Characteristics of drivability, rate of roadway and their interrelationships, 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 labs. Su

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

4720 Asphalt and Bituminous Concrete (3) Properties and tests of asphalt and asphaltic mixes mix design methods of construction. 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 transport environment, water resources and materials. Prereq: Senior standing or consent of instructor. F, Su


4860 Structural Wood Design (3) Application of structural design principles to structural members of solid wood construction. Beams columns and diaphragm construction with plywood. Various types of fastenings and connections. Prereq: 3230. F

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

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

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

5140 Statically Indeterminate Structures I (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 stresses 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. Prereq: 5150 or consent considered for structural systems approximate design methods developed. Prereq: 5120, 5150. Sp

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

5220 Pavement Design (3) Pavement loads pavement design design practices construction and maintenance. Prereq: 3310. W

5240 Advanced Properties of Materials: Cement and Concrete (3) Permeability and durability; volume changes and creep; elastic and thermal properties 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 maintenance techniques 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 transportation modes and between transportation and other community features. (Same as Planning 5270). W

5300 Construction Cost (3) Cost estimation. Management of heavy and building construction projects. Prereq: 4430 or consent of instructor. F, W, Sp

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

5550 Slope Stability and Retaining Structures (3) Stability of natural and cut slopes and embankments, lateral earth pressure theories. Design of rigid retaining structures sheet pile walls and anchored bulkheads. Coreq: 4220

5560 Shear Stress and Strain Behavior of Soil Continuum and strength of fine grain soil from perspective of idealized simple clay. Drained and undrained shear stress and strain behavior of real soils. Consolidation theory. Coreq: 4220

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

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

5730 Prestressed Concrete (3) Properties of prestressing materials and anchorage systems; methods of posttensioning design analysis and design of members and continuous structures. F

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

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 municipal public works. Prereq: Graduate standing in Civil or Environmental Engineering or consent of instructor. W, A

5805 Urban Systems: Engineering and Management II (3) Continuation of 5800. Management and engineering of urban streets including lighting cleaning and snow removal water supply and wastewater drainage solid waste air pollution regulation etc. 5800. Sp

5810 Traffic Engineering—Characteristics (3) Driver vehicle roadway system level of service concept of capacity. Coreq: Statistics 3450. 2 hrs and 1 -2 hr lab. F

5820 Traffic Engineering—Operations (3) Fixing and volume-dependent systems one-way operations reversible flows system operation including computerized networks legal aspects of operational controls. Prereq: 5810. 2 hrs and 1 -2 hr lab. W

5840 Geometric Design (3) Advanced theory and practice in the geometric design of highways. Prereq: 4600. Sp

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

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

5870 Public Transit Planning (3) Person movement, rapid transit and mass transit; the public transit its various roles and how it fits community's need user preferences modal split models total vehicle and service impacts of public transit. Prereq: 4600 or graduate standing. Sp, A
5880 Highway Safety I (3) Transportation safety, development of federal-state-local relationships, current highway safety standards. Prereq: Graduate standing or consent of instructor.

5885 Highway Safety II (3) Effect of current tort law upon highway safety activities; roadside safety design; urban and rural safety; elements and energy attenuators; identification and correction of high accident locations and system deficiencies. Prereq: Graduate standing in Engineering.

5890 Traffic Accident Reconstruction (3) Proper traffic accident data collection and analysis as basis of designating accident prevention or control programs. Many contributing factors to an accident; proximate and secondary causes as they relate to roadway improvements. Prereq: 4640 or 5810 or consent of instructor. Sp, A

5900 Special Problems in Civil Engineering (1-9) To fulfill the special problem requirement in the non-thesis program. Enrollment limited to civil engineering students in 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) Topics related to current developments in civil engineering not included in other courses. May be repeated.

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

6110 Research Development (3) Development of research activities in private and public sectors. Improving skills to become competitive in attracting research funds that can be used to fulfill 6000-level course requirements in doctoral programs. Prereq: Graduate standing and consent of instructor.

6120 Research Management (3) Management strategies for research programs/projects. Long range and day-to-day management requirements. Course cannot be used to satisfy 6000-level course requirements in doctoral programs. Prereq: 6110. E

6510 Behavior of Steel Bridges and Buildings (3) Behavior, analysis, and design of plate girders, columns and composite members subjected to static and dynamic loading. Prereq: 5170 and 5510. Sp, A

6740 Behavior of Reinforced Concrete Beams and Frames (3) Ultimate strength and behavior of statically indeterminate reinforced concrete structures; applicability of elastic analysis to framed structures; limit analysis. Prereq: 5120 and 5740. Sp, A

6750 Behavior of Reinforced Concrete Slabs (3) Behavior, analysis and design of reinforced concrete slabs; finite element solutions. AC Code methods; yield line and plastic methods. Prereq: 5740 or Engineering Science and Mechanics 5310. Sp, A

6800 Statewide Passenger Transportation Planning (3) Comprehensive multimodal transportation planning course. Transportation demand, functional classification, programming and scheduling. Emphasis on government policy decisions, as they affect air and highway investments. Prereq: 5860. W, A


6800 Planning Models for Transportation Systems II (3) Analytical analysis of modal split, trip distribution, and trip assignment. Mathematical, statistical, and computer science techniques in modeling process. Models integrated for urban transportation planning process. Prereq: 6880. Sp, A

6910-30-40 Special Topics in Civil Engineering (1, 2, 3) Independent study of current interest in civil engineering. Prereq: Consent of instructor. E

Environmental Engineering

4000 Environmental Protection (3) Managing of water resources, bodily wastes and wastewaters; air environment, water environment, and solid waste disposal; hazardous materials; food, and exacerbation of physical energy to prevent impairment of health, to promote efficiency and comfort, and to safeguard balances in natural ecosystems. Principles of environmental protection; objectives of design and practice without detailing design of practice methods.

4930 Environmental Engineering Chemistry (3) Fundamentals of pollution chemistry; techniques of pollution concentration, 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: 3330. Sp

4210 Water Resources Engineering Design (3) Planning and design of multipurpose dam project, including reservoir, dam, and discharge control works. Considerations of dam safety and environmental impact. Microcomputer applications. Prereq: 3330 or consent of instructor. F, Sp

4220 Water Resources Engineering Development (2) Mathematical modeling and solution techniques for comparing and selecting among water resources development alternatives; achieving project optimality; single- and multiple-objective formulations; special topics in new developments in water resources engineering. Prereq: 3330 or consent of instructor. W

4330 Hydrologic Design (3) Application of frequency and regression analysis to hydrologic design of water resources system; unstable surface runoff and streamflow modeling; urban peak runoff design using kinematic wave theory; evaluation of effects of land use changes on streamflow quantity and quality. Prereq: 3330. W

4510 Elements of Water and Wastewater Transport Systems (3) Theory and design of water transport systems and wastewater collection systems. Microcomputer applications. Prereq: 3120. F

4520 Elements of Water and Wastewater Treatment Systems Design (3) Unit operations and processes employed in physical, chemical and biological treatment of water and wastewater. Application of unit operations and processes in design of water and wastewater treatment plants. Prereq: Engineering Science and Mechanics 3110 or consent of instructor. Sp, Su

4525 Water and Wastewater Treatment Plant Design (3) Design of wastewater treatment and sludge handling systems, ultimate disposal of residuals. Prereq: Consent of instructor. W

4530 Environmental Engineering Laboratory (3) Standard analytical techniques for evaluation of specific air, water and solid waste pollutants. Prereq: 4930. 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 including landfill, incineration, composting, fixation, recovery, and proposed new technologies; current and future regulations. Prereq: Junior standing. Sp

4700 Air Pollution—Air Resources Management (3) Introductory course on concepts of air pollution; analysis of relationship among emission sources, meteorology and topographic factors, and adverse effects on receptors; safeguarding 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; emphasis upon federal-state relations, recent legislation and court decisions, and enforcement. Prereq: Senior standing. F

4900 Thesis (1-15) P/N/P only. E

5002 Non-Thesis Graduation Completion (3-15) Required for the non-thesis student not otherwise registered during any quarter when such a student unconditionally completes all course work and degree is complete. May not be used toward degree requirements. May be repeated. S/NC only. E

5230 Open Channel Hydraulics (3) Open channels and properties; principles and applications of uniform and gradually- varied flow; unsteady flow. Routing; dam break flood analysis; spatially- varied flow. Microcomputer applications. Prereq: Engineering Science and Mechanics 3110 or consent of instructor.

5232 Sediment Transportation (3) Sediment properties and measurements; bed loads and suspended loads in motion and load transport; current and future regulation 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; topographic design criteria; traditional flood control measures; land use controls and adjustments; flood proofing, flood insurance, and other flood damage reduction elements; interdisciplinary approach in floodplain management; case studies. Prereq: Consent of instructor.

5261 Basic Principles of Remote Sensing (3) Applications of remote sensing in agriculture, natural resources, forestry, meteorology, land use planning, and resource management; properties of electromagnetic radiation and mechanical, physical and optical properties of objects, and the interaction of EM radiation and matter; current data 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, including the Earth Imaging and Communication Systems; mission planning. Prereq: 5261 or consent of instructor.


5301 Stormwater Modeling I (3) Interpretation of hydrologic data using methods of systems analysis. Hydrologic components are analyzed as linear and nonlinear systems integrated into mathematical models of watershed response. Optimizing model parameters with illustrative examples. Prereq: Consent of instructor. W

5302 Stormwater Modeling II (3) Continuous streamflow records interpreted using methods of stochastic hydrology, including flow frequency and time series analysis. Hydrologic design of water resources systems using streamflow simulation techniques including autoregressive and fractional Gaussian noise models. Prereq: Consent of instructor. Sp


5330 Descriptive Hydrology (3) Occurrence and description of elements of hydrologic cycle, effects on earth and relation to humans. Not for civil engineering majors.

4400 Introduction to Environmental Systems (3) Models of air and water quality, water resources, solid waste disposal, and location of central facilities; environmental and related curricula and environmental management problems, optimization of these systems. Prereq: Graduate standing, Civil Engineering 4800 or consent of instructor. Sp

5501 Water and Wastewater Treatment Theory I (3) Theory of unit processes employed in water and/
### Course Descriptions

#### 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 Wastewater Treatment Systems (3) Theory, operation, and use of advanced wastewater systems. Emphasis on those systems used for wastewater reclamation. Prereq: 4520. Sp

#### 5530 Environmental Engineering and Natural Systems Behavior (3) Seminar in selected issues of environmental engineering science relating to natural system behavior. Eutrophication, trace metals, and trace toxicants. Prereq: Graduate standing or consent of instructor.

#### 5551 Water Quality Management (3) Water quality control objectives, methods, and philosophies; water quality criteria; effect of various uses on water quality; receiving water characteristics and waste assimilative capacity; regulatory standards; economic considerations. Prereq: 4520. W

#### 5552 Industrial Waste Unit Operations and Processes (3) Theory, operation, and use of advanced treatment of industrial wastes and residuals, utilization of water quality data. Prereq: 5501, 5502, 5503, 5551. 1 hr and 4 labs.

#### 5553 Industrial Waste Management (3) Sources and characteristics of industrial wastes, recycling, waste reduction, energy recovery, resource recovery, and treatment options, ultimate disposal of residuals including thermal processes, land application, recovery, and encapsulation; design oriented. Field trips. Prereq: 5501, 5502, 5503.

#### 5560 Solid Waste Resource Recovery (3) Analysis and design of resource recovery processes and operations designed to municipal and industrial waste. Prereq: 4500. W


#### 5710 Air Pollution Control Engineering (3) Emission control systems for industrial and power generating processes, stack sampling methods, air monitoring, emission 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. Use of air monitoring data in air quality management programs. Prereq: Consent of instructor.

#### 5720 Air Pollution Particle Collection Theory (3) Mechanics of particles suspended in gaseous media including Brownian motion, coagulation, and aerodynamic capture of particles. Prereq: Engineering Science and Mechanics 3110. W

#### 5725 Air Quality Modeling and Impact Assessment (3) Techniques to assess the air quality impact of major transportation projects and industrial air pollution sources. Application of atmospheric dispersion models and evaluation of meteorological and air quality data. Prereq: Graduate standing, Computer Science 3150. Sp

#### 5730 Air Pollution Control Device Design (3) Design and evaluation of systems used to control emission of gaseous and particulate air pollutants. Comprehensive design of specific devices and systems. Prereq: 5720. Sp

#### 5735 Industrial Source Sampling (3) Sampling methods for gaseous and particulate air emissions from industrial processes. Prereq: Graduate standing. 2 hrs and 1 lab. Su

#### 5745 Ambient Air Chemistry (3) Reaction mechanisms for production of secondary air pollutants from atmospheric primary pollutants and naturally 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 Eulerian and Lagrangian spectra, differences between instantaneous and continuous sources, diffusion in a zone of wind shear and diffusion from urban area sources. Prereq: 5725.

#### 5800 Special Problems in Environmental Engineering (1-9) Special problems in the non-thesis program. Enrollment 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) Problems and topics related to current developments in field of environmental engineering not included in other courses. May be repeated. E

#### 5990 Environmental Engineering Seminar (1) All phases of 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. S/NC only. E, F, W, Sp

#### 6510 Industrial Waste Unit Operations and Processes (3) Laboratory and pilot plant development of physical, chemical and biological variables for treatment of industrial wastes and residuals, utilization of water quality data. Prereq: 5501, 5502, 5503, 5551. 1 hr and 4 labs.

#### 6552 Industrial Waste Management (3) Sources and characteristics of industrial wastes, recycling, waste reduction, energy recovery, resource recovery, and treatment options, ultimate disposal of residuals including thermal processes, land application, recovery, and encapsulation; design oriented. Field trips. Prereq: 5501, 5502, 5503.

#### 6553 Rote Problems in Environmental Pollution (3) Application of scientific principles concerning movement and fate of chemicals at interfaces of three geospheres of environment (air, water and earth solids). Development of intuitive sense to enhance problem solving. Prereq: 5501, 5503 or consent of instructor.

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

**NOTE:** Prerequisite to all graduate courses: Consent of Instructor.

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## Electrical Engineering

**MAJOR**

**DEGREES**

### Electrical Engineering

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

**Professors:**

- J. M. Googe (Head), Ph.D. Georgia Institute of Technology, P.E. ; J. A. LeFebvre, Ph.D. Wisconsin, P.E.;
- T. V. Blalock, Ph.D. Louisiana State; J. T. W. Reddoch, Ph.D. Maryland; J. F. Pierce, M.S. Tennessee; H. P. Kell, Ph.D. Auburn, P.E.;
- J. D. Birdwell, Ph.D. Massachusetts Institute of Technology, D. W. Boulton, Ph.D. Vanderbilt;

**Associate Professors:**

- J. M. Googe, Ph.D. Georgia Institute of Technology, D. W. Boulton, Ph.D. Vanderbilt;

**MAJOR OF SCIENCE PROGRAM**

Graduate work leading to the Master of Science degree in Electrical Engineering cannot be completed during the full-time 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.

## MASTER 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. An examination 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, natural sciences, or engineering sciences.

### DEGREE REQUIREMENTS

Specific degree requirements which must be met include:

1. Electrical Engineering 5070-80 and 5710. Electrical Engineering 5710 is normally available in both fall and spring quarters. Students electing courses such as 5650-60, 5720-30, or 5750-60 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, 4850, 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.

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

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

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

## DOCTORAL PROGRAM

A Ph.D. degree with a major in Electrical Engineering may be pursued in the areas of circuit theory, computers, computer science, signal processing, control 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.

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 either the M.S. or Ph.D. programs. In addition, 4000-level courses in electrical engineering...
production, noise reducing systems. Prereq: Senior standing.

4600 Analog Signal Processing Circuits for Elec-
tronic Instrumentation (3) Operational amplifiers, instru-
mentation amplifiers and integrated circuits in signal pro-
cessing. Active filters, amplifiers, attenuators, function generators, active rectifiers, and sample-hold amplifiers. Analysis of feedback pro-
cessing problems between transducers and signal-
processors. Prereq: 3830. 3 hrs including project
laboratory.

4610 Analog-Digital Systems (3) Principles of ana-
log-to-digital components. Applied to analog com-
puting to include problem set-up and scaling. Char-
acteristics of analog multipliers, dividers and func-
tion generators are developed. Presents compara-
tors, digital-to-analog conversion, and analog to digi-
tal conversion techniques. Prereq: 3180 and 3830. 3
hrs including biweekly lab.

4620 Sequential Machine and Digital System
Theory (3) Considers design aspects of pulse-
mode, clock-mode, and level-mode sequential cir-
cuits, asynchronous and synchronous considera-
tions, and design for both one- and two-
dimensional iterative networks. Design of large scale
digital systems using MSI and MSI technologies. In-
roduces principles of reliability and error detection in
digital systems. Prereq: 3180. 3 hrs including biweekly lab.

4630 Digital System Organization and Design (3)
Considers system organization of digital systems in-
cluding minicomputer and microprocessor
architectures and comparisons. Characteristics of ALL
central processing units, memory, ROM, and PROM building blocks, and input-output
systems are developed. Control unit organization to
include sequential machines and modes of operation, synchro-
nous-asynchronous time sequencing and micropro-
gramming of control functions. Prereq: 3180. 3 hrs
including biweekly lab.

4660 Bioelectric Instrumentation (3) Nature and
origin of bioelectric potentials, transducers, amplifier
requirements, recording systems and noise prob-
elens.

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 theory and practice for one- and two-
dimensional networks. Prereq: 3040, 3830. 3 hrs including
project laboratory.

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

4740 Integrated Circuits (3) Processing and fab-
rication of active and passive components for mono-
lithic computer and circuits. Design techniques for linear
and digital circuits. Prereq: 3830. 3 hrs including pro-
ject laboratory.

4780 Synchronous Machines (3) Construction and
application, analysis of performance from equivalent
circuit models for round motor and salient pole
machines. Park's transformation to the 2-axis model
and use in transient studies; analysis of 2-axis con-
cept to generalized theory of electrical machines.
Prereq: 3090.

4790 Controllable Motor Drives (3) Structural
features and design parameters for usual variations of
the d.c. motor; a.c. servo motor; stepping motor;
development of transfer functions and examples of
their application in control system. Prereq: 3090.

4800 Hardware-Software Interface in Minicom-
puter Systems (3) Microcomputer Organization and Design
(hardware-software interaction and trade-offs. Project
oriented, contrast course. Completion of two pro-
jects utilizing a minicomputer and the other micro-
computer, are minimal course requirements. Prereq: 3180.

4810 Discrete-Data Systems (3) Introduction to
analysis and design of discrete data control/systema-
using frequency domain techniques. Real-time digi-
tal filtering techniques; application of digital comput-
ers in closed-loop feedback systems. Prereq: 3720.

4820 Introduction to Pattern Recognition (3) Role
of pattern recognition within framework of artificial
intelligence. Topics dealing with the design of learn-
ning and adaptive machines. Typical applications of
pattern recognition and measuring signal signifi-
cance. Computer simulation of elementary pattern
recognition problems. Prereq: Either 3100 and Com-
puter Science 4820 or 4830 and Computer Science
1510. (Same as Computer Science 4820.)

4830 Digital Image Processing (3) Principal
methods for coding, storing, and processing images
by means of digital computers. Theoretical algo-
rithms for image operations. Prereq: 3100 and
Computer Science 3150, or Statistics 3450 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 soft-
ware and assembly language programming. Course
is 1410. Coreq: Basic Engineering 1410, Computer
Science 1510 or 3150 or consent of instruc-
tor. (Same as Computer Science 4850.)

4910-20-30 Special Electrical Engineering Prob-
lem (3, 3, 3) Project activity in problems in electrical
engineering involving library and experimental research.

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

5040-50-60 Electrical Engineering Research (3, 3,
3) Coefficient properties of laser radiation and
application examples: plasma diagnostics, optical
diagnosis, X-ray diagnostics. Spectroscopy and its
limitations, etc. Future possibilities. Consen of instruc-
tor or plasma engineer or plasma physics back-
ground or employment in fusion work.

5070-80 Modern Transform Methods (3, 3) La-

5120 Network Synthesis and Design (3) Frequen-
ty domain and time domain synthesis of network
functions: realization of two-port networks. Design
of microwave circuits in signal processing. Active filters, amplifiers,
and digital circuits. Prereq: 3830. 3 hrs including pro-
ject laboratory.

5130 Advanced Network Analysis (3) Mathemati-
cal definition of feedback. Return difference and re-
turn ratio. Sensitivity. A thorough study of Bode's theorems of
feedback network analysis. Comparison of classical and
quantized oscillator models for emission and absorp-
tion. Oscillator spectral line, shape for amplification
by stimulated emission of radiation and schemes for
obtaining population inversion. Coreq: Mathematics
4710 or equivalent.

5150 Advanced Synchronous Machines (3) Con-
struction and application, analysis of performance from equivalent
circuit models for round motor and salient pole
machines. Park's transformation to the 2-axis model
and use in transient studies; analysis of 2-axis con-
cept to generalized theory of electrical machines.
Prereq: 3090.

5160-60 Control Systems Design I, II, III (3, 3,
3) Analysis and design of continuous and digital con-

cal systems theory. State-space model, linear
system compensation. Emphasis on
feedback theory; system modeling; stability anal-
ysis. Computer simulation of elementary pattern
recognition problems. Prereq: Either 3100 and Com-
puter Science 4820 or 4830 and Computer Science
1510. (Same as Computer Science 4820.)

5230 Advanced Electrical Machinery Applica-
tions (3) Linear motors; pole-atom and other special machines; variable fre-
quency operation. Prereq: 2510.

5240 Application of Quantum Electronic Devices
(3) Coherence properties of laser radiation and
quantum electronics. Spectroscopy and its
limitations, etc. Future possibilities. Consen of instruc-
tor or plasma engineer or plasma physics back-
ground or employment in fusion work.

5320 Diagnostics for Fusion (3) Hot plasma. Sim-
ple, passive measurement techniques, and magne-
tism. Microwave methods, Charge-exchange techniques.
X-ray diagnostics. Spectroscopy and its
limitations, etc. Future possibilities. Consen of instruc-
tor or plasma engineer or plasma physics back-
ground or employment in fusion work.

5320 Engineering of Fusion (3) Materials in a
thermonuclear environment. Magnetic field produc-
tion. Divertor design. Blankets and breeding of tri-
tum. Radiological safety. Cost of controlled fusion
power. Prereq: Consent of instructor or plasma en-
gineering or plasma physics background or employ-
ment in fusion work.

5340 Introduction to Quantum Electronics (3) In-
teraction of poly- and monochromatic radiation with atoms and molecules. Comparison of classical and
quantized oscillator models for emission and absorp-
tion. Oscillator spectral line, shape for amplification
by stimulated emission of radiation and schemes for
obtaining population inversion. Coreq: Mathematics
4710 or equivalent.

5350 Properties of Quantum Devices (3) Optical
resonance cavity theory and design; steady-state and
Q-switched operation. Stable modes of oscillation.
Modulation and stabilization techniques. Laser out-
power and spectral line shape for amplification
and modulation. Operation characteristics of NH3 maser and
ruby, plasma, and semiconductor diode lasers.
Prereq: 5340 and Mathematics 4710 or equivalent.

5360 Application of Quantum Electronic Devices
(3) Coherence properties of laser radiation and
quantum electronics. Spectroscopy and its
limitations, etc. Future possibilities. Consen of instruc-
tor or plasma engineer or plasma physics back-
ground or employment in fusion work.

5370 Advanced Direct Electrical Energy Conver-
sion I (3) Theory, latest devices, and applications for
conversion of electrical energy by solid state means of thermonic and photovoltaic effects. Prereq: 4020 or Mechanical Engineering 4150 or equivalent, or consent of instructor.

5380 Advanced Direct Electrical Energy Conver-
sion II (3) Theory, latest devices, and engineering
applications for conversion of electrical energy by
gaseous means of thermonic, magnetohydrodyna-
mic, and electrogas-dynamic effects. Prereq: 4020 or Mechanical Engineering 4150 or equivalent, or consent of instructor.

5390 Advanced Direct Electrical Energy Conver-
sion III (3) Theory, latest devices, and engineering
applications for conversion of electrical energy by
gaseous means of thermonic, magnetohydrodyna-
mic, and electrogas-dynamic effects. Prereq: 4020 or Mechanical Engineering 4150 or equivalent, or consent of instructor.

5410 Power System Networks (3) Sequence im-
pedances for transmission lines, machines, and
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 more than from work on a thesis. In Plan II, a minimum of 45 quarter hours, including the thesis is required. In Plan I a minimum of 48 hours is required. The requirements include the following:

<table>
<thead>
<tr>
<th>Hours</th>
<th>Credit</th>
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<tbody>
<tr>
<td>Mathemat</td>
<td>Engineering courses</td>
</tr>
<tr>
<td>(Major option; may include but is not restricted to courses offered by the Engineering Science and Mechanics Department.)</td>
<td>16</td>
</tr>
<tr>
<td>Related courses (May include additional courses in mathematics, computer science, or the physical and life sciences as well as engineering courses.)</td>
<td>9</td>
</tr>
<tr>
<td>Thesis</td>
<td>9</td>
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<tr>
<td>Total</td>
<td>27*</td>
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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 names and addresses of four references must be included with the department application.

*Engineering courses under Plan II may include advanced laboratory work or special problem work, for example Engineering Science and Mechanics 9010 or analogous courses in other departments.
and regulations. Prereq: 3410, Physics 2320, or con-
sent of instructor.

3700 Dynamics (4) Kinematics of rigid bodies; mass
moment of inertia; kinematics of circular motion; the
geometry of rigid bodies using force, mass, acceleration; work-
energy; impulse-momentum. Not for departmental
credit. Prereq: 2700 or Basic Engineering 1320, Mathematics 2840.

3710 Intermediate Dynamics (3) Three-
dimensional dynamics of particles and rigid bodies; determination of
rigid bodies with varying mass center; the
LaGrange's equations. Prereq: 3700, Mathematics 2850.

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

4520 Biomedical Fluid Mechanics (3) Discuss
objectives, review foundations and present develop-
ments in biomedical and fluid mechanics. Properties of
human blood and blood vessels, determinants of
cardiac performance, analysis and measurement of
flow and pressure in arteries, nontraumatic study of
circulatory system, mechanics of microcirculation.
Applications to areas of hemolysis, thrombosis, and
flow in diseases of the heart and blood vessels.
Prereq: 3310 or 4500 or consent of instructor.

4530 Biomechanics (3) Discuss objectives, review
foundations and present developments in areas of
mechanical properties of living tissues, biomech-
nics of injury and prosthesis, material compatibility of
prosthetic devices and bio-implants. Prereq: 3310 or a
course in fluid mechanics or consent of in-
structor.

4540 Fracture-Safe Design (3) A critical review of
mechanical properties of materials that are indicative of
fracture resistance, including transition tempera-
ture, R-curves, stress intensity factors, and J-
integrals; the use of these properties in design. Pre-
req: 3310 and Metallurgical Engineering 2110
(Same as Metallurgical Engineering 4540) 3 hrs or 2
hrs and 1 lab.

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

4610 Experimental Stress Analysis (3) Basic con-
cepts; theory, techniques, and instrumentation of re-
stance strain gages; theory and techniques of brit-
tie coating method; introduction to other stress
analysis methods. Prereq: 3310, Electrical Engineer-
ing 2030 or 3110. 2 hrs and a 3-hr lab.

4620 Dynamic Data Acquisition (4) Instrumenta-
tion of measuring systems for dynamic events and
responses; signal conditioning, oscilloscopes, electronic
potentiometers, and magnetic tape recording; te-
lemetry and data transmission; data processing. Pre-
req: 3311, 4710, Electrical Engineering 3120. 3 hrs
and 2 labs.

4630 Introductory Photomechanics (3) Introduc-
tion to photoelasticity, photoelastic coating method.
Moire method, interferometry, and holography.
Prereq: 3310, Physics 2320. 2 hrs and a 3-hr lab.

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

4780 Engineering Acoustics (3) Concepts of
acoustics. Measurements of sound and their units. Noise
generation and transmission. Noise control princi-
ples and application. Materials and procedures for
noise abatement. Prereq: Introductory; concepts of
vibration or acoustics.

4810-20 Engineering Analysis (4, 3) Integration of
fundamental physical laws and mathematical
methods for the solution of engineering prob-
lems. Prereq: 3110, 3311, and Mathematics 3150.

4850 Elementary Structural Matrix Methods (4)
(Same as Architecture 4850 and Civil Engineering 4860)

4810 Special Engineering Science Topics (3) Pro-
lems related to recent developments and prac-
tice. Open to juniors or seniors with consent of in-
tructor. May be repeated. Maximum 6 hrs.

5000 Thesis (111) P/NP only. E

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

5110-20 Fluid Dynamics (3, 3) Kinematics of fluids,
vorticity, rate deformation, plane and axially
symmetric stream functions, Navier-Stokes equation, exact
solutions; flow and boundary-layer approx-
imations; nonviscous flow, potential theory, complex
potentials, conformal mapping. Prereq: 5800.

5130 Introduction to Turbulence (3) Macroscopic
effects, analogs to stress-stiffness, correlation func-
tions, 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 ele-
tokes. Basic methodology; initial-value
methods; matrix interaction; accuracy and con-
vergence concepts. Prereq: 5110 or equivalent. 3 hrs
and 3 labs.

5140 Finite Element Structural Analysis (3) (Same
as Civil Engineering 5140)

5220 Mechanics of Viscous Flow (3) Viscous
forces in flow phenomena; application of Navier-
Stokes equations; numberical methods of solutions;
stress-continuity-three-dimensional flow
analysis. Prereq: Mathematics 4610. (Same as Chemical
Engineering 5610.)

5310-20 Advanced Materials of Mechanics (3, 3, 3)
Advanced topics in mechanics of materials:
elementary theory of elasticity. Prereq: 3311 and
Mathematics 4610.

5410-20 Theory of Elasticity (3, 3, 3) Stress, strain in
three dimensions; torsion and bending of prismatical
bars, axi-symmetric; stress, strain, stress con-
centration; plane stress, plane strain. Prereq: 5800.

5430 Thermal Stresses (3) Heat conduction, ther-
eoelastic equations; thermal stresses in beams, rings,
plates, and shells; thermal buckling problems. Pre-
req: 5410 or 5610-20-30, and Mechanical Engineer-
ing 3440.

5550 Fracture Mechanics (3) Equilibrium cracks and
crack propagation. Numerical methods for deter-
mination of fracture mechanics parameters. Prereq:
5800, Metallurgical Engineering 4730 or Mechanical Engineer-
ing 5550.

5560 Photoelasticity (3) Physical optics, wave mo-
tion, polarized light, basic principles of photoelastic-
ty, equipment, and techniques, application to two-
dimensional elasticity and stress concentration,
numerical methods in photoelastic stress analysis,
photoelastic coating methods, three-dimensional
photoelasticity. Prereq: 3311, Mathematics 4610,
and consent of instructor.

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, Mathematics 4510.

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

5800 Introduction to Continuum Mechanics (3)
Fundamentals of mechanics of solids and fluids;
Cartesian tensors; stress, deformation, and flow in
continuous medium; constitutive equations, applica-
tions to solids. Prereq: 3110 and 3311 or equivalents,
Mathematics 4610.

5840 Perturbation Methods in Mechanics (3) Regu-
lar and singular perturbation methods for solution of
4150 Project Control with CPM and PERT (3) A study of modern project planning, control, and evaluation of project costs through use of critical path methods, including applications of computer methods. Prereq: 4060.

4160 Materials Handling (3) Analysis and planning for the overall problem of moving, packaging, and storing of materials. Prereq: 4250 and Engineering Science and Mechanics 3310. Not available for graduate credit for industrial engineering students.

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

4230 Scheduling Systems (3) Performance measures for job shop and flow shop scheduling, including both static and dynamic conditions, as well as techniques for generating production schedules. Deterministic 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. Prereq: 3630.

4520 Engineering Economy (3) Methods and problems in selection or replacement of equipment. Decisions among engineering alternatives, involving capital and operating costs, equipment and rate of return on investment. Not available for graduate credit for industrial engineering students.

4530 Case Studies in Engineering Economy (3) Extension of basic engineering economy principles to actual problems faced by competitive firms and regulated industries. Case studies taken from literature form basis of classroom discussion. Out-of-class assignment is made which involves working with local companies to evaluate make or buy options, leasing versus cash purchases, equipment replacement studies, energy source economies. Prereq: 4520.

4540 Industrial Development (3) Factors other than mechanical or chemical which enter into successful establishment of manufacturing enterprise. Cost and location studies and market analysis to determine the commercial feasibility of new plants or projects.

4590 Simulation (3) Generation of outcome of complex random process by computer. Models of complex systems using available simulation languages. Simulation as design tool in industrial systems. Prereq: 3430 and Computer Science 3150.

4600 Predetermined Time Systems (3) Work design and measurement using predetermined time systems; methods time measurement, basic motion study, work factor. Theory and application. Prereq: 3630.

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.

4630 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) Use of computer hardware and human-computer interfaces; emphasis on small computers as element of larger system; applications and limitations of small computers in solving industrial engineering problems. Prereq: Senior standing.

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

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

5110 Work Design (3) Advanced methods analysis of design and improvement of work systems, human factors, workers' response and management participation. Prereq: Motion and time study or work methods and design.

5210 Advanced Work Measurement (3) Characteristic of predetermined time systems; application to formula construction, and practice in application. Prereq: 3600 or 3620.

5240 Facilities Planning and Design (3) Modern materials handling techniques, computer-aided layout techniques, applications of operations research models, and use of these to design manufacturing facility. Prereq: Production facilities planning or consent of instructor.


5280 Information Systems Design (3) Systems engineering approach to information systems design. System model, analysis, and evaluation of information systems, system objectives and design criteria. Optimization and simulation in system design.

5280 Production and Inventory Systems (3) Application of OR techniques to production and inventory systems; determination of solution areas; search techniques, and use of available computer codes. Prereq: 5700. Coreq: 5710.


5600 Human Factors Engineering (3) Human characteristics which influence design of tools, equipment, environments, and products. Modeling of human behavior, process control system. Prereq: Consent of instructor.

5610 Human Factors Engineering (3) Human operator performance characteristics, and environmental system requirements. Format description of human operator behavior characteristic control based simulation models and models describing operator as information processor. Prereq: 5600.

5700 Optimization Methods in Industrial Engineering (3) Optimization of linear and nonlinear systems required in 5710, 5720, and 5730. Classical optimization theory. N-dimension geometry and calculus of variations, selected areas of operations re-
search. Prereq: Computer Science 3150 and matrix algebra.

5701 Operations Research Applications (3) Survey of operations research techniques with emphasis on application to industrial engineering problems. Prereq: Mathematics 2960 (or equivalent), Statistics 3450, computer programming. Available for credit only to students without a B.S. degree in industrial engineering.

5710 Linear, Quadratic and Separable Programming (3) Mathematical programming; linear programming, quadratic programming, and separable programming. Computer solutions to programming problems. Prereq: Computer Science 3150 and matrix algebra.

5720 Queuing Models and Simulation (3) Theory and application of waiting line models and simulation methods employed to evaluate complex queueing systems. Data analysis and hypothesis testing related to pertinent waiting line probability density functions. Preq: 5700, 5360.

5730 Game Theory and Random Processes (3) Operations research including game theory with applications to decision making in competitive environment, and random processes with applications to queuing, inventory models and decision making. Prereq: 5360.

5830 Health Systems Engineering II (3) Health systems for the future, care improvement and evaluation of function and total health system. Prereq: 4830.


5900 Design Project (1-9) Industrial engineering topic to fulfill design project requirement in nonthesis program. Enrollment limited to industrial engineering students. May be repeated. Maximum 9 hrs. S/NC only.

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


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. Preq: 5700.


6910 Advanced Topics in Industrial Engineering (3) Will cover topics not covered in other graduate courses. A forum for advanced graduate students to study individually or in groups as appropriate. Preq: Graduate standing and consent of instructor. May be repeated with consent of department.

-- Space Institute, Tulsa, Oklahoma

**Mechanical and Aerospace Engineering**

### MAJORS

**Aerospace Engineering**

#### DEGREES

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

**Mechanical Engineering**

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

#### Professors:

- D. R. Pitts (Head), Ph.D. Georgia Institute of Technology, J. F. Bailey (Emeritus), Ph.D. Denigh, P.E.; F. G. Collins, Ph.D. California (Berkeley).

#### Associate Professors:

- R. A. Annini, Ph.D. Virginia Polytechnic; S. E. Becker, Ph.D. North Carolina State, P.E.;
- C. W. Brown, M.S. Tennessee, P.E.;
- R. A. Crawford, M.S. Tennessee, A. Euler,
- Ph.D. Purdue, P.E.; T. H. Moulden*, Ph.D. Tennessee; M. Parang, Ph.D. Oklahoma;
- J. R. Parsons, Ph.D. North Carolina State, P.E.;

#### Assistant Professor:

- P. E. George, Ph.D. Purdue.

#### GRADUATE STUDY PROGRAMS

Graduate programs in Mechanical Engineering or Aerospace Engineering are available which lead to the degrees of Master of Engineering, Master of Science, and Doctor of Philosophy with concentrations in solar energy, energy conversion and utilization, power generation, machine design and improvement of internal combustion engines, and improvement of internal combustion engines, and improvement of internal combustion engines. The student's committee will be of the student's committee. Specific program requirements are given below.

### MASTER OF ENGINEERING PROGRAMS

**Entrance into the Master of Engineering program is restricted to qualified graduates of other curricula 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 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. 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.
4. Participation in the departmental seminar program.
5. The Problems Option. The requirements of this option are that the student must satisfactorily complete a program of study that includes:

1. A minimum of 36 quarter hours of course work which includes at least 18 quarter hours of graduate (5000-level or above) courses in mechanical and/or aerospace engineering and normally 9 quarter hours of course work (4000-level or above) in mathematics.
2. A minimum of 9 quarter hours credit in Selected Engineering Problems (5900). A written report must be presented for each problem investigated.
3. Participation in the departmental seminar program.
4. Passing a comprehensive written final examination on 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 background.

The student must satisfactorily complete an approved program of study which normally includes:

### MASTER'S 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 program.
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.
4. Participation in the departmental seminar program.
5. The Problems Option. The requirements of this option are that the student must satisfactorily complete a program of study that includes:

1. A minimum of 36 quarter hours of course work which includes at least 18 quarter hours of graduate (5000-level or above) courses in mechanical and/or aerospace engineering and normally 9 quarter hours of course work (4000-level or above) in mathematics.
2. A minimum of 9 quarter hours credit in Selected Engineering Problems (5900). A written report must be presented for each problem investigated.
3. Participation in the departmental seminar program.
4. Passing a comprehensive written final examination on all course work submitted for the degree and an oral examination of all work (including problems) submitted for the degree.
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, performance evaluation, application.

4180 Energy Production and Utilization (3) Thermodynamics constraints on energy production; comparison of power generation methods; evaluation of new energy sources and concepts; energy conservation schemes.

4220 Environmental Noise (3) Basic principles of acoustics—measurement and control of noise in industrial and community environments.

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 of sliding bearings; 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, transverse, stress, rate, and physical properties. Planning, conducting, analyzing, and reporting experimental tests run according to test standards and other specifications.

4621 Manufacturing Processes (3) Comparison of machining processes, manufacturing methods, production, metrology, and numerical solutions. Applications to design.

4622 Tool Design (3) Principles underlying tool 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.

4625 Manufacturing Process Engineering I (3) Product specification: dimensional analysis of size and form, dimensional tolerance theory; tolerance analysis; and workpiece control for production to tolerance.

4631 Energy Methods in Mechanical Design (3) Application of strain energy principles in complex beams and structures.

4650 Materials and Manufacturing Process (3) Selection of materials in design process, emphasizing relationship between stress and strain analysis, 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, gearing, andclutches; election of chains and belting.

4680 Machine Elements (3) Application of strength and properties of materials, design factors, theories of failure to design machine elements, springs, gearing, andclutches; election of chains and belting.

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 radiation; review of 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 in internal combustion and propulsion engines; detonation, dissociation, equilibrium, dissociation. Analysis of internal combustion engines using ideal 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) P/NP only. E

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

5110 Conduction Heat Transfer (3) Analysis of steady state and transient heat conduction by analytical and numerical techniques. Prereq: 3910, 4420 and Mathematics 3150.

5120 Convection Heat Transfer (3) Equations of viscous fluid flow, energy equation, convection analysis of internal and external flows including effects of variable heat flux, surface temperature, and fluid properties. Prereq: 5310 or equivalent.


5140 Phase Change Heat Transfer (3) Fundamental mechanisms, modeling and prediction of nucleate, transition and film boiling; critical heat flux; forced convection in bearings 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) Pre- req: Consent of instructor.

5310 Intermediate Fluid Mechanics (3) Vector descriptions in fluid mechanics; derivation of basic equations; two dimensional flow; viscous flows with emphasis on boundary-layer theory. Prereq: 3410.


5410-20-30 Research in Mechanical Engineering (3, 3, 3) Design of experiments; data analysis; experimental investigation.

5510-20-30 Mechanical Engineering Design (3, 3, 3) Design of mechanical engineering units and systems.


5601 Dynamics of Mechanical Systems (3) Computation 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 in the static and dynamic analysis and redesign of complex, three dimensional, statically indeterminate mechanical systems. Prereq: 5601 or consent of instructor.

5610-20-30 Experimental Stress Analysis (3, 3, 3) Theory of elasticity; experimental methods; photoelasticity; strain gages, laser coating techniques.

5640-50-60 Advanced Machine Design (3, 3, 3) Design of bearings, gears, shafting; lubrication systems.

5670-80 Dynamics of Machinery (3, 3) Kinematics and dynamics of rotating machinery; interaction of fluid flow and rotating machinery. Prereq: 3620, 3910.

5690 Vibrations of Mechanical Systems (3) Free and forced vibration of single and multiple degree of freedom systems; linear and nonlinear. Prereq: 3630.

5710 Metal Machining (3) Analytical approach to metal machining. Basic phenomena-plastic flow, fractures, friction and wear. Prereq: 3650, 3440, and Metallurgical Engineering 2110.

5800 Transfer Matrix Methods in Estimatenchan of Structural Dynamics (3) Transfer matrix methods to statically and dynamically lumped parameter elastic systems in mechanical engineering. Calculation of forced response due to complex, historical surfaces to rotating shafts having complex end conditions. Balancing of rotating shafts. Accuracy and numerical convergence. Prereq: Graduate standing in engineering and consent of instructor.


5840-50-60 Turbomachinery Systems (3, 3, 3) Design, analysis of design, and integration of turbomachinery components. Prereq: First year graduate standing and consent of instructor.

5870 Dynamic Modeling and Simulation (3) Modeling of physical systems including mechanical, thermal, hydraulic, pneumatic and electromagnetic systems. Techniques for experimentally determining system parameters. Analog and digital computer simulation techniques. Prereq: 3630, 4420, and Aerospace Engineering 3511.

5900 Selected Engineering Problems (3-9) Selected problems in mechanical engineering to fulfill requirements of Problems Program. Enrollment limited to students in Problems Program. Prereq: Consent of advisor. May be repeated. S/NC only.

5950 Seminars (1) All phases of mechanical engineering, including reports on current research at The University of Tennessee, Knoxville. May be repeated. S/NC only.

5990 Special Topics in Mechanical Engineering (1-3) May be repeated.

6000 Doctoral Research and Dissertation (3-15) May be repeated. S/NC only.

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 characteristics of luminous flames and nonluminous gases; scattering by planetary atmosphere. Prereq: 5110-20-30; Mathematics 4550.

6200 Selected Topics in Thermodynamics (3) Comparison of macroscopic and microscopic approaches to the equilibrium of pure substances; metastable states. Prereq: Consent of instructor.

6340 Selected Topics in Thermodynamics (3) 6610 Engineering Vibrations (3) Mechanical transients. Linear and nonlinear single degree of freedom systems. Prereq: Consent of instructor.

Aerospace Engineering

3610 Dynamics (3) Newton's Law: work-energy impulse-momentum, Lagrange equations, central force, gyroscopic effects. Applications to aerospace systems.

3620 Mechanical Vibrations (3) Free and forced vibration of single and multiple degree of freedom 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 Aeronautical Fundamentals (3) Atmosphere, dynamics and thermodynamics of 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 static performance problems, maneuvers, control surfaces, stability and control. For non-aerospace engineering majors only.

4210 Compressible Flow (3) One-dimensional internal flow, shock and expansion waves; friction and nonadiabatic flow; propulsion, aerodynamic heating.

4220 Low Speed Aerodynamics (3) Potential flow theory; kinematics and dynamics of perfect fluids; analysis and design of aeroelastic 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.

4471-91 Experimental Aerospace 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.

5100 Airplane Performance (3) Introduction to airfoil and wing characteristics, drag; propellers; static performance and maneuvers; theory and design of control surfaces; lift, drag, and stability. Prereq: 5150-60-70 or equivalent.

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

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

5110 Fundamentals of Aerodynamics (3) Kinematics and dynamics of perfect fluids; potential flow about a body; conformal mapping; hodographs. Prereq: 4220 or Mechanical Engineering 5310, Mathematics 4250.

5120 Experimental Methods in Fluid Mechanics (3) Experiments and laboratory experiments: hot wire anemometry and turbulence measurements, flow visualization, wind tunnel tests (supersonic), wind tunnel interferometry, supersonic flow measurements, boundary-layer measurements. Prereq: 4210-20-30 or Mechanical Engineering 5310.

5150-50-70 Air Vehicle Aerodynamics and Performance (3, 3, 3) Application of aerodynamics to air vehicles to provide estimates of performance, stability, and control characteristics for subsonic to hypersonic flight speeds. Prereq: Consent of instructor.

5210-20 Aerodynamics of Compressible Fluids (3, 3) One-dimensional flow; waves, small-perturbation theory, slender body theory; similarity rules; method of characteristics. Prereq: 4210 for 5210, and 5210 for 5220.

5240 Dynamics of Viscous Flows (3) Equations of viscous fluid flow; laminar and turbulent flow; transition; separation; boundary layer theories; exact and approximate solutions. Prereq: Mechanical Engineering 5310 or equivalent.

5250 Introduction to Hypersonic Flow (3) Slender body flow; similarity; Newtonian theory; blunt body viscous separations; free molecule and rarified gas flow. Prereq: 5240.

5260 Selected Topics in Aerodynamics (3) Transonic, supersonic, and hypersonic flow theories. May be repeated. Maximum 9 hrs.


5310 Magnetohydrodynamics (3) Electromagnetic field theory; chemical kinetics, thermodynamics and thermophysical properties of gas plasmas; governing equations and applications. Prereq: 4220 and Mathematics 4710.

5340-50 Atmospheric Entry (3, 5) Motion and heating along ballistic and lifting trajectories; density, altitude; heat protection systems. Prereq: 5220. Recommended: 5240.

5440-50 Transonic Flow (3, 3) Theoretical and experimental aspects. 5440—Nature of flow at transonic speeds and delineation of specific problems due to non-linear nature of flow, strong viscous interaction, development of small disturbance equations and similarity parameters, shock-wave in transonic flow and assumption of irrotational motion, solution techniques. 5450—Shock-wave boundary layer interaction and consequences, design of shock-flows, wind tunnel testing at transonic speeds, interference problems. Prereq: 5220 or equivalent.


5610 Applied Acoustics (3) Energy flow in acoustics, physical acoustics, waves in a uniform and nonhomogeneous moving medium, sound waves due to turbulence, vortical sound, pseudosound, propagation and absorption of sound in ducts, instru-
mentation and measuring techniques. Prereq: Consent of instructor.

5620 Aeroacoustics I (3) Special topics and recent research results in field of aeroacoustics. Turbomachinery noise, microphones, and general theoretical developments, empirical equations. Prereq: 5610.


5620 Air Vehicles (3) Current capabilities and future requirements for air transport vehicles. Parameters significant for air vehicle type selection. Integration of air vehicle into aviation system. For non-aerospace and non-mechanical engineering majors only. Prereq: 5610.

5800 Selected Engineering Problems (3-9) Selected problems in aerospace engineering to fulfill requirements of the Problems Program. Enrollment limited to students in Problems Program. Prereq: Consent of advisor. May be repeated. S/NC only.

5900 Seminars (1) All phases of aerospace engineering, including reports on current research at The University of Tennessee, Knoxville. May be repeated. S/NC only.

5990 Special Topics in Aerospace Engineering Credit to be arranged; 3 hours maximum each quarter.

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


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 6520.

6330 Magnetohydrodynamics III (3) Engineering applications of magnetohydrodynamics, propulsion, and power generation. Prereq: 6320, Mathematics 5630.


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 in a generalized and unified manner with combined viscous/inviscid effects. Relationships among various subsonic flow theories. Prereq: 5240 or equivalent.


6910 Advanced Topics in Gasdynamics (3) Selection of topics based on particular interests of students: nonequilibrium transport phenomena, radiation transport, gasdynamics, nonequilibrium gasdynamic flows, advanced kinetic theory, perturbation techniques. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs.

Nuclear Engineering

MAJOR

DEGREES

Nuclear Engineering

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

Professors:

P. F. Pasqua (head), Ph.D. Northwestern, P.E.; H. D. Davidson, Ph.D. University of Pennsylvania, J. B. Fountain, Ph.D. Georgia Institute of Technology; T. W. Kerlin, Ph.D. Texas; J. Mihalac, Ph.D. Tennessee; D. Perez, Ph.D. Madrid (Spain); H. C. Roland, Ph.D. Pennsylvania; N. Stevenson, Ph.D. Northwestern, P.E.

Associate Professors:


The Department of Nuclear Engineering offers degrees leading to the Master of Science, Master of Engineering, and Doctor of Philosophy with specializations in nuclear engineering: nuclear reliability and risk, radiation transport, thermal hydraulics, and core analysis.

MASTER 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 of 45 quarter hours 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.
3. A master's thesis which demonstrates research or design capabilities.
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 thesis work submitted must be from out of department.
4. A minimum of one-third of the program must be in engineering design, and one-third in one of, or a combination of, advanced math, computer sciences, basic sciences, or engineering sciences.
5. A candidate must pass a final oral examination on all work presented for the degree.

THE DOCTORAL PROGRAM

Students in the field of nuclear engineering desiring to 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 must be required to demonstrate general competence in a comprehensive examination in the areas of engineering science, mathematics, and physics. At the same time, all candidates will be required to demonstrate special competence in nuclear design.

Specific course requirements for the Ph.D. degree in Nuclear Engineering include:

1. A minimum of 72 quarter hours credit beyond the Bachelor's degree, exclusive of credit for the M.S. thesis or Nuclear Engineering Practice.
2. A minimum of 36 quarter hours of credit in doctoral research.
3. A minimum of 45 quarter hours in nuclear engineering courses numbered 5000 and above (or the equivalent), with at least 12 quarter hours of 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.

4110-30-50 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 Thermoelectric Systems (3) Fusion reactions; properties of plasmas; plasma containment; plasma diagnostics; thermonuclear devices. Prereq: Physics 3730, Mathematics 4550 F

4210-20-30 Nuclear Engineering Laboratory (3, 3, 3) Radiation detection and counting instrumentation; counting statistics, half-life and decay schemes, gamma spectrometry, cross-section measurements, analog computation, diffusion properties of neutrons, critical loading experiments, control rod calibration, statistical weight, shielding, xenon poisoning, prompt critical reactor behavior, fission density and
adjoint flux. Prereq or coreq: 4110 or equivalent. F, W, Sp


4710 Energy Transport (4) Development of differential and integral energy conservation equations; conversion, radiation and thermal 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 systems; 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, shield design. Prereq: Physics 3730, Mathematics 4550. Sp

4820 Reactor Kinetics and Controls (3) Derivation of kinetic equations; basic kinetic parameters; transients with feedback and control and protective systems. Prereq: 4110. F

4840 Nuclear Reactor Safety (3) Presentation of reactor safety concepts and criteria; credible accidents; fusion 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) P/NP only. E

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

5110-20-30 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. Modeling of neutronic and non-neutronic processes. Dynamics, stability, and control of zero power reactors and power reactor systems. Prereq: 5210, 4130 or equivalent. W


5420 Reprocessing and Waste Disposal (3) Basic processes related to solvent extraction of nuclear fuels. Reprocessing of light water reactor and advanced reactor fuels. Disposition of radionuclides: reprocessing, site selection and environmental impacts. Prereq: 5410. F


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: 410. F


5810 Fundamentals of Fusion Physics and Engineering (3) Basic physics of fusion plasmas and description of fusion engineering problems. Plasma properties; collision processes; electromagnetics; confinement geometries; kinetic theory; fluid equations; plasma equilibria, transport, and stability; plasma heating and fueling; confinement experiments; fusion reactor requirements; main reactor components; and fundamentals fusion engineering problem area. F

5820 Plasma Engineering (3) Integration of plasma physics models, fusion engineering design criteria, and fusion technology constraints into design of fusion plasma experiments and reactors. Requirements for fusion reactors; particle, momentum, and energy balance equations; burn dynamics; power balance; fuel cycles; heating and fueling requirements; plasma wall interaction; and simulation of various fusion reactor plasmas. Prereq: 5810. W

5830 Fusion Technology (3) Engineering problems associated with fusion reactor design; vacuum and magnetics systems; materials and irradiation; plasma heating, fueling, and impurity control; first wall, blanket, shield, and neutronics; electrical systems; maintenance, environment; and review of major reactor design studies. Prereq: 5820. Sp

5970 Special Topics in Nuclear Engineering (3) Lectures and recitation on recent advances in nuclear engineering. Prereq: Consent of instructor. May be repeated with consent of department. Prereq: 6820. Sp

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

6110-20-30 Selected Topics in Reactor Theory (3, 3, 3) Transport theory; control rod theory, and perturbation theory. Selected topics from literature. Prereq: Consent of instructor. F, W, Sp

6140 Radiation Shielding (3) Advanced topics in radiation shielding. Monte Carlo techniques and space radiation problems. Natural space radiators, energy-source radiators, dose conversion, probability. Selected neutron, gamma, and space radiation shielding problems. Prereq: Consent of instructor. Sp

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. Sp

6510 Nuclear Reactor Noise Analysis (3) Modern
College of Home Economics

Nancy Belck, Dean
Jay Stauss, Associate Dean, Graduate Studies and Research
Fran Andrews, Assistant Dean, Undergraduate Studies
Karl Weddle, 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, business, and industry.

The College of Home Economics offers two graduate degrees, the Master of Science and the Doctor of Philosophy. The Ph.D. degree in Home Economics is offered in three optional areas: interdisciplinary, food science, and nutrition. The M.S. degree program has seven major or minor areas. Both thesis and non-thesis options are available.

PROGRAMS LEADING TO THE DEGREE OF MASTER OF SCIENCE

The interdisciplinary option is available in all majors except Consumer Studies and Housing: Public Policy will consist of 45 credit hours with a minimum of 24 hours in the major field 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. A written comprehensive examination is required.

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 includes 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 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: Nutrition, 36 hours; Food Science, 36 hours; Interdisciplinary option, minimum 36 hours, maximum 48 hours, may be included in the 96 hours presented for the degree.
6. Final oral examination.

Other Requirements:
Interdisciplinary option: The interdisciplinary option of the Doctor of Philosophy degree in Home Economics provides for advanced graduate study with an approach that focuses on the development, integration and application of knowledge to innovative solutions of the multi-level problems of society. A student in the interdisciplinary doctoral program is in the relatively unique position of having a number of alternatives available which are developed as a function of the student's creativity within the general framework:

Individual and Family Behavior (base department of Child and Family Studies):
• normal developmental processes in individuals and families
• socialization through childhood, adolescence, and adulthood
• behavior in diverse environmental and cultural settings
• interaction processes within families
• community services and planning to meet development needs of individuals and families.

Physiological Development and Well-being (base department of Nutrition and Food Sciences):
• physiological response to nutrient intake
• improvement of nutritional status through informed community action
• cultural, economic, and technological influences on food selection.

Environmental Factors (base department of Textiles, Merchandising, and Design or Nutrition and Food Sciences):
• design, space planning, housing, food service systems, clothing, and textiles as they relate to human needs
• cultural, sociological, psychological, and economic change
• technological developments
• aesthetics in improving the quality of the environment.
Consumers' Economic and Social Well-being (base department of Child and Family Studies; Textiles, Merchandising, and Design; or Nutrition and Food Sciences):

- relationship between family structure and decision-making processes in the use of human resources
- effects of social macro- and microeconomics and political development on consumption patterns and other behavior
- community programs to meet the sociocultural needs of consumers

1. Home Economics 6110-20; prerequisite is 5210.
2. Twenty-four to 36 hours from two areas in the College of Home Economics.
3. Fifteen to 24 hours in collateral or supporting courses in other colleges in the University including courses to give sufficient competence in statistics and research methods needed for dissertation research.
4. Doctoral research and dissertation based on a problem within the interdisciplinary concentration.

Food science option:

- Twelve hours from research methods from Food Science 5510 or 5520 or Food Systems Administration 5210; 6 hours from Food Science 5810-20-30-40, 6110, Food Systems Administration 6110; and Zoology 5350 or equivalent.
- Twenty-four to 60 hours in 5000- and 6000-level courses in food science or in food systems administration.

3. Fifteen to 24 hours in a collateral area. Upon approval of student's faculty committee, 4000, 5000, and 6000 courses in collateral area may be substituted for 5000 and 6000 courses in food science or in food systems administration.
4. Minimum of 4 hours of credit in doctoral seminar.

Nutrition option:

1. Thirty hours of 5000 or 6000 courses in nutrition exclusive of research and Zoology 5350 or equivalent.
2. Nine hours in a collateral area. Upon approval of student's faculty committee, 4000, 5000, and 6000 courses in collateral area beyond the 9 hours may be substituted for 5000 and 6000 courses in nutrition.
3. Minimum of 4 hours of credit in doctoral seminar.

GRADUATE PROGRAMS FOR HOME ECONOMICS EXTENSION

Graduate programs at both the doctoral and Master's levels are available for students interested in home economics extension. At the doctoral degree level, programs of study may be planned in the interdisciplinary or in the food science or the nutrition options. A Master's degree major in Consumer Studies and Housing: Public Policy is particularly suitable for students interested in home economics extension, although Master's programs may be planned in any subject matter area of home economics with agricultural extension education as a collateral area. Additionally, four-week courses are offered in February each year for students particularly interested in home economics extension.

ACADEMIC COMMON MARKET

The ACM is an interstate agreement among southern states for sharing academic programs. Through this agreement students from participating states are eligible for in-state tuition. Potential of full students enrolled in the doctoral program in Home Economics at The University of Tennessee, Knoxville, who are residents of Alabama, Arkansas, Georgia, Kentucky, Louisiana, Mississippi, South Carolina, or West Virginia 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 also are eligible. Those who plan to enter the Master's program in Nutrition (including public health nutrition) and are residents of Alabama, Arkansas, Georgia, Kentucky, or Virginia are eligible. Those who plan to enter the Master's program in Consumer Studies and Housing: Public Policy and are residents of South Carolina are eligible.

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:

- J. Strauss, Associate Dean for Graduate Studies and Research
- College of Home Economics
- The University of Tennessee
- Knoxville, Tennessee 37996-1900
- Phone: (615) 974-5221

Graduate Record Examination scores for the aptitude test including the quantitative, verbal, and analytical sections are required for application to all programs. Additionally, Interior Design majors require a portfolio.

Departments of Instruction

Child and Family Studies

MAJORS

- Child and Family Studies
- Consumer Studies and Housing: Public Policy
- Home Economics

DEGREES

- M.S.
- Ph.D.

Professors:

- N. Belck (Dean), Ph.D. Michigan State
- J. L. Cunningham, Ph.D. Michigan State; V. M. Nordquist, Ph.D. Tennessee; R. M. Swagert, Ph.D. Ohio State
- P. White, Ed.D. Tennessee

Assistant Professors:

- D. B. Eastwood, Ph.D. Tufts; J. Strauss (Associate Dean and Interim Head), Ph.D. Washington State
- S. Twardosz, Ph.D. Kansas

Assistant Professors:

- J. Allen, Ph.D. Purdue; C. Buehler, Ph.D. Minnesota
- A. Cov, M.S. Tennesseee; G. Eastman, Ph.D. Cornell
- J. Kiddwell, Ph.D. Purdue; G. Petersen, Ph.D.
- Brigham Young; K. G. Weddle (Assistant to the Dean), Ph.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 routines in terms of time and energy demands. Adaptations for the handicapped.

2460 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 or current status of adult education.

4350 Advanced Child Development (3) Survey of selected theories relevant to child development with emphasis on research literature and research methodology. Prereq: 5080 or Psychology 86 hrs or 6 hrs child development or equivalent.

4420 Learning Experiences with Parents (3) Dynamics of parent-teacher interaction. Emphasis on the complexity of responsibilities involved between educators and between parents and students through experiences in a variety of settings. Prereq: 3210 or Home Economics 1510.

4430 Family Interaction (3) Dynamics of family interaction at different points in the life cycle. Includes dynamics of parent-child relationships and the marital dyad, with family and as family interacts within community, formal and informal support systems within community. Prereq: 3515.

4610 Child in the Community (3) Needs of children; community agencies meeting these needs; visits to agencies contributing to the welfare of children. Prereq: 2110 or Home Economics 1510 or equivalent.

4620 Administration of Programs for Young Children (3) Planning for staffing, housing, feeding, scheduling, and organizing of day care or nursery programs. Prereq: 5080 or consent of instructor. May be repeated with departmental approval. Maximum 9 hrs.

4710 Contemporary Developments (1-3) Student or staff initiated lecture for study of special topics 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.

4820 Families, Economics, and Demographic Change (3) Economic analysis of family demographic change. Change in family size, dual working, career families, economics of marriage, increased divorce rate. Prereq: 3420, 3515, or consent of instructor.

4830 Consumers and the Market (3) Analysis of elements in marketplace which create problems for consumers. Special attention is given to consumer decision-making for products, services, and information and constraints and opportunities associated with government protection of consumers. Prereq: Economics 2110. W, Sp

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

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

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. E

5110 Field Work in Family Life (3) School and community programs concerned with 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 analysis of consumption by individuals and household units. Analysis of factors associated with changes in the standard of living. Review of major consumption studies. Prereq: 4810 or 5170 or consent of instructor.

5150 Assessment of Family Behavior (3) Methods of measurement related to study of family, Current methodological issues. Prereq: 5410 or 5530 or consent of instructor.

5160 Management of Time and Energy in the Home (3) Labor-saving methods and devices for computer, home, and recreational work.
5170 Consumer Economics (3) Consumer function in economy; consumer education; consumer decision making; public sector consumer policies; government action relating to consumers; factors affecting prices of consumer goods.


5180 Family Financial Consultation (3) Analysis of family expenditure patterns, common financial difficulties, avenues by which families are assisted. Field experience 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. Theory and evaluation; students concentrate on type best suited to their experience and future professional orientation. Prereq: 3 hrs child development, 3 hrs family relationships, 3 hrs sociology. 2 hrs and 1 lab.

5310 Theory and Research on Human Sexuality (3) Cultural, social, and psychological dimensions of human sexuality. Major contributions from anthropological, sociological, and psychological theory and research. W.

5410 Advanced Family Relationships (3) Problems in modern family life; individual adjustments, group relationships. Prereq: 3515, 4430, or consent of instructor.

5420 Parents and Children (3) Common problems of young children faced by parents and teachers; emphasis on methods available to modify problem behavior.

5430 Families in Crisis (3) Interpersonal transactions in disordered family behavior. Prereq: 5410 or equivalent. W.

5450 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. Prereq: 5410 or consent of instructor. Sp.

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. Sp.

5520 Research Methods in Child and Family Studies (4) Research procedures in child and family behavior; basic methodology of behavioral sciences. Recommended as prerequisite to beginning thesis work in this area. Prereq: 9 hrs child and family studies. 3 lectures and 1 discussion.

5540 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 programs. Evaluation of nursery student teachers in 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 pre-school 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: 3250.

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 protection legislation. 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. Internship in planned parenthood programs and clinic. 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. E.


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' physical potential, developmental, and status. Family's contribution to members' physiological potential for growth and development and to realization of human potential. Advanced child, family studies, 4 hrs nutrition, 4 hrs physiology, or equivalent. Sp.

6320 Individual and Family Development: Cognition (3) Process through which man individu-ally learn to recognize their world. Cognitive processes involved in development across life span, focus on research findings in cognitive development. Prereq: 5210, 5530, 5530, or equivalent. W.

6330 Individual and Family Development: Socialization (3) Processes of socialization throughout life cycle. Family as primary socializing agent. Prereq: 5210, 5410, or equivalent.

6410 Theory Construction in Family Studies (3) Process and application of theory construction in contemporary research areas and family studies. Emphasis on understanding, criticizing and constructing theoretical models based on research findings. Prereq: 5410 or consent of instructor.

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.

6510-20 Applied Behavior Analysis in Natural Settings (3, 3) Individual supervision in application of applied behavior analysis in natural settings. Prereq: 5420 or consent of instructor.

6710 Elements of Consumer Choice (3) Analysis of consumer decision making, theory of consumer choice, impact of influence on consumer, 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 change from consumer perspective. Relationship between consumer and local government. Prereq: 5170 or consent of instructor.

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Home Economics

MAJOR DEGREE

Home Economics

Ph.D.

5210 History and Philosophy of Home Economics (3) Historical development of home economics; survey of concepts and philosophy of component disciplines and analysis of current programs; emphasis on projection of future developments.

6000 Doctoral Research and Dissertation (3-15) Ph.D. only. E.

6110-20 Theoretical Research in Human Resource Development (3) Interdisciplinary approach to development and use of human resources in solution of family and consumer problems. 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 issues, and economic and social well-being. Prereq: 6110. May be repeated.

6900 Seminar (1-3) May be repeated. S/NC only.

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Home Economics Education

The graduate program in Home Economics Education is administered in concert with the College of Education with home economics education being one of the five service areas within the Department of Vocational-Technical Education. The department offers the M.S., Ed.S., and Ed.D., degree programs with a concentration in home economics education. Inquiries may be addressed to Home Economics Education, Home Economics Building. (See page 62 for staff, program descriptions, and course offerings.)

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Nutrition and Food Sciences

MAJORS DEGREES

Food Science M.S.
Nutrition M.B.
Food Systems Administration M.S.
Home Economics Ph.D.

Professors: R. E. Beauchene, Ph.D. Kansas State; B. R. Carruth (Head), Ph.D. Missouri; M. P. Penfield, Ph.D. Tennessee; J. R. Savage, Ph.D. Wisconsin; J. T. Smith, Ph.D. Missouri, M. A. Smith (Memphis), Ph.D. Tennessee.

Associate Professors: P. E. Andrews (Assistant Dean), Ph.D. Ohio State; G. W. Disney, Ph.D. Tennessee; N. L. Marable, Ph.D. Massachusetts; D. S. Sachan, Ph.D. Illinois; M. R. Traynor, M.D., Ph.D. Berkeley.

Assistant Professors: J. B. Bittle (Memphis), Ph.D. Tennessee; M. D. Brooks (Memphis), M.S. Alabama; M. R. Evans, M.A. Kentucky; B. Haughton, Ed.D. Columbia; J. D. Skinner, Ph.D. Oregon State.


3140 Physiological Chemistry (4) Metabolism of carbohydrates, lipids, and proteins. Role of vitamins
and minerals in metabolism. Not for graduate credit to departmental majors. Prereq: 3130 or equivalent. Sp, Su

4000 Origin of Food and Foodways (3) Food origin and development of individual food groups. Prereq: 8 hrs social science or humanities. F, Su

4020 Introduction to Sensory Evaluation of Foods (3) Sensory evaluation methods. Prereq: 4011 or 9 hrs of food technology and science; Plant and Soil Science 3610 or equivalent. 2 hrs and 1 lab. F, W

4040 Food in Contemporary Society (3) Consumers' options, responsibilities, and potential influence with respect to food supply. F, Su

4050 Food Preservation (3) Application of basic principles and research findings to food preservation in home environments. Prereq: 3010 or 3101. 4 hrs microbiology and 3150 or equivalent recommended. 2 hrs and 1 lab. F, A

4101 Introduction to Nutrition Research (3) Nutritional principles and laboratory experiences involving small animals. Prereq: 3160. 2 hrs and 1 lab. Sp

4130 Nutrition in Disease (4) Nutrition problems in diseases influenced by diet. Prereq: 3160. F, Su

4131 Clinical Experiences in Dietetics (1) Planned clinical experiences applying principles of nutrition in dietetics. Coreq: 4130. Open only to students in the coordinated undergraduate program in dietetics. Su

4140 Nutrition in Disease II (3) Interdisciplinary lectures and discussions on the metabolic processes of normal and diseased tissues and the dietary and biochemical modifications required. Prereq: 4130. Designed for senior students in the coordinated undergraduate program in dietetics. F

4150 Community Nutrition (3) Nutrition problems and solutions in defined, supervised field experiences. Prereq: 3120 or 3160. Sp

4180 Environmental Effects on Nutrition (3) Effect of natural and synthetic food toxins, drugs both social and therapeutic, and extreme environmental conditions upon nutrient availability, utilization, and requirements of humans. Prereq: 6 hrs natural science.

4190 Diet and Drug Therapy (3) Effect of drug therapy on absorption, utilization and toxicity of drugs. Prereq: 3160 or consent of instructor.

4210 Design and Layout of Food Systems (3) Design of physical facilities, selection and purchasing of equipment for food service systems. Prereq: 3220. Su

4220 Food and Lodging Information Systems (3) Design of information systems for decision making in hotel-motel complex; computer application in hospitality industries; Prereq: 2130; College Science 4140; Economics 2130.

4240 Food Systems Personnel Development (3) Development of training programs and personnel management policies for food systems personnel. Prereq: Economics 3420 or Psychology 4460 or consent of instructor.

4250 Food Systems Managerial Cost Control (3) Cost analysis for food and beverages; use of financial statements for decision making in food service systems. Prereq: 3220. F

4255 Food Systems Evaluation (3) Management resources in food systems. Standards for control. Prereq: Consent of instructor. F

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

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

5100 Food Texture (3) Classification of foods according to textural parameters; instrumentation in evaluation of textures. Prereq: 4011 or Food Technology 4920; Plant and Soil Science 3610 or equivalent; or consent of instructor. F

5101 Food Sensory Testing Methods (3) Principles and application of sensory evaluation of food. Prereq: application of methods: analysis of sensory data. Prereq: 4010; Plant and Soil Science 3610 or equivalent; or consent of instructor. F

5102 Advanced Experimental Food Science (3) Application of research methods to individual problems. Prereq: 4010-20 or consent of instructor. Sp

5104 Food Behavior of the Individual (3) Development of and changes in choices of food and food habits of individuals. Prereq: 4000, 3 hrs of nutrition, or consent of instructor. Sp or Su

5105 Foodways in the United States (3) Current foodways of selected subcultures in United States and historical in case studies of their development. Prereq: 4000, 3 hrs of nutrition, or consent of instructor. W, Sp

5106-65 Advanced Food Science (3, 3) Biochemical and biophysical interactions in food. Prereq: 4010; 3150 or equivalent, or consent of instructor. W, Sp

5107 Carbohydrates and Fats in Relation to Food Science (3) Physical and chemical characteristics of fats, carbohydrates, and fats with emphasis on their behavior in food. Prereq: 4010; 3140-50 or equivalent.

5108 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; 3140-50 or equivalent.

5109 Advanced Physiological Chemistry (4) Biochemistry and related methods of analysis of nutrients. Prereq: 3140 or equivalent. 3 hrs and 1 lab. F

5110 Community Nutrition (3) Nutrition problems and solutions in community and field work. Prereq: 3160 and consent of instructor. 3 labs. F

5115 Community Nutrition (3) Observations and participation in nutrition programs of local and state agencies. Prereq: 5110 and consent of instructor. 3 labs. W

5120 Community Nutrition (3) Nutrition programs of state and federal agencies; preparation of material for nutrition education; supervised field work. Prereq: Consent of department head. F

5125 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: 5115 and consent of instructor. S/NC only. Sp

5130 Maternal Retardation or Other Developmental Disorders of Childhood (3) Multidisciplinary core course required of all full-time students in training at Child Development Center, UTT Center for the Health Sciences, Memphis. Prereq: Consent of department head. F, W, Sp

5135 Nutrition in Mental Retardation and Developmental Disorders (1-12) Interdisciplinary diagnosis and treatment of developmentally-handicapped children. Requirements include clinical experience and lectures at Child Development Center, Center for the Health Sciences, Memphis. Prereq: Consent of department head. F, W, Sp

5140 Experimental Methods in Nutrition (3) Use of small animals in experimental nutrition. Prereq: 3140-50-60, 3410. 2 hrs and 1 lab. F

5150-55 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: 3160 and 5100. W, Su

5160 Physiological Bases for Diets in Disease (3) Developments in dietary treatment of disease in which nutrition plays a major role. Prereq: 3160 or equivalent. Su


5170 Survey Methods in Human Nutrition (3) Food consumption, food practices and nutritional status of population groups. Prereq: 5150-55. 2 hrs and 1 lab. F

5175 World Food Supply and Human Nutrition (3) Food supplies and food practices related to human nutrition throughout world. Regional, national and international agencies concerned with food and nutrition problems. Prereq: 5150-55.

5180 Nutrition and Aging (3) Nutritional problems of aging individual, nutritional requirements, dietary intakes, and effect of nutrition on rate of biological aging. Prereq: Consent of instructor. W

5190-20 Experimental Quality Food Study (3, 3) Analysis of food production, handling environment, and service problems related to quality of food prepared, held, served in volume. Management resources. Prereq: 3210, 3220, or consent of instructor. F, Su

5220 Methods of Food Systems Research (3) Research methods applicable to food systems administration. Prereq: 3210 or equivalent. W, A

5240 Experimental Design of Food System Facilities (3) Environment of food systems in order to improve prepared, held, served in volume. Prereq: 4210.

5250 Food Systems Evaluation (3) Management resources in food systems. Standards for control. Prereq: Consent of instructor. F

5265 Food Technology (3) Analysis and control of food systems income and expenses. Forecasting business cycles. Processing of data. Prereq: Consent of instructor.

5270 Administration of Food Service Delivery Systems (3) Role and responsibilities of administrators in maintaining desired qualitative and quantitative standards in food service delivery system. Prereq: 3220 or consent of instructor. W, A

5310 Clinical Training in Health Care Agencies (3) Instructional and supervisory techniques in clinical settings by nurses and dietitians for training of entry-level health care providers. Prereq: Nursing 4760 or consent of instructor. Sp

5340 Foods and Nutrition: Physicochemical Principles (3) Thermodynamics; physicochemical properties of proteins, carbohydrates and lipids; chemistry of colloid state; chemical kinetics; specialized kinetics of enzymatic processes. Prereq: 3140 or equivalent. Sp, A

5380-60 Research Techniques (3, 3) Human metabolic balance experiments. Analytical methods for assay of food and biological materials. Prereq: 5140. 3 labs. A

5385 Field Experience (3-9) Experience in food-related industry or agency under supervision of faculty member. Prereq: Consent of instructor.

5706 Current Programs and Trends (1-3) Recent advances in nutrition and applications of nutritional practices to professional area. Prereq: Consent of instructor. May be repeated.

5800 Problems in Nutrition and Food Sciences (1-3) Advanced study in nutrition and food sciences. Prereq: Consent of instructor. May be repeated.

5900 Seminar (1-3) Prereq: Consent of instructor. May be repeated. Maximum 3 hrs: S/NC only.

5910 Graduate Seminar in Public Health (1-2) (Same as Public Health 5900, Nursing 5900, Physical Education 5900, and Social Work 5900.) S/NC only.

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

6010 Food Dispersions (3) Physical characteristics of solutions, colloidal dispersions, and suspensions in relation to treatments applied. Prereq: 5030
5020-30 Food and Sociocultural Change (3, 3) Critical evaluation of factors and interrelationships affecting food intake and consumption patterns. May be taken in sequence. Prereq: 5040 or 5050; or consent of instructor. F; W

6110 Proteins and Amino Acids (3) Lectures, reports, and discussions. Prereq: 5040 or 55. Sp, A

6120 Mineral Metabolism (3) Lectures, reports, and discussions. Prereq: 5150-55. A

6130 Lipid Metabolism (3) Lectures, reports, and discussions. Prereq: 5150-55. Sp

6140 Vitamin Metabolism (3) Lectures, reports, and discussions. Prereq: 5150-55. A

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: 4240, 5230 or consent of instructor. Sp

6220-30 Quantitative Methods to Control Resources in Food Service Systems (3, 3) Interrelationships of resources and evaluation of efficiency and effectiveness in food service systems. Prereq: 5230 or consent of instructor. Taken in sequence. Credit for 6220 contingent upon completion of 6230. F, A

6310 Advanced Topics (3) Comprehensive individual study and group discussion of topics related to current problems in nutrition and food science. Pre-req: Consent of instructor. May be repeated.

6500 Seminar (1-3) May be repeated. S/NC only. E

Textiles, Merchandising, and Design

MAJORS

Textiles and Clothing

Interior Design and Housing

Consumer Studies and Housing: Public Policy

Home Economics

DEGREES

M.S.

Ph.D.

Professors:

R. O. Blakemore, Ph. D. Florida State; J. O. Dejoge (Head), Ph. D. Iowa State; Z. C. Goswami, Ph. D. Manchester (England).

Associate Professors:


Faculty Associate:

T. L. Vigo, Ph. D. Tulane.

Assistant Professor:

C. E. Cox, Jr., Ph. D. Tennessee.

Interior Design and Housing

A student's course of study may include intensive training in interior design beyond an undergraduate program, behavioral design research, history and preservation of interior architecture and/or housing.

ACQUISITIONS AND EXHIBITIONS

Prospective graduate students pursuing a degree in advanced interior design should submit a portfolio of their graduate work to the department. This portfolio may include slides or original work.

4320 Family Housing Problems (3) Housing requirements of families. Reading and judging house plans; effective use of space; maintenance problems; housing regulations and restrictions; site selection and neighborhood development; financing procedures. Prereq: 6 hrs from Economics 2110-20-30-32.

4450-51 Advanced Interior Design (5, 6) Intensive interior design experiences: complex design problems utilizing systematic design methodology. Project types: multi-family housing, commercial and institutional environments, or complex working environments. Prereq: 3452 for 4450. Courses taken in sequence or consent of instructor.

4791 History of Contemporary Interior Architecture (4) Furniture; design and design philosophies of European architects; orientation of housing in local communities by various user groups. Prereq: 4320 or consent of instructor.

5515 Housing Programs and Policies (3) Analysis of private and public programs and policies to promote realization of sustainable homes and living environments for families. Economic and social problems related to national housing objectives. Prereq: 4320 or consent of instructor.

5620 Experimental Methods in Household Equipment (3) Research methods and techniques in determining performance of household equipment. Prereq: Consent of instructor. 1 hr and 2 labs.

5630 Environmental Requirements for Family Work Centers (3) Trend in planning work center areas such as kitchens and laundries; adequacy, convenience, surface treatment. facilities and costs; problems of installation and remodeling.

5815 Environmental Design Research (1-3) Evaluation and application of research methodologies to interior design problems. Hours and credit arranged. Prereq: 5510-20-30 or equivalent and consent of department head in charger of investigation. May be repeated. Maximum 9 hrs.

5820 Interior Design (1-3) Advanced study in interior design. Hours and credit arranged. Prereq: Consent of department head and instructor in charge of instruction. May be repeated. Maximum 9 hrs.

5910-20-30 Seminar (1-4, 1-4, 1-4) Hours and credit arranged. Prereq: Consent of instructor.

6110 Contemporary Housing Issues and Problems (3) Individual study and group discussion of various issues and problems related to housing. Prereq: Consent of instructor.

6120 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 textiles 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 human resources. Plant tours and case studies on production problems. Field trips required S

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

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

5110 Textiles Testing and Methods of Research in Textiles (3) Physical and chemical testing. Required for textile majors. Prereq: 3 labs. 3 hrs and 1 lab. I
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

5220 Historic Textiles (3) Development of textile industry in world; fibers used, design, and color. F

5240 Practicum (1-9) Off-campus experience with business, industry, governmental agencies and civic groups; preplanned; supervised. Prereq: Consent of major advisor and department head. May be repeated. Maximum 9 hrs. S/NC only.

5250-60-70 Problems in Textile Chemistry (4, 4, 4) Theoretical and experimental study of chemistry of textile fibers including polymerization, reactions, dyeing 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 qtr organic chemistry, 2 hrs and 2 labs.

5310 Fashion Analysis (3) Fashion as social and economic force; evolutionary theories of fashion operation. 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 texturing continuous filament yarns, methods and mechanics of processing staple yarns, spinning system, composite yarns weaving, knitting, non-woven fabric formation. Prereq: Engineering Science and Mechanics 3311, Mathematics 2840. (Same as Polymer Engineering 5610.)


5700 Current Programs and Trends in Textiles and Clothing (1-3) Pertinent developments and trends in textiles and/or clothing and implications for new types of programs, techniques and/or curricula approaches. Content and emphasis vary according to changes in field and needs of group serviced. 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.


6110 Selected Issues in Textiles and Clothing (3) Advanced topics of current significance. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs.

6140 Selected Behavioral Theories in Clothing (3) Role of clothing in functioning of people, utilizing behavioral theories. Prereq: 5170, 6 hrs of graduate level sociology or psychology, or consent of instructor.

6150 Social-Psychological Theories of Clothing Consumption (3) Analysis and evaluation of social science theories of consumer behavior in relation to textiles and apparel. Prereq: Child and Family Studies 5170, 6 hrs of graduate level sociology or psychology, or consent of instructor.

6160 Textile Flammability (3) Factors affecting textile flammability as consumer issue. Standards, regulations, test methods, economic impact. Prereq: 5120, 5180, 5250, or consent of instructor.

6170 Physical Performance Behavior of Textile Structures (3) Fundamentals of yarns and fabric structures; relationship of structure to physical characteristics of textile materials. Prereq: 5120, or consent of instructor.

6910 Seminar in Textiles and Clothing (1-3) May be repeated. Maximum 6 hrs.
Intercollegiate Programs

Aviation Systems

MAJOR DEGREE
Aviation Systems M.S.

Lead Professor: M. A. Wright; Ph.D. Wales.

Professors: W. Frost; Ph.D. Washington; A. A. Mason; Ph.D.
Tennessee; J. M. Wu; Ph.D. California Institute of Technology; R. L. Young; Ph.D. Northwestern.

Associate Professors: F. G. Collins; Ph.D. California (Berkeley); R. D. Kimberlin; M.S. Tennessee.

Assistant Professors: W. B. Baker, Jr.; Ph.D. Tennessee; V. K. Smith, Ill; Ph.D. Georgia Institute of Technology.

The University of Tennessee Space Institute offers a program leading to the Master of Science with a major in Aviation Systems. The Aviation Systems program is designed for those who possess a Bachelor's degree in engineering or science and who wish to study under a "systems philosophy" toward careers in research and development or administration in various phases pertinent to aviation. The program features 18 quarter hours major field credit in various aspects of aviation systems, 6 or more quarter hours credit in each of the areas of research, development and administration, and electives which permit further specialization to either area.

To qualify for admission to this program, the applicant must possess a Bachelor's degree in engineering or science from a recognized institution, show evidence of ability to pursue and benefit from the program, and fulfill the University of Tennessee Graduate School admission procedures and grade point standards. Subject matter prerequisite to the program includes basic knowledge of computer utilization (Computer Science 3150 or equivalent), a background in statistics (Statistics 3450 or equivalent), a basic understanding of aerodynamic fundamentals, aircraft propulsion and performance (Aerospace Engineering 4110 and 4120 or equivalent), a background in accounting (Accounting 5010 or equivalent basic accounting courses), a basic knowledge of economics (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, Industrial Engineering 5700 and 5710; for the administration area, Economics 5030.
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, 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, Industrial Engineering 5700, 5710, and 5720; for the administration area, in Economics 5030, and Finance 5010-20.
3. 6 hours of electives in one of the areas in item 2.
4. 6 hours of electives in the major field, engineering and/or the areas in item 2.
5. Satisfactory completion of Aviation Systems 5100.
6. Satisfactory completion of a comprehensive final written examination on all course work submitted for the degree and defense of the project course paper. The thesis program involves 45 quarter-hour credits minimum while the non-thesis program involves 51 quarter-hour credits minimum.

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

5070 Airports and the Community (3) Structure of airports and their communities. Technology and economics of cargo, baggage, ticket and passenger handling. Airport management, economics and logistics. Interfaces with the community, collection and distribution, demand requirement analyses, types of developments and their projections. Prereq: Aerospace Engineering 5810.

5080 Collection and Distribution (3) Capabilities, technology, plans, programs and developments for collecting and distributing passengers and freight to and from various types of airports. Ground, water, air and mixed transportation modes, present and future, requirements analysis, and model analysis of the system. Prereq: Aerospace Engineering 5810.

5090 Governmental Policies for Aviation (3) Theoretical and legal basis for economic and governmental regulation of aviation. Historical and legislative development of aviation regulatory agencies, organizational structure and administrative and enforcement procedures. Prereq: Aerospace Engineering 5810.

5100 Project in Aviation Systems (3) In-depth study and formal report on aviation systems topic, normally performed during last quarter of work toward degree in non-thesis program. For aviation systems degree candidates only.


5970 Special Topics in Aviation Systems (3) Current problems in aviation systems. Prereq: Consent of instructor. May be repeated with consent. See also course descriptions for Aerospace Engineering 5810, 5820, and Industrial Engineering 5840.

Comparative and Experimental Medicine

MAJOR DEGREE
Comparative and Experimental Medicine M.S., Ph.D.

Joint Graduate Coordinating Committee

H. Kitchen (Chairperson); J. E. Fuhr; J. E. Lawler; R. L. Michel.

The Comparative and Experimental Medicine degree program (M.S. and Ph.D.) is a jointly administered graduate program intended to prepare students for teaching and/or research careers in the health sciences. This program emphasizes the comparative approach to the study of pathology, immunopathology, aberrant metabolism, oncology, and genetic disorders. The Ph.D. program is open to approved graduate students seeking training in this area.
and is especially useful for individuals with professional degrees. For the student with an undergraduate biological science background, the Comparative and Experimental Medicine program provides an unusual opportunity to study disease processes common in humans and animals from a multidisciplinary perspective. The scope of this intercollege program, which pools faculty resources from both veterinary and human medicine, is broadened by including 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, Hemophilia 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 148 in this catalog.

ADMISSION REQUIREMENTS

General Requirements

Admission requirements of The Graduate School of UTK will apply. In addition, all applicants will submit a letter of recommendation. The Graduate Program in Ecology offers Master of Science and Doctor of Philosophy degrees. This interdepartmental program provides advanced courses in contemporary ecology for students from undergraduate programs in basic and applied biology, social sciences, mathematics and engineering. Research opportunities in both fundamental and applied ecology are intended to prepare students for academic careers as well as professional positions in industry or government. The Environmental Sciences Division of the Oak Ridge National Laboratory, the National Park Service, and the Tennessee Valley Authority provide advisors and research facilities. The Great Smoky Mountains, Cumberland Plateau, valley and ridge topography, TVA lakes and wild rivers provide locally a spectrum of natural habitats and consequent biological diversity that is truly unique. In addition, faculty research programs provide opportunities for student research elsewhere on this continent and abroad.

ADMISSION REQUIREMENTS

Requirements for admission to this program are:
(1) admission to The Graduate School; (2) chemistry through organic, mathematics through calculus, and 4 quarter hours of ecology at the upper division level; (3) departmental application and 3 rating forms; (4) the Graduate Record Examination.

Application forms for admission should be obtained from The Graduate School. Inquiries concerning the admission requirements should be directed to the Office of Research and Graduate Programs, P.O. Box 1071, Knoxville, TN 37901.

Ecology

MAJOR

Ecology

DEGREES

M.S., Ph.D.

D. L. Bunting, Chairman, Ph.D. Oklahoma State

The Graduate Program in Ecology offers Master of Science and Doctor of Philosophy degrees. This interdepartmental program provides advanced courses in contemporary ecology for students from undergraduate programs in basic and applied biology, social sciences, mathematics and engineering. Research opportunities in both fundamental and applied ecology are intended to prepare students for academic careers as well as professional positions in industry or government. The Environmental Sciences Division of the Oak Ridge National Laboratory, the National Park Service, and the Tennessee Valley Authority provide advisors and research facilities. The Great Smoky Mountains, Cumberland Plateau, valley and ridge topography, TVA lakes and wild rivers provide locally a spectrum of natural habitats and consequent biological diversity that is truly unique. In addition, faculty research programs provide opportunities for student research elsewhere on this continent and abroad.

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Application forms for admission should be obtained from The Graduate School. Inquiries concerning the admission requirements should be addressed to the Chairperson, Graduate Program in Ecology, University of Tennessee, Knoxville, Tennessee 37996-1610.

ADVISORS

Advisors are selected from ecologists on the shared faculty of the University who have competence in the area in which the student expects to work. Entering students should consult early with the chairperson of the program on the choice of a faculty advisor who will become the chairperson of the student's faculty committee.

THE MASTER'S PROGRAM

The minimum 45 quarter hours of graduate credit shall include 18 hours of ecology courses (exclusive of thesis). Ecology 5210-20-30 or approved equivalent 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 19.

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 or an approved equivalent and a minimum of 9 quarter hours of courses numbered above 5100. A student cannot enroll for dissertation until the research proposal has been discussed and approved by the doctoral committee. A foreign language is required.

Faculty


5000 Thesis (1-18) P/NP only. E

5100 Special Problems in Ecology (1-3) Individual investigations in ecology. May be repeated with consent of instructor. Maximum 3 hrs.


5230 Principles of Ecology: Ecosystems (3) Patterns, underlying causes of short and long-term dynamics, energetics and nutrient cycling of terrestrial, freshwater and marine ecosystems. Prereq: 5220.

5310 Ecology for Planners and Engineers (3) Ecological principles and effects of human-caused changes have on living organisms. Lectures and
field trips. For students in Graduate School of Planning and Environmental Engineering.

5300 Implementation of Environmental Policy (3)
Goals and problems of environmental legislation, especially National Environmental Policy Act; purpose, preparation, and evaluation of environmental impact statements and similar multidisciplinary studies, prerequisite: 5210 or 5310, or Environmental Engineering 4020.

5510 Environmental Toxicology (3) (Same as Biochemistry 5640)

5640 Techniques in Environmental Toxicology (3) (Same as Biochemistry 5640)

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

6100 Special Topics in Ecology (3) Seminars on advanced topics and recent developments in ecology. Prerequisite: Consent of instructor. May be repeated.

6110 Seminar in Animal Behavior (2)

6120 Seminar in Aquatic Ecology (2)

6130 Seminar in Physiological Ecology (2)

6140 Seminar in Community Ecology (2)

6150 Seminar in Radiation Ecology (2)

6160 Seminar in Systems Ecology (2)

6431 Current Topics in Environmental Toxicology (1) (Same as Biochemistry 6431). S/NC only.

Industrial and Organizational Psychology

MAJOR DEGREES
Industrial and Organizational Psychology
M.S., Ph.D.

Committee:
J. M. Larsen, Jr. (Chairperson); W. H. Calhoun;
H. D. Dewhurst; M. E. Gordon; R. T. Ladd;
J. W. Lounsbury; M. C. Rush; J. E. A. Russell;
R. O'Brien; M. S. Wortman, Jr.

(For complete Faculty Listing, see Departments of Management and Psychology)

The Master's and doctoral programs are offered jointly by the Department of Psychology and the Department of Management. They are designed to prepare students for personnel, managerial, and organizational research, for university teaching, and for consulting relationships with industry. The emphasis is upon applied research utilizing a thorough theoretical background, including classical and modern organization theory, organizational behavior, psychology, and management. The programs are administered by a joint committee of the two departments, appointed by the Vice Chancellor for Graduate Studies and Research on recommendations from the two department heads.

It is intended that students entering the program will represent widely different undergraduate and graduate backgrounds, including psychology, business administration, engineering, science, and liberal arts. The first-year program provides the opportunity to take courses which will assist the student to attain a reasonable level of sophistication in areas of deficiency.

ADMISSION PROCEDURE
Applicants for admission should request forms and materials from both The Graduate School and the Chairperson, Industrial and Organizational Psychology Program, 413 Stotley Center for Management Studies, Knoxville, Tennessee 37996-0545.

Two separate applications must be completed: one 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 1 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 admitted to the program have performed at or above the 69-79th percentile on the aptitude tests. (This corresponds to a raw score of approximately 600 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 1984 entrance):
A. Management or Psychology 5170-80-90.
B. Statistics 5050-60-70 and 3 hours of applied psychometrics.
C. Eighteen hours of additional course work to be selected from among the 5000-level course offerings in psychology and industrial 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 650 or the 90th percentile on the GRE Advanced Test in Psychology.
B. The Ph.D. program requirements described below in sections II A, and II G comprise the major requirements for a Master's degree. An oral examination covering the thesis and related topics must also be completed.

THE DOCTORAL PROGRAM

I. Course Requirements (Currently under review and subject to change for Fall 1984 entrance):
A. Minimum course requirements: 1. Management or Psychology 5170-80-90.
B. Statistics 5050-60-70. Examination by petition.
C. Minimum of five 6000-level seminars to be selected from Psychology or Management 6250-60-70, and Management or Psychology 6380.
D. 36 hours of Psychology or Management 6000.
E. Recommended electives:
1. Preparation for advanced section (81) GRE: Psychology courses as appropriate.

2. For students who require preparation in psychometrics: Applied psychometrics.
3. For students who require preparation in management: Management 5110, 5220, 5320.
4. For students who wish to pursue special research interests aside from their dissertation: Management 5220, 5260, Management or Psychology 6900.
5. Courses available in areas related to industrial and organizational psychology:
   a. Through College of Business Administration;
   b. Through College of Liberal Arts;
   c. Others as approved by advisor.

II. Program Requirements**
A. Attainment of a B average** in Management or Psychology 5170-80-90.
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 90th 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).
F. Completion of an oral examination following the preparation of a doctoral dissertation. This examination is set in the field of doctoral research and related topics, and must be passed at least four weeks prior to the awarding of the degree.
G. Maintenance of at least 3.0 grade point average.

Life Sciences

MAJOR DEGREES
Life Sciences
M.S., Ph.D.

Coordinating Council:
W. H. Calhoun (Chairperson); Animal Physiology;
H. G. Welch: Cellular and Molecular Biology;
J. M. Becker: Environmental Toxicology;

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 studies and research in the following concentrations: animal physiology, cellular and molecular biology, environmental toxicology, ethology, plant physiology/biochemistry, and reproductive.

**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.
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 grading policies. The minimum 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 of theory, 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 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.

5110-20-30 Cellular and Molecular Biology (3, 3, 3) Survey of cell structures and functions at molecular and supramolecular level. 5110—Cellular organization; cell metabolism; energy production and use; membrane structure and function; cellular communication. 5120—Flow of biological information, cell growth and replication; cellular motility; virus-cell interactions. 5130—Structure and function of specialized cells; muscle, nerve, germ cells, blood endocrine and immune systems; chomotaxis and phototaxis; differentiation, aging and cancer. Prereq: Consent of instructor.

Management Science

MAJOR

Management Science

DEGREE

M.S.

Committee:


THE MASTER'S PROGRAM

The M.S. program in Management Science is designed as preparation for a career in the application of quantitative techniques for the solution of complex problems. The program's flexibility also makes it appropriate as preparation for doctoral study in Management Science.

Management Science course work will expose students to both the theoretical development of quantitative techniques and their application to managerial decision making. In addition to the development of sufficient mathematical maturity for creative use of quantitative skills, the program requires concentrated study in a supporting area. Supporting areas are available in other departments of the College of Business Administration (excluding statistics) as well as in computer science, public administration, ecology and other areas, subject to approval by the Management Science Committee.

Applications are encouraged from all majors, but mathematics background equivalent of the completion of at least two years of college calculus and proficiency in a computer language (e.g. Computer Science 3150) is required. The program is designed to be completed in one calendar year by full-time students. However, students may start the program in any quarter and may pursue an M.S. degree in Management Science on a part-time basis.

Course Requirements

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Quarter Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Management Science 5310-20-30-35-40</td>
<td>14</td>
</tr>
<tr>
<td>Applied concentration area</td>
<td>12</td>
</tr>
<tr>
<td>Statistics 5110</td>
<td>3</td>
</tr>
<tr>
<td>Statistics elective (5000 level or above)</td>
<td>3</td>
</tr>
<tr>
<td>Mathematics (4000 level or above)</td>
<td>6</td>
</tr>
<tr>
<td>Electives selected from mathematics,</td>
<td>6</td>
</tr>
<tr>
<td>statistics, computer science, and management</td>
<td></td>
</tr>
<tr>
<td>science</td>
<td></td>
</tr>
<tr>
<td>Electives in any area approved by advisor</td>
<td>6</td>
</tr>
<tr>
<td>Total</td>
<td>50</td>
</tr>
</tbody>
</table>

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. On the other hand, a student lacking experience in rigorous senior-level mathematics courses will be asked to take such courses to fulfill the 6-hour mathematics requirement. The total course load will remain 50 hours for all non-thesis students and 45 hours for all thesis students; however, the number of hours of electives can be reasonably expected to vary between 6 and 18 as a function of prior background.

For course listings and description of the Ph.D. program in Management Science, refer to p. 44.
The College of Law is, since 1981, conducted on the semester system. Information regarding admission, financial aid, academic policies, extracurricular activities, and student services is available in the College of Law Bulletin. Students interested in the college should obtain a copy of the Bulletin from the Admissions Office, The University of Tennessee, College of Law, 1505 West Cumberland Avenue, Knoxville, Tennessee 37996. Completed application should be received before February 1 of the year of expected admission.

The University of Tennessee College of Law commenced operation in 1890 and has continuously sought to provide high quality legal education in a university community. While the principal objective of the college is to prepare students for the private practice of law, its total mission is more broadly conceived. The college exposes students to the legal issues of our society enabling them to develop analytical skills in respect of decisional law and statutes, the ability to communicate effectively to others their knowledge of the law, an awareness of the historical growth of the law, a knowledgeable appreciation of the interrelationship of law and society, and the ability to use law as an implement of societal control and development. Students are thus equipped to serve their community not only as advocates and counselors, but as policy makers and active, responsible citizens.

The coordinated program of the college has three dimensions: teaching and learning, research into and appraisal of our legal systems and institutions, and service to the community. Each plays a significant role in the college as a modern law center.

The teaching and learning element of legal education at the college involves a cooperative classroom interaction between faculty and students in the analytical study of a host of questions and problems found in today’s legal profession. These involve decisional law, statutory interpretation, administration regulation, techniques of trial and appellate advocacy, and the roles and responsibilities of the lawyer in advising and representing clients. While proper consideration is given to the problems of Tennessee law, the course of study is conducted with a view toward providing an awareness and understanding of the regional and national perspective to prepare our students for service in any state.

The college is also directly involved in providing service to the community of which it is a part. A major element of public service is centered in the Legal Clinic where students, under the guidance of skilled and experienced licensed practitioners, provide legal services to indigent persons of Knox County. Additionally, through research, consultation, and other services to legal institutions and groups within the state, the college seeks to participate in the development and improvement of the society in which its students may eventually practice law. The Public Law Institute is a primary example of this function.

In combination, the direction and objectives of the college lead to the development not of a narrow technician, but of a student of the law with the perspective, breadth, and understanding necessary for the accomplishment of the many tasks assigned by society to the legal profession.

THE COLLEGE OF LAW BUILDING
Since 1950 the college has occupied a building especially designed for teaching, study, and research in the law. In the spring of 1971 the college occupied the new wing begun in the fall of 1969. The new addition has doubled the available facilities. The library, the classrooms, and the offices are air-conditioned. Adequate classrooms, courtrooms, seminar rooms, a private office for each full-time faculty member, the well-equipped offices of the Legal Clinic, and a spacious, well-lighted Law Library are contained in this modern building. Stack space for more than 200,000 volumes will permit one of the largest law book collections in the South.

LEGAL CLINIC
The University of Tennessee Legal Clinic was established in 1947. Though the Legal Clinic provides legal assistance to indigent persons, it is designed primarily as a teaching device to correlate theory and practice. It introduces the student under faculty supervision to the law in practice through personal contact with clients and their problems. The Legal Clinic functions as a large law office in which the student gains experience in interviewing clients, writing legal letters, investigating and evaluating facts, preparing memoranda of law, preparing cases for trial or adjustment, and briefing cases. Classroom work supplements the handling of actual cases. The student is thus trained in the technique of law practice and the management of a law office. The ethical responsibilities of lawyers and their function as public servants are stressed. Under present rules of the Tennessee Supreme Court, students, under the direct supervision of the Legal Clinic staff, are certified to practice before all the courts of Tennessee.

THE LAW LIBRARY
The Law Library contains the official state reports of all states, the complete National Reporter system which covers all states and the federal courts, the Annotated Reports, standard sets of miscellaneous reports, the reports of the Canadian cases and of English cases from the yearbooks to date. In addition to these, there are adequate encyclopedias, digests and dictionaries, standard textbooks, law reviews, and current looseleaf services, totaling together more than 133,000 cataloged volumes. The library is under the supervision of a law librarian who is trained in law and library science. Law students also have the use of the collections in the University Main Library, which is located across the street from the Law Library, the Undergraduate Library a few blocks away, and other branch libraries.

Degree of Doctor of Jurisprudence
The degree of Doctor of Jurisprudence will be conferred upon candidates who complete, with the required average, six semesters of resident law study and who have 84 semester hours of credit, including all required courses. The required average is 2.0 and that average must be maintained on the work of all six semesters and also for the combined work of the grading periods in which the last 28 hours
of credit were earned. Averages are computed on weighted grades. Grades are on a numerical basis from 0.0 to 4.0. A grade of 0.9 or below is a failure.

Eligible law students may receive credit towards the J.D. degree for acceptable performance in up to three (3) upper-level courses taken in other departments at The University of Wyoming. Course selection and registration are subject to guidelines approved by the law faculty which include the requirement that any such course be acceptable for credit towards a graduate degree in the department offering the course.

Note: Students are advised to consult The Graduate School's degree requirements as stated in the front section of this catalog as well as the requirements for this college.

**Dual J.D.-MBA Degree Program**

The College of Business Administration and the College of Law offer a coordinated dual degree program leading to the conferred of both the Doctor of Jurisprudence and the Master of Business Administration degrees. A student pursuing the dual program is required to take fewer hours of course work than would be required if the two degrees were to be earned separately.

Admissions. Applicants for the J.D.-MBA program must make separate application to, and be independently accepted by, the College of Law for the J.D. degree and the Graduate School and College of Business Administration for the MBA degree, and by the Dual Degree Committee. Students who have been accepted by both colleges may commence studies in the dual program at the beginning of any term subsequent to matriculation in both colleges provided, however, that dual program studies must be started prior to entry into the last 28 semester hours required for the J.D. degree and the last 24 hours required for the MBA degree.

Curriculum. A dual degree candidate must satisfy the graduation requirements of each college. Dual degree students withdrawing from the dual degree program before completion of both degrees will not receive credit toward graduation from either college for courses in the other college, except as such courses qualify for credit with regard to the dual degree program. For students continuing in the dual degree program, the J.D. and MBA degrees will be awarded upon completion of requirements of the dual degree program.

The College of Law will award credit toward the J.D. degree for acceptable performance in a maximum of 8 semester hours of approved graduate-level courses offered by the College of Business Administration. A student shall receive 2 semester hours of credit for each such course successfully completed. The law faculty specifies otherwise. Two of the 8 semester hours must be earned in Accounting 5810 or a more advanced accounting course. If College of Law credit is given for such accounting course, the dual degree student may not receive College of Law credit for Legal Accounting (Law College Course 5890).

The College of Business Administration will award credit toward the MBA degree for acceptable performance in a maximum of 8 semester hours of approved courses offered by the College of Law.

Except while completing the first year courses in the College of Law, the students are encouraged to maximize the integrative facets of the joint program by taking courses in both colleges each year.

**Awarding of Grades.** For grade recording purposes in the College of Law for graduate business courses and in the College of Business Administration for law school courses, grades awarded will be converted to either Satisfactory or No Credit and will not be included in the computation of the student's grade average or class standing in the college where such grades are so converted. The College of Law will award a grade of Satisfactory for a satisfactory business graduate course in which the student has earned a B grade or higher and a No Credit for any lower grade. The College of Business Administration will award a grade of Satisfactory for a College of Law course in which the student has earned a 2.3 grade or higher and a No Credit for any lower grade. Grades earned in courses of either college may be used on a regular graded basis for any appropriate purpose in the college offering the course. The official academic record of the student maintained by the Registrar of the University shall show the actual grade assigned by the instructor without conversion.

**NON-LAW ELECTIVE COURSE CREDIT**

Students enrolled in the J.D.-MBA degree program may not receive credit towards the J.D. degree for courses taken in other departments of the University except for those taken in conjunction with the joint program.

**SATISFACTORY/NO CREDIT OPTION**

(1) **Course Eligibility**

Required courses may not be taken on a Satisfactory/No Credit (S/NC) basis except as specifically designated.

(2) **Satisfactory/No Credit**

a. Election to take courses on a Satisfactory/No Credit basis must be made at the time of registration and cannot be changed thereafter. Students who register for a course Satisfactory/No Credit when they are ineligible to do so will be required to change to regular grading when the error is discovered.

b. Credit will be given for a course taken on a Satisfactory/No Credit basis only in semesters in which the student completes (receives a grade in) at least ten hours on a regular graded basis.

c. Students electing the Satisfactory/No Credit basis must meet all requirements imposed on students taking the course on a regular grade basis, e.g., attendance, term paper, recitation, etc.

d. Examinations and other work of students electing a Satisfactory/No Credit basis shall not be graded separately or differently from that of other students.

(3) **Satisfactory/No Credit grading**

Satisfactory/No Credit grading shall mean a grade of at least 2.0.

f. A student electing Satisfactory/No Credit who makes 2.0 or above shall receive credit for the course, but the grade shall be recorded as S and will not be used in determining the grade average.

g. A student electing Satisfactory/No Credit who makes 2.0 or below shall receive a No Credit for the course and neither this grade nor the hours for the course will be used in computing the grade average or hours credit.

h. A maximum of two courses may be taken on a Satisfactory/No Credit basis excluding 8679 Legal Writing.

**MAINTENANCE OF A SATISFACTORY RECORD**

No student will be excluded from the College of Law for academic reasons prior to the completion of two semesters of academic study. A full-time student who fails to achieve an overall average of at least 2.0 upon completion (receipt of a grade) of two semesters of academic study shall be excluded. Such exclusion shall occur regardless of whether the student has obtained permission to vary the first-year full course load.

**MAXIMUM COURSE LOAD PER SEMESTER**

The maximum course load for a law student is 18 hours in any one semester. During the summer term the maximum course load is 7 hours.

**POLICY FOR GRADUATE STUDENTS TAKING LAW COURSES**

Law courses are not available for graduate credit; however, a graduate student may be allowed to take up to 6 credit hours of law courses and receive credit toward a degree upon approval of the College of Law and the major chairperson. The graduate student must register for the law course during regular registration at the College of Law requesting an S/NC grade only. If a 2.0 or above is obtained in a law course, an S will be recorded on the transcript. If a student earns below a 2.0, an NC will be recorded and the course cannot be used toward meeting degree requirements. Grades for law courses will not be reflected in the cumulative average.

Different rules apply to the student enrolled in the Dual J.D.-MBA Program. Grades must be earned according to the grading system of the respective college, e.g. numerical grades for law courses, letter grades for graduate courses. Refer to page 15 for the grading scale acceptable toward meeting degree requirements. Cumulative GPA for law courses only will be carried until graduation, at which time both the graduate and the law cumulative will be shown on the permanent record.

**Faculty**

Professors:

- K. L. Penegar (Dean), LL.M; Yale; N. P. Cohen, LL.M; Harvard; J. G. Cook, LL.M; Yale; G. E. Coven, LL.B; Columbia; J. G. Gobert, J. D. Stine, J. M. Gray (Emeritus), LL.M; George Washington; P. H. Hardin, J. D. Chicago; D. S. Jones, J. D. North Carolina; J. H. King, J.D; Pennsylvania; J. C. Kirby, LL.M; New York; F. W. Lacey (Emeritus), S.J; Michigan; F. S. LeClair, LL.B; Duke; C. H. Millard (Emeritus), J.D; Duke; E. E. Overton (Emeritus), S.J; Harvard; J. J. Phillips, J.D; Yale; D. H. Rivkin, J.D; Vanderbilt, A. Seibert, J.D; Michigan; J. L. Sobieski, J.D; Michigan; T. H. Sewell, LL.M; George Washington; F. H. Thompkins, J.S.D; Columbia; H. C. Warner (Emeritus), J.D; Chicago; W. H. Wicker (Emeritus), LL.D Newberry; D. O. Wickham, LL.M; Harvard

Associate Professors:

- G. L. Anderson, LL.M; Harvard; P. Black, Jr., J.D; Vanderbilt; D. K. Brennan, M.L; Alabama; J. O. Cochran, J.D; Yale; G. B. Gray, J.D; Vanderbilt; A. M. Hess, J.D; Virginia; J. D. Jones, J.D; Wyoming; R. M. Lloyd, J.D; Michigan; C. A. Pierce, J.D; Yale; R. S. Wirtz, J.D; Stanford

Distinguished Professor:

- G. L. Anderson, LL.M; Harvard; P. Black, Jr., J.D; Vanderbilt; D. K. Brennan, M.L; Alabama; J. O. Cochran, J.D; Yale; G. B. Gray, J.D; Vanderbilt; A. M. Hess, J.D; Virginia; J. D. Jones, J.D; Wyoming; R. M. Lloyd, J.D; Michigan; C. A. Pierce, J.D; Yale; R. S. Wirtz, J.D; Stanford
PROGRAM OF INSTRUCTION

The J.D. program is designed to give the student an adequate preparation for the practice of law. From 12 to 15 hours of classroom work a week are required of all full-time students. The required courses will be taken as early in the law curriculum as possible or as scheduled by the law faculty.

Required Courses


8020 Contracts I (3) Basic agreement process and legal protection afforded contracts. Problems to offer and acceptance, interpretation, illegality, and statute of limitations.

8030 Contracts II (3) Continuation of Contracts I. Remedies, conditions, impossibility and frustration, third party beneficiaries, assignment and delegation, discharge.

8040 Criminal Law (3) Substantive aspects of criminal law. General principles applicable to all criminal conduct, specific analysis of particular crimes. Substantive defenses of crimes, including insanity, intoxication, mistake, necessity, legal duty, self-defense, and duress.

8070 Legal Process (2) Judicial process, brief survey of judicial organization and procedure, legal history, case analysis, significance of precedent, influence of judge as policy maker, adversary system, and role and responsibilities of lawyer as advocate; legislative interpretation.

8100 Research and Writing I, II (1, 2) Progressive involvement in legal research and writing. Fundamentals of legal bibliography, techniques and research skills. Drafting of legal office memorandum and other written materials. Preparation and presentation of appellate argument (written and oral). Small section classes with individual criticism. Lectures on research, writing, and advocacy skills. Must be taken in sequence.


8140 Property II (3) Recording system, title assurance, easements, nuisance, lateral support, water rights, zoning, and eminent domain.

8180 Torts I (3) Intentional interference with the person, assault and battery, false imprisonment, negligence, affirmative duties, immunities, actual causation, and contributory causes.


8200 Constitutional Law I (3) Judicial review, limitations on judicial power, national legislative power, regulation of commerce, power to tax and spend; implications on judicial power, national legislative power, and presidential power; conflicts of interest, decision to represent or withdraw as counsel; fiduciary relationship, advocacy and its limitations, legal and ethical aspects.

8260 Income Tax I (4) What is income; whose income is it; when is it income; how is it taxed (capital gains and losses, maximum and minimum tax); deductions and credits; rates (corporate, estate, and gift).

8940 Civil Procedure II (3) Pleading, joinder of claims and parties; discovery, trials, verdicts, judgments and appeals; emphasis of Federal Rules of Civil Procedure.

PERSPECTIVE COURSE REQUIREMENT

One course among the following is required for graduation: American Legal History; Comparative Law; Criminal Law Theory; Environmental Law; International Law; Jurisprudence; Law and Economics; Law and Language, and Ethics; Legal Imagination; and Tax Theory.

WRITING REQUIREMENT

One seminar or upper-level course requiring a substantial legal research paper under faculty supervision is required for graduation. This requirement may also be satisfied by a directed research project approved by the Academic Standards Committee.

No single course may be taken to satisfy both the Perspective Course Requirement and the Writing Requirement. These additional required courses may be taken at any time during the second or third year.

Elective Courses

8015 Comparative Law (3) General introduction to civil law systems of France and Germany, focusing on legal institutions, methodology and aspects of law of obligations and commercial law.

8050 American Legal History (3) Historical development of law, legal institutions, legal profession, and legal education from colonial times to present. Historical relationship of legal system to society.

8055 Criminal Law Theory (3) Theoretical foundations of criminal law, including a determination of concepts of justice and morality and pertinent materials in physical and behavioral sciences.

8061 Criminal Procedure I (3) Police practices and rights of persons charged with crimes; arrest, search and seizure, identification, interrogation, entrapment, electronic eavesdropping, right to counsel, and jury trial.

8062 Criminal Procedure II (3) Pre- and post-trial procedures in a criminal case: bail, preliminary hearing, grand jury, prosecutorial discretion, discovery, speedy trial, plea bargaining, and post-conviction relief.

8125 Adjudicative Law (2) Adjudicative courts and jurisdiction; death and injury to persons; special provisions concerning various maritime workers; carriage of goods by ships; principles governing collisions and liability.

8170 Trial Practice (3) Criminal and civil litigation, trial preparation, professional responsibility, fact investigation, witness preparation, discovery and presentation of evidence, selection, and introduction of jurors, opening and closing arguments.


8230 Law and Current Problems (2-3)

8260 Bills and Notes (2) Negotiable instruments, negotiability, transfer, holders in due course; equities and defenses; liability of parties; discharge; letters of credit: Arts. 3, 4, and 5 of Uniform Commercial Code.

8280 Conflict of Laws (3) Jurisdiction, foreign judgments, choice of law, constitutional limitations, renvoi, and classification.

8310 Constitutional Law II (3) Freedom of expression, association and religion. Fourteenth Amendment rights excluding rights of criminally accused, including discrimination as to race, sex, etc.; right to franchise and apportionment, concept of state action in matters of civil rights.


8360 Family Law (3) Survey of laws affecting formal and informal family relationships. Premarital disputes, antenuptial contracts, creation of common law and formal marriage, legal effects of marriage, support obligations within family, legal separation, annulment, divorce, alimony, property settlements, child custody, child support, adoption, abortion, and illegitimacy.

8420 Evidence (4) Rules regulating introduction and exclusion of oral, written, and demonstrative evidence, including relevance, hearsay, privilege, judicial notice, presumptions, burden of proof.

8460 Federal Courts (3) Jurisdiction of federal courts and conflicts between federal and state judicial systems, selection and instruction of juries, opening and jury trial.

8940 Environmental Law and Policy (3) Methods of public policy analysis, framework for understanding responses of legal systems to environmental litigation. Clean Air Act, National Environmental Policy Act, and selected regulatory issues.

8500 Future Interests (3) Law of future interests, including reversions, remainders, possibilities of reverter and rights of entry, executory interests, construction of limitations, and rule against perpetuities.

8510 Government Contracts (2) Principles relating to government procurement, both federal and state. Award, performance, and termination of contracts. Administrative determination of disputes arising under government contracts. Preer; 8200.

8525 International Business Transactions (3) Legal status of persons abroad, acquisition and use of property within a foreign country, doing business abroad as a foreign corporation, engaging in business with a foreign country, expropriation or annulment of contracts or concessions.

8530 Public International Law (3) International agreements, organizations, recognition of states, nationality, territory, jurisdiction and immunities, claims, extraterritoriality, force and war.

8535 Jurisprudence (3) Legal theories: natural law, idealism, historical jurisprudence, utilitarianism, analytical jurisprudence, sociological jurisprudence, legal realism, policy science approach.

8540 Labor Law (4) Evolution of labor relations laws, rights of self-organization, employer and union unfair labor practices; strikes; boycotts and picketing, collective bargaining; public employee labor relations: internal union affairs; individual rights under labor laws; employment discrimination; federalism and preemption; unions and antitrust laws.

8550 Law, Language, and Ethics (3) Intermediate level jurisprudence-type course. Law as the mind's attempt to defend, direct, and administer human activity. Exploration of ethical values underlying formal legal reasoning and statement. Analysis of judicial reasoning and legal concepts through methods of epistemology.

8565 Law and Economics (3) Relationship between