tion on admission, financial support, and housing should be sent to

Director, University of Tennessee-Oak Ridge Graduate School of Biomedical Sciences, Biology Division, ORNL, Box Y, Oak Ridge, Tennessee 37831.

THE DOCTORAL PROGRAM

1. Satisfactory (B grade or better) comple-
tion of the following core courses or their
equivalent: Biochemistry (511); Biophysical
Biochemistry (514); Genetics (515); Molecular
Genetics (517); Cell Biology (518-19); Com-
puting for the Life Sciences (525); and
Statistics for Biologists (574).

2. Three semesters of Biomedical Sci-
cence Laboratory (531-32-33).

3. Participation in at least one of the seminars
during each term of residence after the first
year is strongly recommended.

4. Satisfactory completion of formal
advanced courses in the areas of the stu-
dent's interests. The number and nature of
the required advanced courses will vary
dependent upon the student's background
and area of specialization.

5. Passing both written and oral compre-
hen sive examinations. The student is
required to pass the comprehensive exami-
nations for the major area of study (511, 514,
515, 570, etc.) and to pass at least one of the
minor area examinations (518, 519, 525, etc.).

6. A dissertation reporting the results of
original and significant scientific research. A
minimum of 24 semester hours of course
work is required.

7. A final oral examination on the disser-
tation.

8. A formal seminar presentation of the
dissertation research.

SPECIAL MASTER OF SCIENCE DEGREE

The graduate faculty has designed a Master of Science program in Biomedical Sciences which may be completed in a minimum of 6 semester hours.

1. Graduate credit or a proficiency in the fol-
lowing courses is required: Biochemistry (511);
Biophysical Biochemistry (514); Cell Biology
(518-19); and any of the following courses:
Genetics (515); Molecular Genetics (517); Statistics
for Biologists (574); or Computing for the Life
Sciences (525). Additional credits may be ob-
tained (6 to 15 hours) with electives.

2. Thirty hours of approved advanced
courses including a minimum of 6 semester
hours for thesis.

3. For admission to candidacy: Completion
of any required prerequisite courses and one
semester of graduate course work with a B
average. Admission to candidacy forms must
be filed at least one full semester prior to
receipt of degree.

4. A Master's committee of three
approved faculty members upon admission
to candidacy.

5. A thesis reporting results of original and
significant scientific research.

6. Passing a final examination.

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

502 Registration for Use of Facilities (3-15) Required for the student not otherwise registered during any semester when student uses University facilities and/or
time before degree is completed. May not
be used toward degree requirements. May be
repeated. S/NC only. E

507 Physical Chemistry (3) Thermo-dynamics; phase
equilibria; chemical equilibria; electrostatic force; sur-
face chemistry; electrolysis; solutions; kinetics;
conductance; viscosity; diffusion.

511 Biochemistry (3) Chemistry of carbohydrates,
lipids, proteins, and coenzymes; enzyme kinetics inter-
mediary metabolism and photosynthesis; biosynthesis
of amino acids lipids, and macromolecules. Coreq:
507.

514 Biophysical Biochemistry (3) Chemistry metabo-
lism and biosynthesis of purines, pyrimidines and nucleic
acids; biosynthesis of RNA, DNA, and proteins. Energy
levels and excited states of large molecules; optical
instrumentation; adaptations to system perturba-
tions; properties of macromolecules in solutions;
molecular solution; molecular conformations; inter-
and intramolecular forces; principles of microscopy.
Prereq: 511.

515 Genetics (3) Mendelian genetics, mitosis and mel-
ois; transmission genetics; mapping and linkage;
genetics of phage, bacteria and eucaryotes; map-
ing, linkage, mutagenesis; cytoplasmic inheritance.
Mechanisms of recombination, chromosome struc-
ture and replication.

517 Molecular Genetics (2) Molecular biology of genetic
processes. Three intensive lectures present
recent current research on mechanisms of gene regulation;
protein synthesis; suppression of nonsense and non-
sense mutations; recombination; gene fusions and
hereditary diseases. Prereq: 511, 514, and 515.

518 Cell Biology I (3) Structure and composition of
major nuclear and cytoplasmic organelles of eukary-
tic cells. Pertinent instruments and techniques; mi-
erosomes and mitosis; organelle structure and func-
tions; mRNA metabolism; nucleoli and ribosome biogenesis;
survey of specialized cells. Structure of genetic tran-
scription and translation in bacteria. Coreq: 511.

519 Cell Biology II (3) Comparative biochemical approach
to cell structure and function. Membrane systems and
metabolism; development and function of mitochon-
dria, chloroplasts, peroxisomes and other organelles
as related to metabolism and regulation; transport
phenomena, cell cycle, cell products; interaction of
cells; function of tissues and organs. Prereq: 511,
518.

525 Computing for the Life Sciences (3) Interactive
computing. Mini- and micro-computing environ-
ments; Basic, Fortran, and/or Pascal languages;
applications of statistics, graphics, text manipulation,
and computer communications.

531-32-33 Biomedical Sciences Laboratory (3,3,3)
Approaches and technologies in various areas of mod-
ern biology. Students spend a semester in each of three
laboratories conducting research in different areas of
biomedical science. Required of all first-year stu-
dents.

543-46-49 Graduate Research Participation (3,6,9)
Special advanced research project not related to dis-
sertation research. Topics chosen with consent of
instructor. May be repeated.

551-52-53 Special Topics in Biomedical Sciences
(3,3,3) Either tutorials or formal lectures. Potential
topics: X-ray diffraction and crystallography; excided-
state biophysics; chemical or physical properties;
pathology; mammalian genetics coverage.

570 Developmental Biology (2) Principles of early
embryogenesis and tissue interactions that initiate
cellular differentiation. Mechanisms of differential gene
action and regulation of protein synthesis; cellular
differentiation. Prereq: 511, 517, 519.

574 Statistics for Biologists (2) Application and inter-
pretation of statistical methods in data analysis. Random
variation; normal, binomial, and Poisson distribution;
statistical presentation of data; estimating means and
variation; confidence intervals; tests of significance for
comparisons of means; chi-square tests; correlation
and association; linear regression. Prereq: Statistics
201 or consent of instructor.

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

622 Enzyme Regulation and Kinetics (3) Kinetics of
catalysis; inhibition by product, substrate and dead
end products; mechanisms of allosteric enzymes,
types of feedback regulation; role of sub-
units in enzyme regulation; multifunctional enzymes.
Prereq: 511, 514.

624 Chemistry and Metabolism of Lipids (2) Nomen-
clature, chromatographic isolation, chemistry, physical
properties, and enzymology and lipids. Hormonal action
of prostaglandins and role of lipids in membranes;
enzymes, expression and turnover of nervous tissue; lipo-
chemistry of mammals. Comparative aspects, lipid
pathways in bacteria and yeast. Prereq: 511, 514.

627 Cancer Biology: Carcinogenesis (2) Biological
and biochemical characteristics of cancer cells. Tumor
immunology, membranes, DNA repair, Nature, metab-
olism, and mechanism of action of chemical carcinogens.
Radiation and site-specific carcinogenesis.

628 Molecular Genetics of Carcinogenesis (2) DNA
and RNA tumor viruses, oncogenes, growth factors,
and their potential role in induction of cancers.

640 Membrane Biology (3) Seminar in current topics:
transport kinetics, membrane biogenesis and turn-
over, endocytosis and exocytosis, receptor regulation,
and hormone-membrane interactions. Prereq: 511,
514, 518, 519.

641 Techniques in Cell Biology (3) Basic concepts of
cell biology techniques, their application to specific
research problems, kind of data yield, and cautions in
data interpretation. Laboratory demonstrations may
be arranged where appropriate. Prereq: 511, 514,
518, 519.

651-52-53 Advanced Topics in Biomedical Sci-
ences (3,3,3) Current and future research developments;
protein synthesis, protein chemistry and enzyme mech-
anism; cryobiology, and special topics. Either as tutorial
or literature survey requiring substantial student prep-
aration. May be repeated.

650 Mammalian Genetics (3) Known genetic variants
affecting each organ system of experimental mam-
als, especially laboratory mice. Inheritance of
phenotypical and biochemical traits in rodents and
other laboratory rodents. Prereq: 515.

655 Microbial Genetics (3) Basic phenomena in micro-
bial genetics: transduction, transformation, conjugation,
and mutation. Genetics of bacteriophage. Prereq: 515,
517.

660 Cytogenetics (3) Chromosome structure, chromo-
mal alterations (mitosis and meiosis), mechanisms of
induction of chromosomal alterations by radiation
and chemicals, aneuploidy, chromosomes involved in
situ hybridization. Chromosome changes and cancer,
human cytogenetics, sister chromatid exchanges, human
genetic assessment, molecular techniques for
analyzing chromosome changes. Prereq: 515.

Botany

Botany (College of Liberal Arts)

DEGREES

Botany...........................................M.S., Ph.D.

Raymond W. Holton, Head

Professors:

J. D. Caponetti, Ph.D. Harvard;
E. E. Clegsb, Ph.D. Duke; H. R. DeSelm,
Ph.D. Ohio State; A. M. Evans, Ph.D.
Michigan; W. R. Herndon (Alumni
Distinguished Service Professor), Ph.D.
Vanderbilt; L. G. Hickok, Ph.D.
Vanderbilt; L. W. Jones, Ph.D. Texas;
J. F. McCormick, Ph.D. Emory; F. H. Norris (Emeritus), Ph.D.
Ohio State; R. H. Petersen (Alumni Distinguished Service Professor), Ph.D. Columbia; A. J. Sharp (Emeritus) (Alumni Distinguished Service Professor), Ph.D. Ohio State; H. H. Shugart, Ph.D. Georgia; P. L. Wolfe, Ph.D. Texas.

Associate Professors:
C. C. Amundsen, Ph.D. Colorado; A. S. Heilman, Ph.D. Ohio State; R. R. Henke, Ph.D. Miami (Ohio); B. Mullin, Ph.D. North Carolina State; E. E. Schilling, Ph.D. Indiana; D. K. Smith, Ph.D. Tennessee; W. O. Smith, Ph.D. Duke.

Assistant Professor:
B. E. Wofford (Curator), Ph.D. Tennessee.

The Department of Botany offers the Master of Science and Doctor of Philosophy degrees with concentrations in anatomy, bryology, cytology, ecology, genetics, ichenology, morphology, mycology, photobiology, physiology, psychology, pteridology, and taxonomy.

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

For further information, contact the Department Head or the Graduate Coordinator.

ADMISSION REQUIREMENTS

The Botany Department requires scores from the general and subject biology portions of the Graduate Record Examination, at least three letters of recommendation or standard recommendation forms from academic or professional persons, a short statement describing reasons for interest in graduate education in botany, and the following academic requirements:

1. Bachelor's degree: A.B. or B.S. from an accredited college or university with a cumulative grade point average of 2.5 or better (on a 4.0 scale), with evidence of ability to do work of graduate quality.

2. General botany or general biology: 8 semester hours.

3. Advanced botany or closely allied biological sciences: 12 semester hours.

4. Physical sciences: general inorganic chemistry: 8 semester hours; organic chemistry: Physics highly recommended.

5. College mathematics: 8 semester hours including 1 term of calculus.

Evidence of a broad undergraduate background, an ability to do work of graduate quality, and an interest in the study of plant science are considered to be much more important than the particular courses taken as an undergraduate. Accordingly, students lacking specific prerequisite courses but otherwise qualified may be admitted to graduate studies in botany. In such cases, the deficiencies should be removed as soon as possible, typically during the first year of the student's graduate program. The determination of deficiencies and the manner in which they will be removed will be decided upon by the student's pro-tem committee during the first meeting with the student.

THE MASTER'S PROGRAM

The program for the Master of Science is patterned to fit the needs of students who desire a less extensive course of study than the Ph.D. program. However, the applicant must be equally well prepared and display an aptitude and ability for advanced study. The M.S. includes thesis and non-thesis options.

Thesis Option

The thesis program is the normal route taken by botany students for the M.S. In accordance with the emphasis of the University and the department on research, it involves writing and defending a thesis to describe the results of a completed research project of original work. It is important that the entering student promptly identify a major professor and a suitable research project. (It may be either a terminal degree or a preliminary step to studying for a Ph.D. degree).

1. Satisfactory preparation of a written formulation and an oral defense to the student's committee of a research proposal suitable for a thesis. This must be completed before enrollment in Botany 500.

2. Successful completion of 30 hours of graduate credit, at least two-thirds of which must be at the 500 level or higher.

3. Satisfactory performance in one modern foreign language or the use of computer for data analysis. Proficiency in a foreign language may be demonstrated by satisfactory performance on an examination in one modern foreign language (see Graduate Coordinator) or an A or B in French 302 or German 332 (can also be applied to the doctoral program). Proficiency in computer use may be demonstrated by satisfactory completion with a grade of A or B of the following computer science courses or their equivalent: C.S. 101 or 102, 112, and 403 or Stat. 261.

4. Satisfactory completion of two hours at the 600 level.


6. Presentation of a 30 minute departmental seminar.

7. Educational service in the form of teaching and/or ancillary services; consult major professor and department head.

Non-Thesis Option

1. Satisfactory completion of 34 semester hours of approved graduate courses of which 30 semester hours must be in botany including Botany 503. At least two-thirds of the hours must be at the 500 level or higher.

2. Satisfactory completion of two hours at the 600 level.

3. Educational service in the form of teaching and/or ancillary services; consult major professor and department head.

4. Satisfactory performance on a final written examination on all work offered for the degree. The student's committee may also require that an oral examination follow the written examination.

THE DOCTORAL PROGRAM

The Doctor of Philosophy program is patterned to provide training that involves extensive investigation with the student's area of concentration. Although there is no formal program of course work, the student's committee may require specific courses for the completion of the degree.

Most students spend from three to five years working on their Ph.D.

Requirements for successful completion of the Ph.D. are as follows:

1. Satisfactory presentation of a research problem by means of a written proposal and an oral defense to the student's committee. This must be completed before enrollment in Botany 600.

2. Satisfactory performance on a written comprehensive preliminary examination.

3. Presentation of one or more cognate areas outside of the department totaling 6 hours of graduate credit with at least a B average.

4. Satisfactory performance on an examination in one modern foreign language (see Graduate Coordinator) or an A or B in French 302 or German 332.

5. Satisfactory completion of 6 hours at the 600 level (excluding dissertation).


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

Note: The listed requirements for the M.S. and Ph.D. degrees should be interpreted as minimal requirements. Specific stipulations or requirements set as additional foreign languages or an additional oral preliminary examination may be required by the student's faculty committee.

401-02 Field Studies in Botany (3,3) Field experience and taxonomy of special plant groups. Topics vary: bryology, lichenology, mycology, agrostology, mycology, physiology, aquatic vascular plants, synanthrophy, woody plants, and botanical photography. May be repeated under different topic. Maximum 9 hrs.


431 Plant Ecology (3) Interactions between individuals, species, communities and their environments. Circulation of energy and matter in ecosystems. Weekly field trips or laboratory periods, and at least two weekend field trips. Prereq: 330 or equivalent. Su.

451 Plant Tissue Culture (3) Methods for culture of cells, tissues, and organs; media preparation and maintenance of cultures. Prereq: 110-20 or Biology 110-20 or equivalent and Chemistry 120-30 or equivalent. Recommended prerequisites: 310-20, 321, 412; Microbiology 310 and Plant Science 310. Prereq: 110-20 or Biology 110-20. 500 Thesis (1-15) P/NP only. E 501 Mycology (4) Intensive survey of fungi, all major classes, lecture laboratory and field information. Weekly field trips. Prereq: 310, 3 hrs and 1 lab. Su. A 502 Registration for Use of Facilities (1-15) Required for the student not otherwise registered during any semester when student is a resident of faculty and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. S/JNC only. E 503 Non-Thesis Research (2) Library field, or laboratory research under supervision of staff member. Not for thesis candidates. May be repeated. Maximum 4 hrs. E
506 Phycology (4) Comparative study of major algal phyla, both freshwater and marine: morphological, developmental, ecological, taxonomic and physiological aspects. Field and laboratory studies, identification, classification. Prereq: 310 or consent of instructor. 3 hrs and 1 lab. F,A

507 Biological Illustration (3) Principles and applications of photography (B/W and Color) photomacro- and photomicrography, drawing, graphics and video for recording and presentation for research and publication of data in pictorial and graphic form.

509 Morphology and Evolution of Basidomycetes (4) Structure and function of somatic and sexual life cycles as applied to evolution in group. Cultures and specimens in laboratory. Prereq: 310 or equivalent.

512 Taxonomy of Grasses and Grass-like Plants (3) Collection, identification, classification of grasses, sedges and rushes, phylogeny of the grass subfamilies and tribes. Prereq: 330 or consent of instructor. F,A

516 Biosystematics (3) Major experimental methods in systematics and application to specific types of systematic problems. Cytotaxonomy, numerical taxonony, chemotaxonomy and cladistics.

521-22 Advanced Plant Physiology I, II (3, 3) Water and solute uptake, loss and movement; translocation; and fundamentals of mineral nutrition. Prereq: Biochemistry 410 and plant cell physiology course. Recommended prereq: 1 yr Physics. 522- Pheromones and responses of plants to light: Photobiology, and phytchrome mediated responses. Prereq: 521 or Biochemistry 410 and a plant cell or plant physiology course.

530 Advanced Taxonomy of Flowering Plants (3) Evolution and classification of families of angiosperms, local flora. Prereq: 330 or equivalent, 2 hrs and 1 lab. F,A

531-32 Special Problems in Botany (1-4, 1-4) May be repeated. Maximum 12 hrs.

535 Plant Communities and Plant Geography (4) Plants in communities and their classification and ordination; geographic distribution of communities—their climatic and soils relationships. Prereq: 431.

537 Natural Resource Management and Environmental Assessment in Developing Nations (3) (Same as Ecology 537 and Planning 553.)

544 Seminar in Botany (1) Readings and discussions of current literature and/or selected topics in botanical research. May be repeated. Maximum 8 hrs. S/NC only.


555 Seminar in Quaternary Studies (3) (Same as Geology 555 and Zoology 555.)

565 Phytoplankton Ecology (3) Interaction between environment and phytoplankton. Nutrient uptake, primary production, competition, ecological theory applied to phytoplankton communities, and physiological adaptations by populations to environment. Prereq: 310 or consent of instructor.

573 Population Biology (3) (Same as Zoology and Ecology 573.)

578 Plant Cell Biology (4) Plant cellular organization, structure and function of cellular components and correlation of their structures and functions. Principles and application of analytical and experimental laboratory procedures in cell biology research. Prereq: Biology 220 or equivalent. Recommended prereq: Biochemistry 410-19. 3 hrs and 1 lab. F,A

580 Bryophytes and Pteridophytes (4) Taxonomy, phytology, ecology and development morphology. field studies and current research. Prereq: 310-20 or consent of instructor. 2 hrs and 2 labs. F,A

581 Cytogenetics (3) Chromosome structure and behavior during mitotic and meiotic divisions in relation to structural changes, genetic controls, hybridization, speciation, and polyploidy. Laboratory emphasis on normal and aberrant meiotic systems and somatic chromosomes from plants and animals. Prereq: 310 and at least 6 additional hrs in biological sciences. (Same as Forestry 581.) Sp,A

582 Methods and Instrumentation in Laboratory Investigation (1) Project experience and theoretical background in various research methods, ion exchange resins, absorption spectroscopy, disc electrophoresis, polargraphy, zonal and ultracentrifugation, gas chromatography, automatic analyzers, microscopy, culture methods, use and detection of radioisotopes. Prereq: Chemistry 350, 360; Physics 121, 122. May be repeated. Maximum 5 hrs. S/NC only.

583 The Field Research Problem (3) Conceptualization, planning, and implementation of field research. Criteria for choosing instruments, sampling methods, and locations for study of populations, communities, and ecosystem. Field practice. Development and critique of formal research proposal like those required by granting and contracting agencies. Prereq: 431, or 553 or 573.

585 Methods and Instrumentation in Field Investigation (1) Appropriate methods and instrumentation. Topics vary. May be repeated with consent of instructor. Maximum 5 hrs. S/NC only.

590 Developmental Plant Morphology (3) Developmental morphology of plants from vegetative and reproductive organs, and embryonic determination and differentiation. Prereq: 310, 320 or 412 and 521 or 521 or consent of instructor. 2 hrs and 1 lab. F,A

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

606-07 Advanced Topics in Botanical Sciences (1-3, 1-3) Experimental botanical science: nomenclature, morphology and systematic of vascular plants, cryoprotectant botany, cytology and cell biology, genetics, plant physiology, palynology and ecology. May be repeated. Maximum 12 hrs.

632 Ecosystems of the World (2) Characterization of world and regional ecosystems, special characteristics of ecosystem function. F,A

637 Applied Ecology (3) (Same as Ecology 637.)

662 Seminar in the History of Botany (2) History of botanical exploration and advances from early civilization to modern periods. May be repeated. Maximum 4 hrs.

Broadcasting
(College of Communications)

MAJOR

Communications........................................ M.S.
Norman R. Swan, Head

Professors:
D. W. Holt, Ph.D. Northwestern;
H. H. Howard, Ph.D. Ohio; N. R. Swan, Ph.D. Missouri.

Associate Professor:
B. A. Moore, Ph.D. Ohio.

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

Adjunct Professor:
Lindsey Nelson, B.A. Tennessee.

The Department of Broadcasting offers a concentration area for the Master's with a major in Communications. See Communications for additional information.

410 Television News (3) Writing, reporting, performing, and producing news for television. Experience as reporter/producers for television news program. Electronic news gathering equipment and techniques, video editing. Prereq: 310. 1 hrs and 4 labs. E

420 Radio-TV Sales and Promotion (3) Problems and practices of television, radio, and cable sales and promotion. Case studies in sales, sales management, pricing, rate cards, use of rating, and sales presentation. Effective station promotion techniques. Prereq: 320. F

430 Producing for Television (3) Principles of television studio and field production, both technical and creative. Writing, producing, shooting, and editing video stories and programs. E


490 Radio & Television Management (3) Business policies and practices of broadcast operations, departmental function, cost and income analysis, leadership styles and techniques, mid-level management. Capstone course to be taken in student's last semester. Prereq: 275, 310, 330, 390. E

560 Radio & Television Law and Regulations (3) Legal problems faced by broadcast managers. Philosophy of regulatory policy formation. Efforts at self-regulation. Sociopolitical restraints, effects of laws and regulations, and public pressure on stations, networks, cable and new technologies. Unique situation of broadcasting among media in terms of regulations. Prereq: Consent of instructor or admission to program. F

570 Radio & Television Research (3) Various techniques used by stations and consultants in broadcast research. Applied audience research. Deciding which method to use, interpreting results, and applying research to management decision making. Prereq: Communications 512 or 612, or consent of instructor. Sp

580 Seminar in Radio & Television (3) Salient issues in broadcasting. Topics vary. Historical and social perspectives in broadcasting, cable and new technologies, corporate television, educational and public broadcasting, broadcast and society. Prereq: Consent of instructor or admission to program. F

590 Advanced Radio & Television Management (3) Financial management of broadcast operations: budgeting, financial planning, accounting, and related techniques. Theoretical perspectives in broadcast management, organization and management of commercial and non-commercial operations from perspective of general manager. Prereq: 490. Sp

597 Independent Study (2) Prereq: Consent of instructor. May be repeated. Maximum 6 hrs. E

598 Internship (3) Full-time (30-40 hrs per week) work experience in news, production, or sales and management with non-university professional organization. Educational experience beyond that available at university. Final term paper. No retroactive credit for previous work experience. Prereq. Senior or graduate standing, completion of at least 15 hrs of broadcasting courses, GPA 3.0 or better, and consent of department head.

Business Administration (College of Business Administration)

MAJOR

DEGREES

Business Administration/Majors of Instruction 53
THE MBA PROGRAM

The MBA program is designed for students with undergraduate degrees in the social and natural sciences, the humanities, and professional fields such as engineering, business, agriculture, and architecture. For full-time students, the MBA program is a two-year, lock-step program with students beginning in the fall semester and graduating in the spring of each year. Part-time students enter in the fall semester and take approximately 4 years to complete the program. Part-time students are required to successfully complete six hours of graduate credit per semester.

The program consists of 15 MBA core courses and 5 concentration/elective courses. Each course is 3 semester hours of graduate credit with the exceptions of Business Administration 501 and 503, which are one semester hour of graduate credit each.

Application and Admission

Applications are accepted for fall semester only. The application deadline for fall semester are March 1 for international students and June 1 for others. Applications by U.S. citizens and permanent residents received after June 1 will be considered as space allows.

To obtain application materials, write or call:

Associate Dean for Graduate Business Programs
Suite 527, Stokely Management Center
Office of Business Administration
The University of Tennessee
Knoxville, TN 37996-0550
Telephone: (615) 974-5033

To be considered for admission, the applicant's file must be complete. A completed file includes the Graduate School Application, transcripts of prior college work, the MBA program application, two completed recommendation forms, and the Graduate Management Admission Test (GMAT) score report. The first items should reach The Graduate School ten days before the MBA application deadline to allow for processing. Additional information is required by The Graduate School for international students (see page 14).

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

Prerequisites

Upon matriculation, the student must have received a Bachelor's degree from a regionally accredited institution. College-level mathematics through at least one course in calculus is one of two prerequisite requirements for entry into the program. Students whose undergraduate training does not include calculus should arrange to take it at UTK or at another accredited institution prior to the fall semester of entry into the program. The other prerequisite is that the student possess basic operating skills on a microcomputer. An intensive one-week summer workshop is offered for candidates not having the required computer skills.

Those electing the mathematics concentration or statistics concentration must have completed two years of college-level calculus.

MBA Core

The following courses are required in each student's program. For full-time students, the sequence of core courses is:

Third semester: Economics 503, Business Administration 506.

The same courses, but in a different sequence, comprise the core for part-time students.

Concentration and Electives

A concentration area may be indicated on the MBA Program Application or this declaration may be deferred until after matriculation. In any event, selection must be made no later than completion of 18 hours of MBA program course work. In some cases, selection of an area early in the program is encouraged to facilitate proper course sequencing. Requests for changes in concentration area must be submitted for approval to the Office of Graduate Business Programs.

Among the 5 courses in the concentration/electives block, at least 3 but not more than 4 must be in one of the following concentration areas. For specific courses required in concentration areas, see the appropriate field of instruction.

Controllership

Economics

Finance

Forest Industries Management

Management Science

Marketing

New Venture Analysis and Entrepreneurship

Statistics

Transportation and Logistics* *Available to residents of West Virginia under terms of the Academic Common Market.

(See College of Business Administration.)

The remaining elective courses (1 to 2) must be in fields outside the concentration area, normally selected from MBA courses offered in other departments of the college. Courses outside the College of Business Administration as well as courses listed in the Graduate Catalog numbered below 500 may be included in this block only with written permission via formal petition to the Office of Graduate Business Programs.

Transfer Credits

Graduate level courses taken at other institutions accredited by the American Assembly of Collegiate Schools of Business that otherwise conform to University policy may be credited toward MBA degree requirements within the following limits:

MBA Core: 6 hours

Concentration Area: 3 hours (provided at least 6 hours of work at this institution are included in the concentration area).

Elective Area: 3 hours.

The maximum number of hours that may be transferred is 6 semester hours. Transfer credit will be considered upon formal petition to the Associate Dean for Graduate Business Programs.

Other Requirements

The Application for Admission to Candidacy must be approved by two faculty members and the department head in the student's area of concentration. Transfer credit may be transferred to the Associate Dean for Graduate Business Programs.

To be considered for admission, the student must achieve a B average (3.0) or above in MBA core courses required in his/her program, a B average or higher in courses comprising the concentration area, and a B average or higher in the overall program. The student must demonstrate competency in these areas in a comprehensive exam administered in the capstone course, Business Administration 509.

BUSINESS ADMINISTRATION CONCENTRATION

For complete listing of MBA program requirements, see above.

MBA Concentration

New Venture Analysis and Entrepreneurship: This MBA concentration has been designated a Center of Excellence by the Tennessee Higher Education Commission. The concentration is comprised of three specifically designated courses which are interdisciplinary in nature. This concentration strives to build a strong academic foundation for both entrepreneurial and intrapreneurial activities. The new venture analysis and entrepreneurship concentration is offered to both the full- and part-time student in recognition of the growing trend in American business today towards new product/venture development. The new venture analysis/entrepreneurship concentration courses may be combined with two elective courses in another area (finance, management, etc.) to achieve a dual concentration.

Minimum Course Requirements for MBA
Concentration: Finance 551, Management 551, and Marketing 550. These course descriptions are listed for reference under their fields of instruction.

**DUAL J.D.-MBA PROGRAM**

The College of Business Administration and the College of Law offer a coordinated dual program leading to the conferral of both the Doctor of Jurisprudence and the Master of Business Administration. The dual program saves the student one year over the time that would be required to earn both degrees independently.

The establishment of the dual program recognizes the increasingly complex body of knowledge to the creative conduct of business and business-related law practice, the complementary nature of many aspects of the graduate programs of the College of Law and the College of Business Administration, and the intellectual benefits inherent in the concurrent study of both business and business-related law. The program is designed to accommodate the interests of students who (a) contemplate a career in public service and want to acquire the skills and perspective of the lawyer and the business-oriented manager; (b) contemplate a career in business management and want to acquire the skills and perspective of the business-oriented lawyer; or (c) contemplate a career as a lawyer specializing in business-related law and want to acquire the skills and perspective of the business-oriented manager.

**Admissions**

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

Students who have been accepted by both colleges may apply for approval to pursue the dual program anytime prior to, or after, matriculation in either or both colleges. Such approval would provide that dual program studies be started prior to entry into the last 28 semester hours of J.D. course work and prior to entry into the second year of the MBA program. Students interested in entering the dual degree program should submit a letter of application to the Dual Program Committee.

The primary objective of the Ph.D. in Business Administration is to prepare a select number of qualified students for careers in university-level teaching and research and for responsible positions in business and government.

Students seeking to enter the Ph.D. program must have an outstanding undergraduate background and should represent a deep and sincere commitment to the pursuit of a career in research and instruction. If you are interested in applying to the Ph.D. program under these circumstances, contact the Associate Dean for Graduate Business Programs for consideration of the application.

**Program of Study**

The Ph.D. normally requires at least three years of intensive study and research beyond the Master’s degree. Typically, the first two years of a student’s program consist of course work, writing, and research. The third year usually focuses on completion of the dissertation research and writing. It is emphasized that the Ph.D. program of study is structured for full-time students only. Upon acceptance of a student by a particular departmental faculty, the student is expected to remain in residence until the dissertation has been completed and all requirements are met for completion of the Ph.D.

Since the program focuses on the development of competent scholars, heavy emphasis is placed on both teaching and research skills. As part of the doctoral program, each student is required to serve as a teaching assistant to an undergraduate business class or as a research assistant to a senior faculty member. Typically, the College of Business Administration offers financial support for doctoral students during their tenure in the program.

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

There are five concentrations offered in the Ph.D. program:

- **Accounting**
- **Finance**
- **Management (Operations Management and Strategic Management)**
- **Marketing**
- **Transportation and Logistics**

More detailed information concerning specific areas is available by writing directly to each department chairperson and by referring to the appropriate fields of instruction.
Degree Requirements

Doctoral students must file a program of study that has been approved by their temporary doctoral advisory committee and the Associate Dean for Graduate Business Programs by the end of the first semester of course work after entry into the program. This committee is nominated by the department chairperson in a student's intended area of concentration, subject to the Graduate Council's policies and procedures.

Following are specific degree requirements:
1. Students must complete at least three years of full-time course work beyond the baccalaureate degree, with two years of residence on the Knoxville campus.
2. Students must complete appropriate courses at the graduate level, or other approved concentrations of course work, in the following areas:
   - Accounting
   - Behavioral Science
   - Business Policy
   - Calculus
   - Computer Science
   - Economics
   - Finance
   - Legal Environment
   - Management
   - Marketing
   - Statistics

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

3. Basic Core: Economics 510 (or approved substitute) is required, except that Management 567 (or equivalent) may be substituted with prior approval.
4. Research Tools: A minimum of 9 semester hours of graduate research methods required. At least 6 semester hours in statistics courses beyond Statistics 531 are required. The remaining 3 semester hours may be completed in additional statistics courses (not to include Statistics 531) or in other areas such as research methodology, management science, computer science, econometrics, and psychometrics.
5. Concentrations: The concentration is the focal point of the Ph.D. program. Students are expected to learn the literature and research techniques in the concentration area and to do quality research as evidenced by the preparation of an acceptable dissertation. A minimum of 12 semester hours of course work is required. At least 9 hours of doctoral seminars. Graduate work taken in the concentration at other institutions is considered by the temporary doctoral advisory committee in approving the specific course work required. Available concentrations are: accounting, finance, management (operations management and strategic management), marketing, and transportation/logistics. See the appropriate fields of instruction for specific course requirements.
6. A minimum of 9 semester hours of graduate course work is required in an area outside, but consistent with, the concentration. The student may choose the cognate from one of the following: one of the five concentration business areas listed above, economics, statistics, or a related area in another school or college of the University.

Comprehensive Examinations

Comprehensive written examinations over the concentration and cognate areas are required of each person seeking candidacy for the Ph.D. The concentration area examination is administered in two sessions of approximately four hours each and the cognate area examination in one session of approximately four hours. Written examinations may be supplemented with oral examinations. For a doctoral student having a cognate area in the College of Law, the results of only an oral examination may be deemed acceptable. Scheduling of comprehensive examinations is coordinated through the Office of Graduate Business Programs. Comprehensive examinations are generally offered during the fall and spring terms. Comprehensive examinations must be taken within five years of matriculation.

When either the concentration or cognate area examination is passed, the remaining examination must be passed within the next 13 months.

Doctoral Committee

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

Admission to Candidacy

Students may apply for admission to candidacy for the Ph.D. after maintaining at least a "B" average in course work, successful completion of comprehensive examinations, and acceptance of a research proposal for the dissertation by the student's doctoral committee.

Admission to candidacy must be approved at least one full semester prior to the date the degree is conferred. (Admission in the fall permits graduation in the following spring semester.)

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

Dissertation

Minimum of 24 semester hours: The student must complete a dissertation embodying the results of original research demonstrating the ability to do scholarly writing. The dissertation is supervised by the candidate's doctoral committee, which must certify its completion and acceptability after oral defense of the candidate's research effort.

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

501-03 Integrative Management, II (1,1) Introductory integrative managerial policy and strategy for MBAs only. Use of tools of analysis, data, information, design, and remediation to identify, solve, and correct problems in and of organizations.

506 Management Information Systems (3) Analysis of organizational information needs, decision support systems, data base designs, data base software, computer utilization in data display, modeling, and strategies.

509 Managerial Policy and Strategy (3) Strategy and policy that affect character and success of total enterprise. Capstone course integrating all functional areas in formulation and implementation of strategy that ensures organization to reach objectives. Prereq: MBA core.

599 Executive-In-Residence (3) Interaction with corporate executives from wide spectrum of business disciplines and discussion of domestic and international strategic planning as applied in major corporations. Prereq: MBA core and consent of instructor.

Chemical Engineering (College of Engineering)

MAJOR

Chemical Engineering

DEGREES

Joseph J. Perona, Head

Professors:
- D. C. Bogue, Ph.D. Delaware; E. S. Clark, Ph.D. California (Berkeley); L. W. Crawford (UTSB), Ph.D. Cincinnati; O. L. Culberson (Emeritus), Ph.D. Texas; J. F. Fellers, Ph.D. Akron; G. C. Frazier, Jr., D.Eng. Johns Hopkins; J. M. Holmes (Emeritus), Ph.D. Tennessee; H. W. Hsu, Ph.D. Wisconsin; H. F. Johnson (Emeritus), Ph.D. Yale; C. F. Moore, Ph.D. Louisiana State; J. J. Perona, Ph.D. Northwestern, P.E.; J. W. Prados (Visiting Assistant Professor), Ph.D. Tennessee; C. D. Scott (Adjunct), Ph.D. Tennessee; C. O. Thomas, Ph.D. Tennessee; J. S. Watson (Part-time), Ph.D. Tennessee.

Associate Professors:
- P. R. Bienkowski, Ph.D. Purdue; D. D. Burns, Ph.D. Houston; C. H. Byers (Adjunct), Ph.D. California (Berkeley); R. M. Counce, Ph.D. Tennessee; T. L. Donaldson (Adjunct), Ph.D. Pennsylvania; A. C. Sheth (UTSB), Ph.D. Northwestern.

Assistant Professor:
- F. E. Weber, Ph.D. Minnesota; T. W. Wang, Ph.D. M.I.T.

Lecturer:
- D. W. Lane (Adjunct), Ph.D. Tennessee.

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

THE MASTER'S PROGRAM

The standard Master's program includes a thesis and leads to the Master of Science. Minimum departmental requirements are as follows:
1. A total of at least 21 hours in graduate courses in chemical engineering and related areas, including at least 15 hours in chemical engineering; 3 hours in other engineering, scientific, or business areas (as approved by the departmental faculty); and 3 optional hours from either one of these two categories.


3. Active participation in graduate seminars in the department. Resident students must register for CHE 501 every semester it is offered.

4. A final oral examination covering the thesis, related fields and graduate course work.

Under certain conditions, a candidate may apply for a non-thesis program. To be eligible, a candidate must show evidence of significant professional experience after the baccalaureate degree; at least five years of industry experience in a chemical engineering or related field; evidence of independent research; and a satisfactory written report of research, which would be examples of such evidence. The departmental faculty will consider each application individually. Upon acceptance, the requirements for completion of the non-thesis program are as follows:

1. A total of at least 33 hours in graduate courses in chemical engineering and related areas. The minimum requirements are 18 hours in chemical engineering; 6 hours in one or more of the sciences, engineering, scientific, or business areas (as approved by the departmental faculty); and 9 optional hours from either one of these two categories.

2. Completion of a critical review of the literature and other sources in an area related to chemical engineering (CHE 580).

3. A written comprehensive examination over the major field and an oral examination covering the review paper and related areas.

THE DOCTORAL PROGRAM

Students applying for entrance into the doctoral program must submit evidence of ability to perform and report independent research to the satisfaction of the department. The Master's thesis may be offered as a component of the doctoral program. To be eligible, a candidate must show evidence of significant professional or research experience after the baccalaureate degree; at least five years of industry experience in chemical engineering or a related field; evidence of independent research; and a satisfactory written report of research, which would be examples of such evidence. The departmental faculty will consider each application individually. Upon acceptance, the requirements for completion of the doctoral program are as follows:

1. Graduate courses in chemical engineering, amounting to approximately 24 semester hours, at least 9 of which must be in 600 series courses.

2. Supporting courses in related scientific and engineering fields amounting to approximately 24 semester hours, subject to approval by the student's faculty committee. These related fields will normally include chemistry, mathematics, physics, and engineering.

3. The comprehensive examination, usually given in two parts, and covering such topics as chemical engineering operations and processes, thermodynamics, technology, and other related fields.

4. Active participation in graduate seminars conducted by the department. Resident students must register for CHE 501 every semester offered.

5. Reading ability, by means of a written examination, in one foreign language of technical or commercial significance. Language must be selected from the following list, which is not intended to be comprehensive and may be amended from time to time by vote of the departmental faculty.

600 Doctoral Seminar (1) Prereq: Admission to graduate program. May be repeated. S/NC only.

503 Registration for Use of Facilities (3-15) Required only for students not otherwise registered during any summer semester when University facilities and/or faculty time before degree is completed. May be used toward degree requirements. May be repeated. S/NC only. E.

505 Engineering Analysis (3) Formulation and solution of problems in chemical engineering and materials areas, ordinary and partial differential equations; types of ODE; PDE and solution techniques; conformal mapping; variational methods; introduction to numerical methods. (Same as Materials Science Engineering 505.)

506 Approximate Methods in Chemical Engineering (3) Chemical engineering problems requiring approximate solution; introduction to some approximate methods. Prereq: 505.


531 Advanced Chemical Engineering Thermodynamics (3) Phase equilibrium in ideal and nonideal solution; composition relationship between phases, solution behavior and applications; introduction to microscopic approach to thermodynamics. Prereq: 511, 525.

541 Fluid Mechanics and Polymer Processing (3) (Same as Polymer Engineering 541.)

542 Diffusive and Stagewise Mass Transfer Operations (3) Analysis of mass transfer phenomena; coupled mass transfer and reaction, mass transfer operations in packed towers and agitated vessels, membrane separations. Equilibrium stage concepts applied to mass transfer operation; emphasizing nonisothermal and multicomponent systems.

551 Chemical Reactor Analysis (3) Rate models for heterogeneous reactions, properties of porous catalysts, catalyst deactivation, fluid-fluid and fluid-solid reactors.


588 Measurement Science I (3) (Same as Nuclear Engineering 588, Civil Engineering 588, Electrical and Computer Engineering 588, Engineering Science and Mechanics 588, Mechanical Engineering 588, and Aerospace Engineering 588.)

589 Measurement Science II (3) (Same as Nuclear Engineering 589, Civil Engineering 589, Electrical and Computer Engineering 589, Engineering Science and Mechanics 589, Mechanical Engineering 589, and Aerospace Engineering 589.)

590 Special Topics in Chemical Engineering (3) May be repeated. Maximum 6 hrs.

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

625 Venture Analysis (3) One or more chemical engineering processes as basis for proposed new venture business. Case study with attention to markets, manufacturing needs, cost estimation, and management and financial planning. To support decisions by management or by potential investors. Prereq: 525 or equivalent.

631 Advanced Topics in Statistical Thermodynamics and Molecular Dynamics (3) Statistical thermodynamics, computer simulation, University physics and statistics, Monte Carlo and molecular dynamic calculations; applications to supercritical fluids, macromolecules and biological systems. Prereq: 531.
Chemistry

(College of Liberal Arts)

MAJOR

DEGREES

Chemistry ........................................ M.S., Ph.D.

Gleb Mamantov, Head

Professors:

J. E. Bloor, Ph.D. Manchester; N. S. Bowman (Emeritus), Ph.D. Princeton; C. A. Buehler (Emeritus) (Alumni Distinguished Service Professor), Ph.D. Ohio State; W. E. Bull, Ph.D. Illinois; J. C. Chambers, Ph.D. Kansas; R. N. Compton, Ph.D. Tennessee; J. A. Dean (Emeritus), Ph.D. Michigan; J. F. Eastham, Ph.D. California (Berkeley); W. H. Fletcher (Emeritus), Ph.D. Minnesota; G. Guiocch (Distinguished Scientist), Ph.D. Ecole Polytechnique and Paris VI; G. W. Kabaika, Ph.D. Purdue; D. C. Kleinlester, Ph.D. Princeton; M. H. Lietzke, Ph.D. Wisconsin; R. M. Magid, Ph.D. Yale; G. Mamantov, Ph.D. Louisiana State; R. M. Pagni, Ph.D. Wisconsin; J. R. Peterson, Ph.D. California (Berkeley); H. H. Ross, Ph.D. Wayne State; G. K. Schwitzer, Ph.D. Illinois; D. A. Shirley (Emeritus), Ph.D. Iowa State; W. T. Smith (Emeritus), Ph.D. Ohio State; W. A. Van Hook, Ph.D. Johns Hopkins; E. L. Wehr, Ph.D. Purdue; T. F. Williams, Ph.D. London; J. H. Wood (Emeritus), Ph.D. North Carolina.

Associate Professors:

J. L. Adcock, Ph.D. Texas; J. E. Bartment, Ph.D. Northwestern; K. D. Cook, Ph.D. Wisconsin; F. A. Grimm, Ph.D. Cornell; J. L. Kovacs, Ph.D. Yale; C. A. Lane, Ph.D. California (Berkeley); L. J. Magid, Ph.D. Tennessee; F. M. Schell, Ph.D. Indiana; M. J. Sapaniahi, Ph.D. Iowa State; C. Woods, Ph.D. North Carolina State.

Assistant Professors:

S. D. Alexandratos, Ph.D. California (Berkeley); C. E. Barnes, Ph.D. Stanford; C. S. Feiger, Ph. D. Colorado; J. H. Shibata, Ph.D. Washington.

Students majoring in Chemistry for the Master's or doctoral degree are required to present as a prerequisite two years of chemistry including quantitative analysis.

THE MASTER'S PROGRAM

The department offers concentrations in six areas for the M.S.: analytical chemistry, environmental chemistry, inorganic chemistry, organic chemistry, polymer chemistry, and physical chemistry. The requirements for the M.S. in Chemistry consist of the satisfactory completion of:

1. Research and a thesis to give a minimum of 6 hours of graduate credit in Chemistry 500.
2. Participation in seminar (Chemistry 501) during the entire period of graduate study, including the presentation of at least one seminar. (No more than 2 hours may be applied to the course requirements.)
3. Prescribed remedial courses based on performance on entrance examinations.
4. Sufficient graduate course work in chemistry (at the 400 level or above) and/or a related field to make an overall total of 30 hours, including one of the following sequences: 510-11-12, 530-31-32, 550-51-52, 570-72-73, 590-94-95. At least 14 hours of this graduate course work must be at the 500 level or above.
5. A final oral examination.

THE DOCTORAL PROGRAM

The department offers concentrations in eight areas for the Ph.D.: analytical chemistry, chemical physics, environmental chemistry, inorganic chemistry, organic chemistry, polymer chemistry, and theoretical chemistry. The requirements for the Ph.D. in Chemistry (except for the chemical physics concentration) consist of the satisfactory completion of:

1. Research and a dissertation to give at least 24 hours of graduate credit in Chemistry 600. Registration must be continued from the beginning of research.
2. Participation in seminar (Chemistry 501) during the entire period of graduate study, including the presentation of at least one seminar.
3. Prescribed remedial courses based on performance on entrance examinations.
4. Completion of the comprehensive examination and defense of an original research proposal to give 2 hours of credit in Chemistry 601.
5. Demonstration of a reading knowledge of French, German, Russian, or an alternative approved by the Chemistry faculty.
6. Eighteen additional hours in courses at the 500 level or above including at least one course above 601 and one of the following sequences: 510-11-12, 530-51-52-53-54, 570-71-72-73, and 590-94-95.
7. A final oral examination.

The Ph.D. program with concentration in physical chemistry is conducted jointly with the Department of Physics. Requirements depend on the choice of the major department. Departmental requirements include passing the above degree requirements in concentration in physical chemistry plus additional hours in physics at the 500 level or above. Three of the additional physics hours can be used to satisfy the 18 hours requirement in item 6.
Child and Family Studies/Fields of Instruction 59

of use in synthesis; carboxyl chemistry and carbon- carbon bond formation; stereochemistry and regio- chemistry of synthetic processes. Prereq: 550. Sp

552 Organic Reaction Mechanisms (3) Techniques and principles in study of organic reaction mecha- nisms; applications and interpretations in polar, radical, and pericyclic reactions; reactive intermediates. Prereq: 550. F

553 Spectroscopic Characterization of Organic Com- pounds (2) Organic structure elucidation using spectroscopic methods: nuclear magnetic resonance, infrared, ultraviolet and mass spectrometry. Prereq: 360 or equivalent. Sp

554 Advanced Organic Chemistry Laboratory (1) Syn- thesis of organic compounds illustrating modern techniques. Prereq: 360 or equivalent. Sp

570 Quantum Chemistry and Spectroscopy (3) Basic principles of quantum mechanics and their applica- tions to molecular orbital theory, molecular structure, and spectroscopy; introduction to group theory. Prereq: 1 yr of physical chemistry. F

571 Advanced Quantum Chemistry and Spectro- copy (3) Prereq: 570 or consent of instructor. Sp

572 Thermodynamics and Statistical Mechanics (3) Macroscopic and microscopic description of equilib- rium systems. Basic principles of thermodynamics and statistical mechanics, and application to selected chemical systems. Prereq: 1 yr of physical chemistry. F

573 Chemical Kinetics and Transport (3) Time-de- pendent phenomena in chemistry: chemical kinetics, chemical dynamics, transport theory. Prereq: 1 yr of physical chemistry. F

580 Fundamental Topics in Physical Chemistry (3) Quantum chemistry, spectroscopy, chemical kinetics, transport properties, thermodynamics, and statistical thermodynamics. Prereq: 1 yr of physical chemistry. F

590 Polymer Chemistry (3) Fundamentals of polymer synthesis and characterization through application of organic and physical chemical principles. Prereq: 1 yr each of organic and physical chemistry.

584 Organic Chemistry of Polymers (3) Synthesis of monomers; mechanism, stereochemistry, sequence distribution, and kinetics of polymerizations. Forma- tion of block, graft, and network polymers. Reactions on polymers. Prereq: 360 or equivalent. Sp

585 Physical Chemistry of Polymers (3) Conforma- tion of macromolecules, solution and bulk properties, rubber elasticity, kinetics of polymerization, polymer thermodynamics. Prereq: 360 or equivalent. Sp

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

601 Chemistry Research Proposal (2) Preparation and oral defense of original written research propos- al based on thorough survey of chemical literature. Prereq: Consent of department head. S/NC only. E

610 Selected Topics in Analytical Chemistry (3) Topics of current significance. Prereq: 510-11-12 or consent of instructor. May be repeated. Maximum 12 hrs.

620 Selected Topics in Inorganic Chemistry (3) Topics of current significance. Prereq: 530-31-32 or consent of instructor. May be repeated. Maximum 12 hrs.

630 Selected Topics in Organic Chemistry (3) Topics of current significance. Prereq: Two of 550-51-52 or consent of instructor. May be repeated. Maximum 12 hrs.

650 Selected Topics in Physical Chemistry (3) Topics of current significance. Prereq: Two of 550-51-52 or consent of instructor. May be repeated. Maximum 12 hrs.


670 Selected Topics in Physical Chemistry (3) Topics of current significance. Prereq: 570-72-73 or consent of instructor. May be repeated. Maximum 12 hrs.

690 Selected Topics in Polymer Chemistry (3) Topics of current significance. Prereq: Consent of instructor. May be repeated. Maximum 12 hrs.

Child and Family Studies (College of Human Ecology)

MAJORS DEGREES

Child and Family Studies............................... M.S.

Human Ecology.......................................... Ph.D.

Greer L. Fox, Head


Associate Professors: J. H. McInnis, Ph.D Florida State; G. Peterson, Ph.D. Brigham Young; G. Twardosz, Ph.D. Kansas.

Assistant Professors: J. Allen, Ph.D. Purdue; B. Barber, Ph.D. Brigham Young; L. Blinn, Ph.D. Ohio State; C. Euehler, Ph.D. Minnesota; C. Catron, Ed.D. Vanderbilt; R. Hailstorks, Ph.D. Ohio State; G. Pettit, Ph.D. Indiana University; D. Tegano, Ph.D. Virginia Tech; K. Weddle, Ph.D. Tennessee.

The Department of Child and Family Studies encompasses two primary concentra- tions: child development and family studies. Integration of these areas creates a unique perspective for the study of individu- als and families. Each graduate student's program of study is carefully planned in con- junction with a faculty committee to establish a program consistent with individual goals. All programs are characterized by a broad array of course work, varied research experiences, and opportunities for experiences in applied settings.

Because the doctoral degree is a research degree, students at this level receive sub- stantial preparation in statistics and research methodology. Interested students should contact the department head.

ADMISSION REQUIREMENTS

Admission to the program is contingent upon faculty evaluation of GRE scores, undergraduate/graduate GPA, writing forms, and work experience. Prerequisites for admission to the Master's or doctoral program are 9 semester hours of either upper division undergraduate or graduate social science.

THE MASTER'S PROGRAM

An individual program of study may be designed under the student's guidance and approval. The program provides for a concentration in one of the following fields of study:

1. Child development
2. Family studies
3. Early childhood special education
4. Early childhood administration
5. Child development and family studies

Specializations in the child development concentration consist of early childhood edu- cation, early childhood special education, early childhood administration, and child development. Specializations in the family studies concentration consist of family life intervention and family science. Thesis and non-thesis options are available in both con- centrations.

All students in the child development concentration must enroll in CFS 510, 511, 533, and 571. At least 6 hours in a cognate area outside the department must be completed. Thesis students are required to take the following: 3 hours of 500-level research methods, 3 hours of 500-level statistics, 6 hours of CFS courses in the area of specialization, 6 hours of thesis credit and an oral comprehensive examination. Non-thesis stu- dents are required to take the following: 3 hours of 500-level research methods, statisti- cal methods, or interpretation of methods and statistics; CFS 564, 565, 9 hours of CFS courses in the area of specialization; and a written comprehensive examination.

Students seeking the M.S. in Child and Family Studies are required to file a plan of study with the department head after 15 hours of graduate credit have been com- piled.

THE Ph.D. CONCENTRATION

The doctoral program in Human Ecology prepares scholars in the concentration areas of child development and family studies. The strength of the doctoral program is based on three major components: the integra- tion of child development and family studies within the context of human ecology and related areas of research, with attention given to child development or family studies, and an emphasis on becoming proficient producers and consumers of research. A doctoral pro- gram that is concurrently specialized and integrative in nature reflects the complexity of the disciplinary subject matter, provides a broader context to formulate theoretical questions, and broadens the empirical litera- ture for addressing those questions.

Requirements include:

1. Minimum 18 credits in child and family studies required foundation courses: 510, 511, 550, 551, 570, 571;
2. Minimum 12 credits in 500- and 600-level courses in child development or family studies, with at least 3 credits in 600-level courses (in addition to the required courses described in #1);
3. Minimum 9 credits in a cognate area;
4. Minimum 9 credits in graduate-level sta- tistics; with at least 3 of these credits in a more specialized area than a sequence of survey courses;
5. Minimum 3 credits of specialized research methods;
563 Family Life Education Programs (3) Planning, implementing and evaluating programs in marital, parent-child, and family relationships, and parenthood education. Prereq: Consent of instructor. (Same as Home Economics Education 563.) F, A

564 Practicum in Human Development or Family Studies II (3) School and community programs concerned with education for human development and family living. Prereq: Consent of instructor. S/NC only. E

565 Practicum in Human Development or Family Studies II (3) School and community programs concerned with education for human development and family living. Committee approved and supervised written project. Prereq: 564 and consent of instructor. E

566 Approaches to Family Intervention and Counseling (3) Various theoretical approaches for family intervention and counseling. Structural, strategic, experiential and social learning schools of practice. Effects of intervention from perspective of their impact on family functioning and counseling. Prereq: 562. (Same as Educational and Counseling Psychology 566.) Sp, A


571 Research Seminar (1) Presentation and critique of research projects. Prereq: Departmental major or consent of instructor. May be repeated, S/NC only. E

580 Special Topics in Human Development or Family Studies (3) Research, theory and current issues in child development or family studies: divorce, handicapped children, family interaction, work and family, Piaget, mainstreaming children, theory and research in human sexuality, cognition. Prereq: 6 graduate hrs in major, or consent of instructor. May be repeated with different topics. Maximum 6 hrs. E

581 Directed Study in Human Development or Family Studies (3) Individual learning experiences in specific topics in child development and early childhood education or family studies. Prereq: 6 graduate hrs or consent of instructor. May be repeated with different topics. Maximum 6 hrs. E

590 Assessment of Development and Learning in Young Children (3) Theory, empirical research and practices related to measurement of development and learning in young children. F, A

591 Assessment of Family Behavior (3) Analysis of methods and measures used in family science research. Prereq: 551 or equivalent or consent of instructor. F, A

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

610 Advanced Special Topics in Human Development or Family Studies I (3) Study of research and theory related to current issues. Prereq: 12 graduate hrs in major or consent of instructor. May be repeated with different topics. Maximum 6 hrs. E

630 Advanced Study in Infant and Early Childhood Development (3) Normative and nonnormative development during infant and preschool years of life: cognitive, emotional, social, and physical aspects. Prereq: 510 or equivalent or consent of instructor. F, A

631 Adolescent Development in Families (3) Normative and nonnormative adolescent development: physical, cognitive, moral, social, family, peers and personality. Prereq: 510 or equivalent or consent of instructor. F, A

632 Family Communication and Conflict Management (3) Human communication and conflict management within family context. Theoretical perspectives for familial processes, adjustment, decision making, and coping. Prereq: 550 or equivalent or consent of instructor. Sp, A

CIVIL ENGINEERING

MAJORS

MAJORS

CIVIL ENGINEERING

MAJOR

DEGREES

Civil Engineering

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

Environmental Engineering

M.S.

Gregory D. Reed, Acting Head

Professors:

E. G. Burdette (Fred N. Peebles Professor), Ph.D. Illinois; A. Chatterjee, Ph.D. North Carolina State, P.E.; W. T. Davis, Ph.D. Tennessee; D. W. Goodpasture (Tenneco Professor), Ph.D. Illinois, P.E.; W. L. Grecco, Ph.D. Michigan State, P.E.

K. W. Heathington, Ph.D. Northwestern, P.E.

J. B. Humphreys, Ph.D. Texas A & M, P.E.

H. L. Johnson, M.S. Tennessee, P.E.

W. A. Miller, Ph.D. Georgia Institute of Technology, P.E.; G. D. Reed, Ph.D. Arkansas, P.E.; B. A. Tshantz (Condra Professor), S.C. New Mexico State, P.E.

G. R. Walker (Emeritus), M.S. Massachusetts Institute of Technology, P.E.; D. W. Weeter, Ph.D. Purdue, P.E.; F. J. Wegmann (IBM Professor), Ph.D. Northwestern.

Associate Professors:

B. J. Frederick, BCE Clarkson, P.E.

J. H. Hansen, Ph.D. Missouri; G. D. Kressin, J.D. Tennessee; A. B. Moore, M.S. Tennessee; R. B. Robinson, Ph.D. Iowa State, P.E.

R. F. Tiry (Emeritus), B.S. Marquette, P.E.

Assistant Professors:

R. M. Bennett, Ph.D. Illinois; E. C. Drumm, Ph.D. Arizona, P.E.

W. F. Kane, Ph.D. Virginia Polytechnic Institute.

Lecturers:


The Department of Civil Engineering offers degrees leading to the Master of Science, Master of Engineering, and Doctor of Philosophy with a major in Civil Engineering focusing on environmental engineering, structural engineering, materials engineering, and transportation engineering; to the Master of Science in Environmental Engineering with concentrations in water quality, water resources, air quality, and solid waste.

MAJOR

DEGREES

Master of Science

Civil Engineering

Civil Engineering

The Department of Civil Engineering offers two options for the Master of Science with a major in Civil Engineering.
Thesis Option: A minimum of 30 semester hours, including at least 6 hours of thesis, is required.

Non-Thesis Option: A minimum of 33 semester hours, including a 3-hour special problems is required. The special problem will culminate in a written report which must be approved by the student's major professor.

Environmental Engineering
For a Master of Science with a major in Environmental Engineering, normally a Bachelor's degree in a field of engineering is required. For a student who does not have an engineering background, the following minimum prerequisite courses will be required: EE 121, 131; ESM 321; CE 231, 390, 395, 396; Math 141, 142, 231, 241. In general, these must be completed before courses for graduate credit can be taken.

The Department of Civil Engineering offers both thesis and non-thesis options for work toward the Master of Science degree in Environmental Engineering.

Thesis Option: The student must present a minimum of 30 credit hours of approved graduate courses. The major shall include a minimum of 6 semester hours of thesis and 12 semester hours of approved environmental engineering course work. A minor may be selected but is not necessarily required.

Non-Thesis Option: The student must present a minimum of 33 semester hours of approved graduate courses. The major shall include a minimum of 18 semester hours of approved environmental engineering course work. A minor may be selected but is not necessarily required.

Either option may be approved by the student's committee. A student's program must include a minimum of 9 semester hours of advanced engineering design courses selected from a list provided by the student's committee.

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

MASTER OF ENGINEERING PROGRAM
A graduate program in civil engineering leading to the degree of Master of Engineering is available to qualified graduates of EAC/ABET accredited undergraduate curricula in civil engineering or environmental engineering. At least one third of the program of study must be classified as engineering design. The student's advisor will assist in planning the program of study to ensure that it includes the necessary design content. The thesis and non-thesis option noted under the Master of Science program is available under this program.

THE DOCTORAL PROGRAM
A graduate program leading to the Doctor of Philosophy is offered in Civil Engineering. Specific departmental requirements for the Ph.D. degree include the following:

1. A minimum of 72 semester hours beyond the Bachelor's degree, exclusive of credit for the M.S. thesis. Of this number, a minimum of 24 semester hours in 600 Doctoral Research and Dissertation will be required.

2. A minimum of 24 semester hours of graduate courses in civil engineering, exclusion of thesis or dissertation credit, at least 6 hours of which must be 600-level courses.

3. Supporting courses in related scientific and engineering fields, amounting to approximately 24 semester hours, subject to approval by the student's faculty committee. These related fields will normally include such disciplines as mechanics, chemistry, mathematics, microbiology, physics, and other engineering fields. A minimum of 9 semester hours of mathematics will be required beyond the civil engineering graduate requirements.

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

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

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

Civil Engineering
404 Computer Applications in Civil Engineering (3) Computer solution of civil engineering problems involving the use of equations, simultaneous linear equations, curve fitting, numerical integration, and ordinary differential equations. Student written programs. PreReq: Basic Engineering 201 and Mathematics 241.

406 Legal and Ethical Aspects of Engineering (2) Legal principles underlying engineering work; laws of contracts, torts, real property; problems of professional registration and ethics. PreReq: Senior standing.

410 Land Surveying (3) Procedures of locating properties, evaluating evidence, procedures to describe property, to create land division, and to prepare plats; laws of land surveying. PreReq: 210.

421 Portland Cement and Asphalitic Concrete (3) Aggregate properties and tests, tests of portland cement concrete, mix design methods for concrete and asphalt, concrete admixtures, tests of asphalt and asphalt mixes, and nondestructive testing. PreReq: 321. 2 hrs and 1 lab.

451 Highway Engineering (3) Design, construction, operation, and maintenance of highway facilities; application of various engineering principles and techniques to the process of planning, locating and design of highway facilities; both geometric and pavement design. PreReq: 210, 251, 352.

452 Traffic Engineering (3) Characteristics of driver, vehicle, and roadway and their interrelationship; traffic studies; safety aspects of traffic circulation and control, lighting, capacity analysis, roadway safety analysis and design. PreReq: 210, 251, 352.

453 Airport/Railroad Planning and Design (3) Airport master planning and railroad engineering. Runway configuration, airfield capacity, geometrics and terminal layout and design. Railroad capacity, geometrics and system layout and design. PreReq: 210, 251, 352.

472 Steel Design (3) Design of plate girders and composite beams used in bridges and other structures. Design for fatigue and strength; complex reinforcement and takeoff techniques, market cost conditions, and 330.

494 Urban Drainage Engineering (3) Design, management and operation of stormwater conveyance and control structures. Application of hydrologic and hydraulic principles to design of drainage systems for urban, storm, and irrigation operation, development of inlet structures, ditches, culverts, and detention/retention basins; application of commonly-used computer runoff models; evaluation of design and cost versus performance. PreReq: 390, 395.

495 Water Resources Development and Management (3) Principles of water resources project development planning and management. Institutional framework; water law, evaluation of competing and water resource development alternatives, multi-objective planning, principles of engineering economics, benefit-cost analysis, cost allocation methods; environmental impact assessment procedures; decisions using risk-based methods; case studies. PreReq: Senior standing.

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

502 Registration for Use of Facilities (3-15) Required for the student not otherwise registered during any semester when student uses University facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. S/JNC only. E

508 Seminar (1) Reports on current research in civil engineering at UTK. PreReq: Graduate standing.

510 Urban Systems: Engineering and Management (3) Various urban systems usually under responsibility of city manager and/or city engineer: streets, lighting, water, sewage, refuse collection, personnel management, finance, planning and public relations. PreReq: Graduate standing.

521 Pavement Design (3) Empirical and theoretical methods of pavement design and analysis, strengthening existing pavements, pavement distress and economical design alternatives. PreReq: 231 and 330.

530 Shear Strength and Earth Slope Stability (3) Shear strength of fine grained soil from perspective of idealized, simple clay. Drained and undrained shear strength and stress-strain behavior of real soils. Laboratory testing, Stability of natural and cut slopes and embankments. PreReq: 335.


535 Advanced Foundations and Retaining Structures (3) Planning subsurface investigations; bearing capacity and settlement of shallow foundations, drilled piers; foundation design with pressure-meter, lateral earth pressures and design of retaining structures and sheetpiles. PreReq: 335.

536 Numerical Methods in Geotechnical Engineering (3) Application of numerical techniques to geotechnical engineering; beams on elastic foundation, nonlinear soil behavior, soil structure interaction. Application of finite element method to selected soil engineering problems, piles, retaining structures, and consolidation. PreReq: 335.


543 Construction Estimating (3) Project costs, estimating and takeoff techniques, market cost conditions, and feasibility of design to cost. PreReq: 340 or consent of instructor.


551 Traffic Engineering/Characteristics (3) Driver-vehicle-roadway system; traffic flow modeling; elements of traffic control; highway safety. PreReq: Graduate standing.
552 Traffic Engineering-Operations (3) Signs, signals, and automated operations; control strategies; signal timing/phasing; one-way reversible flow; system operations; identification and correction of high-accident locations and system deficiencies. Prereq: 551 or 452.

553 Geometric Design and Layout of Roadways and Community Facilities (3) Functional and geometric design and rural and urban roads of all classes; subdivision layout; configuration of urban roads of all classes; techniques for access control; freeway interchange and change streets and intersections; and parking. Prereq: 452 or consent of instructor.

554 Urban Transportation Planning (3) Transportation problems in urban area; systematic planning for identifying existing and future problems; travel surveys and demand models; evaluation of alternatives; implementation. (Same as Planning 553.)

555 Public Transit Planning (3) Characteristics of transit modes—conventional and paratransit; operational design of transit services: route planning and scheduling; cost analysis; mode choice models; performance evaluation; transit surveys; organization and financing. Prereq: 554 or graduate standing.

556 Traffic Accident Reconstruction (3) Data collection and analysis as basis for accident prevention on control programs; roadside hardware design and crash testing. Prereq: 452 or graduate standing.

557 Transportation Planning and Operations with Micro-Computer Applications (3) Transportation system management techniques and application of microcomputers to analysis of transportation actions. Prereq: 551, 554.

558 Planning and Transportation (3) Preparation of transportation plans as elements of comprehensive development plans. Analysis of relationship between various transportation modes and between transportation and other community features. Use of planning process to establish existing travel patterns, modeling of demand, proposing alternatives and evaluation. Prereq: Graduate standing. (Same as Planning 553.)


562 Analysis and Design of Plate Structures (3) Plate bending and buckling theory; analysis and design of bridge and building floors and structural plate components. Prereq: 562.

563 Statically Indeterminate Structures (3) Deflections of members—deflection curves, moment distribution and other displacement methods; secondary stresses. Prereq: 561.

564 Finite Element Structural Analysis (3) Application of finite element method to structural analysis; plane stress, plane strain, axisymmetric, and three-dimensional elements; use of typical computer programs. Prereq: 561.

565 Structural Dynamics (3) Analysis of free and forced vibrations, and transient response of structures having many degrees of freedom; elastostatic behavior considered for structural systems; earthquake design and response of structures. Prereq: 561.

566 Structural Reliability (3) Application of probability and statistical methods to estimating reliability of structures; development of safety factors and probability based design codes.

571 Behavior of Steel Structures (3) Behavior of structural steel members due to static and fatigue loading; determination of critical sections and design for corrosion; use of computer programs for design, and current specialization for design. Prereq: 471.

572 Connections for Structural Steel Frames (3) Design, analysis and behavior of connections for structural steel members; design of welded and riveted and semi-rigid connections; column bases and column splices. Prereq: 472.

573 Prestressed Concrete (3) Properties of prestressing materials; methods of prestressing and posttensioning; analysis and design of simple and continuous beams and slabs. Prereq: 471.

574 Behavior of Reinforced Concrete Members (3) Monotonic and cyclic behavior of reinforced concrete beams; combined bending and axial load; shear and torsion; relation between research results and specifications for design. Prereq: 471.

575 Repair and Retrofitting of Structures (3) Techniques, methods, and materials for repair and retrofitting of deteriorated or overstressed structures, foundation underpinning, retrofitting of steel fatigue failures. Prereq: 472.

588 Measurement Science I (3) (Same as Nuclear Engineering 588, Chemical Engineering 588, Engineering Science and Mechanics 588, Electrical and Computer Engineering 588, Mechanical Engineering 588, and Aerospace Engineering 588.)

589 Measurement Science II (3) (Same as Nuclear Engineering 589, Chemical Engineering 589, Engineering Science and Mechanics 589, Electrical and Computer Engineering 589, Mechanical Engineering 589, and Aerospace Engineering 589.)

590 Special Problems in Civil Engineering (1-6) Enrollment limited to civil engineering students in nonthesis programs. May be repeated. Maximum 6 hrs. S/NC only.

595 Special Topics (1-4) Problems and topics related to current developments in field. May be repeated. Prereq: Consent of instructor.

600 Doctoral Research and Dissertation (3-15) P/NP only. E Prereq: 590.

637 Numerical Models for Geologic Materials (3) Numerical models to represent the stress/strain/temperature relationships of geologic materials; study of plastic, elastic-plastic, and creep models. Prereq: 335 and 565 or Engineering Science and Mechanics 539.

638 Soil Dynamics (3) Behavior of soils and soil-structure systems under dynamic loading; wave propagation in elastic media; principles of seismic refraction techniques; effects of earthquakes and vibrational phenomena in soil foundations. Prereq: 335 or 556 or Engineering Science and Mechanics 539.

651 Analysis Techniques for Transportation Systems I (3) Analysis of trip generation, trip distribution, modal split and traffic assignment, employing mathematical, statistical, and computer science techniques. State of the art and new modeling techniques. Prereq: 554 or 558.

652 Analysis Techniques for Transportation Systems II (3) Advanced topics of application of mathematical, statistical and computer science techniques in modeling and analysis of transportation systems. Prereq: 651.

666 Advanced Structural Reliability (3) Monte Carlo methods; structural system reliability; random processes; dynamic loads on structures. Prereq: 556.

671 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: 571.

674 Behavior of Reinforced Concrete Beams and Slabs (3) Strains and stresses in statically determined reinforced concrete beams and frames; limit analysis; behavior, analysis, and design of reinforced concrete slabs; yield-line theory, finite element solutions, and ACI Code Method. Prereq: 574.

682 Water Quality Engineering (3) Nutrient removal systems; wastewater treatment processes; control systems for water and wastewater treatment. Prereq: 390 and Environmental Science and Mechanics 590.

692 Water Reuse and Reclamation (3) Desalination, wastewater reuse, and recycling systems; advanced treatment processes; water resource planning. Prereq: Environmental Engineering 390 and 590.

693 Waste Management Engineering (3) Waste treatment, recycling and disposal; landfills and waste incineration; hazardous waste treatment and disposal. Prereq: Environmental Engineering 390 and 590.

700 Hydrology for Environmental Engineering (3) Surface water hydrology; hydrologic processes; hydrologic data; hydrologic and hydraulic models. Prereq: Environmental Engineering 390.

702 Environmental Protection (3) Managing of water resources, wastewater systems, and hazardous materials to promote efficiency and comfort and to safeguard balances in natural ecosystems. Prereq: Consent of instructor.

703 Water Resources Engineering (3) Water resources engineering systems and management; water resources systems and models; implementation tools; special topics: urban goods movement, transportation, and parking. Prereq: Civil Engineering 390 or consent of instructor for non-majors.
552 Biological Treatment Theory (3) Theory and design applications of biological processes to treatment of wastewater and solid wastes. Prereq: Civil Engineering 380. 2 hrs and 1 lab.

553 Environmental Engineering Chemistry (3) Theoretical, applied, and analytical chemistry related to generation, measurement and treatment of environmental contaminants. Prereq: Chemistry 130. 2 hrs and 1 lab.

555 Solid Waste Management (3) Magnitude and characteristics of solid waste problems; collection systems; design of disposal systems: landfill, incineration, and composting, design of resource recovery systems; current and future regulations. Prereq: Senior standing.

556 Hazardous Waste Management (3) Analysis and design of operations and processes for hazardous waste disposal and processing; regulations analysis; industrial applications. Prereq: Graduate standing or consent of instructor.

570 Air Quality Management/Pollution Control (3) An introductory course on concepts of air pollution, analysis of relationships among sources, meteorology, effects; stack sampling; emission control systems. Prereq: Consent of instructor.

571 Design of Air Pollution Control Systems (3) Design and evaluation of systems used to control emission of gaseous and particulate air pollutants. Comprehensive design of specific devices and systems. Prereq: 570.

572 Air Quality Dispersion Modeling (3) Diffusion in atmosphere; application of atmospheric dispersion models and evaluation of meteorological and air quality data. Prereq: Consent of instructor.

573 Sampling of Air Pollutants (3) Standard sampling methods for particulate and gaseous air pollutant emissions from industrial processes; ambient air monitoring instrumentation/techniques. Prereq: Consent of instructor.

590 Special Problems in Environmental Engineering (1-6) Enrollment limited to environmental engineering students in non-thesis program. Prereq: Graduate standing. May be repeated. Maximum 6 hrs. S/NC only.

595 Special Topics (1-4) Problems and topics related to current developments in field. May be repeated.

596 Special Readings (1-4) Readings related to current developments in field. May be repeated.

620 Advanced Surface Water Hydraulics (3) Advanced topics in surface water hydraulics; solutions in St. Venant equations of unsteady flow for complex channel situations; dam breach modeling. Prereq: 520.

630 Advanced Stormwater Modeling (3) Advanced topics in stormwater modeling; stormwater quality modeling; advanced applications of available stormwater computer models. Prereq: 530.

651 Industrial Waste Unit Operations and Processes (3) Theoretical design and laboratory modeling of industrial waste treatment processes and operations. Prereq: 551, 552. 2 hrs and 1 lab.


653 Pollutant Fate Modeling and Risk Assessment (3) Application of scientific principles concerning movement and fate of chemicals at interfaces of air, water, and earthen solids in environment. Methods of assessing risk posed by presence of those chemicals. Prereq: 551.

691 Special Topics in Environmental Engineering (3) Advanced topics of interest in wastewater problems of current interest. Prereq: Consent of instructor. May be repeated.

692 Special Topics in Water and Waste Management (3) Advanced topics of interest in wastewater problems of current interest. Prereq: Consent of instructor. May be repeated.

693 Special Topics in Water and Waste Management (3) Advanced topics of interest in wastewater problems of current interest. Prereq: Consent of instructor. May be repeated.

700, 701, 702, 703 Special Topics (1-4) Problems and topics related to current developments in field. May be repeated. Maximum 9 hrs.

705 Advanced Studies in Water Resources Engineering (3-6) Advanced topics in water resources engineering. Prereq: Graduate standing. May be repeated. Maximum 9 hrs.

740 Advanced Water Quality Engineering (3-6) Advanced topics in water quality engineering. Prereq: Graduate standing. May be repeated. Maximum 9 hrs.

Clasics

(Classic of Liberal Arts)

H. C. Rutledge, Head

Professors:
G. C. Gesell, Ph.D. North Carolina;
H. C. Rutledge, Ph.D. Ohio State.

Associate Professors:
C. P. Craig, Ph.D. North Carolina;
J. E. Shelton, Ph.D. Vanderbilt;
D. W. Tandy, Ph.D. Yale.

Assistant Professor:
S. D. Martin, Ph.D. Michigan.

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

401 Greek Poetry (3) Epic, lyric, drama, Authors vary. Prereq: 261.


405-06 Selected Readings from Greek Literature (3,3) For advanced students in Greek, plays, historical writings, poetry of ancient Greece in original Greek. Prereq: 401-402 or consent of instructor. May be repeated. Maximum 9 hrs.

414 Cicero and Techniques of Latin Prose Composition (3) For advanced students in Latin, practice in prose composition, writings of Cicero the model. Prereq: 351-352 or consent of instructor. Sp

422 Seminar in Classical Studies (3) Field of classical studies today; recent achievements in areas of both philology and archaeology; impact of decipherment of Linear B; new understandings of culture and politics of "golden age" of Pericles and Augustus; classical studies and academic profession on both high school and college levels. May be repeated. Maximum 6 hrs.

431-32 Selected Readings from Latin Literature (3,3) For advanced students in Latin, oratory, historical writings, poetry of ancient Rome in original Latin. Prereq: 351-352 or consent of instructor. May be repeated. Maximum 9 hrs.

435 Medieval Latin (3) Selected readings from Latin prose and poetry of medieval Europe. Prereq: Consent of instructor.

441 Special Topics in Classical Civilization (1-3) Art, literature, religion, and society of Greece and Rome. May be repeated with consent of department. Maximum 9 hrs.

461 Studies in Classical Archaeology (3) Variable content course offering subject matter not taught in existing course, or concentrating on one aspect of existing course. Prereq: According to topic. May be repeated. Maximum 9 hrs.

462 Roman Law (3) Development of Roman law through examination of cases from writing of Roman jurists, world's first legal professionals. Understanding legal institutions in relationship to Roman society; Roman property and contract law.

501 Special Topics in Greek Literature (3) Advanced study of classical Greek literature, authors selected by students and instructor. May be repeated. Maximum 9 hrs.

531 Special Topics in Latin Literature (3) Advanced study of classical or medieval Latin literature, authors selected by students and instructor. May be repeated. Maximum 9 hrs.

541-42 The Latin Epic: Lucretius, Vergil (3,3) Advanced study of epic masterpieces of Lucretius and Vergil; both Georgics and Aeneid of Vergil.

561 Special Topics in Classical Civilization (3) Advanced tutorial work in Greek and Roman authors in English translation; problems in cultures of Greece and Rome. May be repeated. Maximum 9 hrs.

562 Problems in Old World Archaeology (3) Selected topics and research problems in European, Asian, and African prehistory. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs. (Same as Anthropology 562.)

Communications

(College of Communications)

MAJOR

DEGREES

Communications

M.S., Ph.D.

Professors:
P. G. Ashdown, Ph.D. Bowling Green;
J. A. Crook, Ph.D. Iowa State; G. A. Everett, Ph.D. Iowa;
J. D. Swift, Ph.D. Northwestern;
H. H. Howard, Ph.D. Ohio; B. K. Lattier, Ph.D. Southern Illinois;
M. S. Singletary, Ph.D. Southern Illinois; N. R. Swan, Ph.D. Missouri.

Associate Professors:
J. N. Adamson, M.S. Tennessee;
M. M. Miller, Ph.D. Michigan State;
B. A. Moore, Ph.D. Ohio; R. E. Taylor, Ph.D. Illinois.

Assistant Professors:
C. E. Caudill, Ph.D. North Carolina;
G. G. Johnson, Ph.D. Southern Illinois;
M. J. Stankey, Ph.D. Illinois; D. Ziegler, Ph.D. Southern Illinois.

MASTERS OF SCIENCE PROGRAM

The Master of Science with a major in Communications is intended for students who desire a career in the mass media with an emphasis on communications management and a deeper understanding of the communication process and social role of the mass media. The program follows a broad-based multi-media approach while allowing the student to concentrate in one of four fields: advertising, broadcasting, journalism, or public relations.

The prospective student who is interested in acquiring basic skills in one of the areas listed above is advised to enroll for a second baccalaureate rather than an advanced degree.

Degree Requirements

The M.S. program emphasizes communications management in the areas of advertising, broadcasting, journalism (publications), and public relations. A minimum of 31 hours of approved graduate work is required:

1. Ten hours of core courses—Communications 510, 512, 540, and 550, the first three of which must be taken during the first two semesters of the student's program, except with written approval of the Assistant Dean for Graduate Studies for the College.

2. Twelve hours within one department of the college, at least 6 hours at the

College of Communications.
or above. An internship, if needed, is included.

3. Three hour elective from a list provided by the department in area of concentration.

4. Six hours of thesis work (Communications 500), including a thesis seminar.

Admission requirements may be required for those who do not have professional prerequisites, and an internship may be required for those who do not have professional experience in the field they wish to study. A course in communication laws is a prerequisite.

Twentieth hours of core courses—Communications 610, 612, 620, 640, 641; 6 hours of statistics; and three of the following courses: Communications 622, 632, 642, 652, and 682.

1. Fifteen hours in a primary concentration (advertising, broadcasting, journalism, public relations, or speech communications).

2. Twelve hours in a secondary concentration (outside the College of Communications).

3. Nine hours of electives.

4. Twenty-four hours of dissertation.

Specific courses to be taken require the approval/student's advising committee.

Admission to candidacy must be attained at least two semesters prior to graduation and requires successful completion of a written comprehensive examination.

A diagnostic exam must be taken during the second semester after entering the doctoral program. This exam covers Communications 610, 612, 640, 641, and one statistics course.

Candidates without prior teaching experience must register for Communications 521, Tutorial in Communications Teaching.

Planned course offerings in the College of Communications for a full calendar year are published in the College bulletin the preceding November. This information is available from the Dean's Office, 302 Communications Building, 974-3031.

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

502 Registration for Use of Facilities (3-15) Required. S/NC only. E

507 Independent Study (3) Reading, research or projects of specified topics in communication. On individual basis, under faculty direction, with consent. May be repeated. Maximum 6 hrs. E

510 Orientation to Doctoral Research (1) Degree and dissertation requirements. Committee formation and program planning. Overview of research methods and informational sources. Prereq: Consent of instructor or admission to program. S/NC only. F

512 Fundamentals of Media Research (3) Applications of communications research techniques for management: Planning and analysis of data for assessing media audiences and message impacts. Prereq: Consent of instructor or admission to program. Sp

521 Tutorial in Communications Teaching (1) Experience as teacher under guidance of faculty member. Prereq: Consent of instructor. S/NC only. E

540 Theory for Media Management (3) Selected research hypotheses and theories in literature of mass communications, managerial decision making. Prereq: Consent of instructor or admission to program. F

550 Seminar in Media Economics and New Technology (3) Electronic and print media ownership, finance and corporate structure. Roles of new technologies and marketing techniques in changing media content and function in future. Prereq: Consent of instructor or admission to program. Sp

593 Seminar Mass in Communications Issues (3) Contemporary issues in communications. Consent of instructor. Maximum 6 hrs. E

597 Independent Study (3) Reading, research or projects of specified topics in communication. On individual basis, under faculty direction, with consent. May be repeated. Maximum 6 hrs. E

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

610 Orientation to Doctoral Research (1) Degree and dissertation requirements. Committee formation and program planning. Overview of research methods and informational sources. Prereq: Consent of instructor or admission to program. S/NC only. F

612 Fundamentals of Communications Research (3) Universal research process from defining ideas and problems to reporting results. Causal inference and relative strengths of various research designs. Fundamentals and specific applications of most common data-gathering and measurement techniques in communications research: experimental, survey, content analysis, historical and qualitative. Prereq: Consent of instructor or admission to program. Sp

620 Seminar in Mass Communications Education (3) Role and scope of mass communications teaching unit, historical perspectives of curricular trends. Teaching methods and instructional objectives: classroom testing and measurement; design of professional curricula, research and extension; program evaluation; grants and contracts in research. Prereq: Consent of instructor or admission to program. Su

622 Quantitative Research (3) Techniques for evaluation of research design and measurement. Survey, content analysis, and experimental techniques. Assessment of reliability and validity. Data analysis, hypothesis testing, and inference strategies. Prereq: 612. F

632 Mass Communications History and Historiography (3) Origins and development of mass media in America. Philosophies of history. Historical sources and their verifications. Synthesis and interpretation of data. Prereq: 612 or consent of instructor. Su

640 Mass Communications Theory I (3) Selected research hypotheses, and theories in literature of mass communication theory. Prereq: Consent of instructor or admission to program. F

641 Mass Communications Theory II (3) Selected topics in theory. Critical evaluation of hypotheses, and advanced theory construction. Prereq: 540. Sp

642 Qualitative Research (3) Theory and application of qualitative research methods to social science and communications research. Theoretical considerations underlying symbolic interactionism as translated into research strategies of participant observation, life history interviews, content analysis, and case studies. Prereq: 612 or consent of instructor. Sp

652 Mass Communications Law and Legal Research (3) Legal restrictions under which mass media operate. Finding, interpreting and analyzing sources of legal information. Prereq: 612 or consent of instructor. F

692 Advanced Topics in Communications Theory and Methodology (3) Advanced study of communication issues, theories and methods. May use quantitative, qualitative, historical or legal approaches. May be repeated. Prereq: 622, 632, 642 or 652 or consent of instructor. Sp

Comparative and Experimental Medicine

(Office of the Provost)

MAJOR DEGREES

Comparative and Experimental Medicine

M.S., Ph.D.

Hyram Kitchen, Chair
Selected individuals having baccalaureate degrees with strong backgrounds in the physical and biological sciences may be admitted upon presenting evidence of satisfactory performance on the Graduate Record Examination.

Exceptions to the above requirements may be made at the discretion of the Admissions Committee if the minimal requirements of The Graduate School have been met. Applicants who are admitted to graduate programs but who are lacking in course requirements will be required to correct these deficiencies early in their graduate programs.

For additional information, write to the Office of Research and Graduate Programs, P.O. Box 1071, Knoxville, TN 37901.

**Computer Science**

*(College of Liberal Arts)*

**MAJOR DEGREES**

Computer Science ..................... M.S., Ph.D.

Jesse H. Poore, Head

Professors:

Moonis Ali (UTSI), Ph.D. Aligarh; A. George (Distinguished Scientist), Ph.D. Stanford; R. C. Gonzalez, Ph.D. Florida, (Electrical Engineering); J. H. Poore, Ph.D. Georgia Institute of Technology; G. R. Sherman, Ph.D. Purdue (Director of Computing Center); M. G. Thomason, Ph.D. Duke.

Associate Professors:

R. B. Blake, D.Phil. Oxford (U.K.); J. D. Case, Ph.D. Illinois (Urbana-Champaign); C. P. Pfleeger, Ph.D. Pennsylvania State.

Assistant Professors:

R. S. Blair, Ph.D. Pittsburgh; J. R. B. Cockett, Ph.D. Leeds (U.K.); Seung-Chui Lee (UTSI), Ph.D. Florida State; D. W. Straith, Ph.D. Texas; T. A. Thomas, Ph.D. North Carolina (Chapel Hill); M. Zemankova, Ph.D. Florida State.

Instructor:

J. W. Mayo, M.S. Tennessee.

**THE MASTER'S PROGRAM**

Thirty semester hours of graduate credit are required, 24 of which must be 500 level or above. 511 and 513 are required unless explicitly waived by the department. Graduate courses outside the department are allowed but must be approved by the Graduate Committee before enrolment.

**Thesis Option**

The student must reach agreement on a thesis topic with a faculty advisor and must take at least 6 hours of 500 Thesis. No more than 6 hours of 500 Thesis may count in the 24-hour requirement at the 500 level or above.

**Non-Thesis Option**

The student must take course work in an area to prepare for the non-thesis Master's examination. The student's advisor must verify that an acceptable set of courses has been taken before the student may schedule the examination.

**Master's Minor in Computer Science**

The graduate minor consists of 511 or its equivalent plus an additional 6 hours of computer science graduate level courses at or above the 400 level.

**THE DOCTORAL PROGRAM**

**Admission Requirements**

A student seeking admission to the Ph.D. program is expected to meet the following requirements:

1. The student should have three letters of recommendation sent directly to the department head from individuals capable of assessing the student's potential for advanced work in computer science (for example, college teachers or employers for whom the student has worked after earning a Bachelor's degree). The department reserves the right to contact these individuals or other knowledgeable people if additional information is deemed necessary or desirable.

2. The student is expected to have taken the GRE verbal and quantitative general test within the past three years and to have these scores sent to The Graduate School.

3. The student should satisfy the background requirements for graduate work. See the departmental brochure for details.

**Precandidacy Course Work**

The departmental precandidacy course requirements include a set of 400-level core courses and a distribution among 500-level and 600-level courses as determined by the departmental graduate committee. Information about specific requirements is available from the department.

**Admission to Candidacy**

Admission to the Ph.D. program does not guarantee admission to candidacy for the degree. Official admission to candidacy is based on the following procedures:

1. The student completes the course work requirements as defined above.

2. The student passes the comprehensive examinations covering three areas determined individually in advance. Each exam is graded as high pass, pass, low pass, or fail. The student must make a high pass in at least one of the areas and no less than low pass in all other exams. These exams may be taken a maximum of two times, separated by no more than one calendar year. In a second attempt, a student does not have to retake the area(s) in which a high pass was earned on the first attempt. The Computer Science Graduate Committee administers these exams, which must be passed prior to admission to candidacy and at least two semesters in advance of conferment of the degree. Comprehensive examinations must be taken within five years, and all requirements must be completed within eight years after the time of a student's first enrollment in the doctoral program.

3. The student requests a member of the Computer Science Department's faculty to become the major professor, dissertation director, and chair of the student's commit-
tee. The committee must have at least four members, with at least three from the Computer Science Department, and at least one holding an appointment in another department. At least three members, including the chair, must be approved by the Graduate Council to direct doctoral research.

4. The student's dissertation committee evaluates the student's background and performance and outlines a coherent program of study, which may include additional courses and outside readings in the technical literature. This program is subject to periodic revision within reasonable limits and will be reviewed by the committee no less frequently than once a year. Completion of the entire program is not required before admission to candidacy.

5. In a public meeting, the student presents to the committee a survey of current literature in the area of proposed Ph.D. research.

6. The student completes Graduate School requirements for formal admission to candidacy.

Postcandidacy Work

1. The student completes courses and other requirements of the program noted above.

2. The student completes no fewer than 400-level courses (at least 9 credits earned, exclusive of 600 Dissertation).

Dissertation Proposal

After consultation with the committee and initial investigation of a topic, the student submits a written proposal to the committee and makes an oral presentation of this proposal in a meeting which other faculty may attend. The written version must be typed, conform to high standards of scholarly writing, and contain an overview of previous research in the area of interest. Based on the written and oral presentations, the committee must accept, reject, or modify the topic to make it suitable for doctoral research.

Dissertation and Residency Requirements

The student continuously registers in CS 600 (minimum of three hours each semester) from the time the topic proposal is approved, admission to candidacy occurs, or registration for course 600 is begun, whichever comes first. The semester in which the dissertation is accepted by The Graduate School and the summer semesters are included in this continuing registration. The minimum residency for a doctoral degree is one academic year or two consecutive semesters of full-time study (minimum of nine hours each semester) in the graduate program subsequent to admission to candidacy. Part-time enrollment does not count toward this requirement.

Dissertation Defense

The student defends the dissertation in a public meeting. The committee determines pass or fail.

Additional Course Requirements

401 Applications of Computer Graphics (3) Service course in computer graphics. Commercial software, techniques. Prereq: 100 or 101 or 102. Not for credit for computer science majors. 3 hr lab required.

402 Applications of Artificial Intelligence (3) Service course in artificial intelligence. Commercial software, techniques. Prereq: 100 or 101 or 102. Not for credit for computer science majors. 3 hr lab required.
Urban Studies
401 The City in the U.S. (3) (Same as Planning 401.)
441 Urban Geography (3) (Same as Geography 441.)
464 Urban Ecology (3) (Same as Sociology 464.)

Women's Studies
400 Topics in Women's Studies (3) Content varies. May be repeated.
422 Women Writers in England (3) (Same as English 422.)
425 Women's Health (3) (Same as Health 425.)
434 Psychology of Gender (3) (Same as Psychology 434.)
456 Rhetoric of the Women's Rights Movement (3) (Same as Speech 456.)
483 Afro-American Women in American Society (3) (Same as Afro-American Studies 483.)

Curriculum and Instruction
(College of Education)

MAJOR
DEGREES
Curriculum and Instruction.M.S., Ed.S., Ed.D.
Education ................................. Ph.D.

Theodore W. Hipple, Head

Professors:
J. E. Alexander, Ed.D. Kentucky

Associate Professors:

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

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

THE MASTER'S PROGRAM
For the Master of Science, thesis and non-thesis options are available in the Curriculum and Instruction major with concentration in the following areas: 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 33 semester hours of course work. The thesis option requires the completion of 30 semester hours including six hours of Thesis 500.

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 Doctor of Philosophy with a major in Education includes concentrations and specializations as listed under Education.

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

404 Problems in Improvement of Instruction (1-3) Special conferences, workshops, or in-service programs. May be repeated. Maximum 6 hrs. S/NC only. E


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

460 Teaching Reading and Literature in the Secondary School (3) Teaching basic reading skills and ways of teaching literature. Sp

461 Developing Reading Skills in Content Fields (3) Techniques for teaching reading and study skills in content areas of school program. Extensive assessment of textbooks. Middle school and high school. E

475 Utilization of Instructional Media (3) Basic concepts of communication and instructional development for improving instruction through use of media. (Same as Language and Information Science 475.) E

488 Introduction to Instructional Computing (3) Classroom use of computers, applications for teachers, overview of computer operation and software for teachers of all grades. F,Sp

496 Teaching Science Grades 7-12 (3) Methods, materials, recent trends in science and environmental education programs for secondary schools. Prereq: Admission to teacher education. F

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

502 Registration for Use of Facilities (3-15) Required for the student not otherwise registered during any semester when 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

503 Problems in Lieu of Thesis (3-5) May be repeated. Maximum 9 hrs. S/NC only. E

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

507 Teaching Poetry Grades 7-12 (3) Research and theory in application to teaching of poetry. Design of strategies and materials for teaching and writing and reading of poetry. Review of texts and materials. F

568 Teaching Composition in the Secondary School (3) Teaching narrative, description, exposition, and argumentation: writing process and marking of student papers. Sp

569 Teaching Fiction in the Secondary School (3) Teaching of novels and short stories. F


515 Seminar (1-3) Curriculum, instructional technology, elementary education, secondary education, or social foundations as related to goals of students' programs. May be repeated. Maximum 6 hrs. S/NC only. E

516 Seminar (1-3) Curriculum, instructional technology, elementary education, secondary education, or social foundations as related to goals of students' programs. May be repeated. Maximum 6 hrs. S/NC only. E

517 Seminar (1-3) Curriculum, instructional technology, elementary education, secondary education, or social foundations as related to goals of students' programs. May be repeated. Maximum 6 hrs. S/NC or letter grade. E

518 Educational Specialist Research and Thesis (2) May be repeated. Maximum 4 hrs. P/NP only. E

519 Educational Specialist Research and Thesis (2) P/NP only. E

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

521 Teaching Social Studies in Elementary and Middle Schools (3) Planning and techniques. Trends in curriculum, development of concepts and generalizations, integration of social sciences. Prereq: Course in teaching of social studies or consent of instructor. Sp

522 Teaching Mathematics in Elementary and Middle Schools (3) Instructional strategies for helping elementary school children learn mathematics. Examination, development and use of materials for creating active learning environment. Prereq: 443 or equivalent or consent of instructor. F, Su

523 Diagnosis and Correction of Children's Difficulties in Learning Mathematics. Children's difficulties in learning mathematics and procedures for helping classroom teacher correct difficulties. Prereq: 522 or equivalent or consent of instructor. Sp


525 Strategies, Programs and Materials for Teaching Elementary Social Studies (3) Analysis of new and innovative social studies program materials and techniques. Exploration of current trends in social
541 The High School Curriculum (3) Identification of problems associated with high school curriculum. Study see curriculum framework, assessment of trends in programs of local, national, and regional significance. E.

542 Development of Educational Thought (3) Histo- ry and philosophy of education; analysis of the writings of influential educators. Plato, Quintillian, Comenius, Ros- seatu, Pestalozzi, Froebel, Dewey. Prereq: Graduate status and permission of instructor. F, Su.

543 Foundations of Educational Policy (3) Relationship between theory, policy, and practice; educational policies that arise from philosophical and practical considerations; relative to human nature, to educa- tional purpose, to content of curriculum and to methods and techniques for conducting educational enter- prise. F, Su.

544 Survey in Contemporary Philosophies of Education (3) Existentialism, phenomenology, philosophical analy- sis, Marxism, structuralism, hermeneutics and other philosophies. E.

545 Educational Sociology (3) Sociological analysis of American education system. Controversial social issues that affect educational system and potential solutions offered by various programs. Open to jun- iors, seniors, and graduate students. F.

546 Topics in History of Education (3) May be repeated. E.

547 Topics in Philosophy of Education (3) May be repeated. F, Su.

549 Topics in International Education (3) Historical, philosophical, and sociological foundations; selected nations and their cultures. May be repeated. E.

550 Assessment and Correction of Language Arts Difficulties (3) Procedures and materials for diagnosing and correcting language arts difficulties; analysis of children's work. Prereq: At least one language arts course or consent of instructor. Su.

552 Developmental Reading Practice (2) Diagnosis and teaching children having developmental and corrective reading needs. Prereq: Course in diagnosis and correction of reading problems or consent of instructor. May be repeated. Maximum 4 hrs. Su.

557 The Junior High and Middle School Curriculum (3) Curriculum and instructional design for junior high and middle school. Characteristics of students, cur- riculum designs, instructional patterns, and organization and structure of junior high and middle schools. Prereq: 500-level course in reading education or consent of instructor. F.

558 Curriculum Planning and Development (3) Found- ations and principles of curriculum planning and development. Historical analysis of curriculum theory, principles of planning and development, and class- room applications for improved learning. E.

561 Educational Statistics (3) Applications of descriptive and inferential statistics to educational and instruc- tional problems. Use of electronic calculators in educational research. Prereq: Research methods and an elementary course in statistics, or consent of instructor. F.

562 Direction and Supervision of Student Teaching (3) Roles and responsibilities of cooperating teachers and student teacher; objectives and policies of stu- dent teaching program; elements of clinical supervision; overview of research. F.

564 Curriculum for Early Childhood Education (K-3) (3) Theoretical foundations and instructional design for the early childhood years. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs. Sp, Su.

565 Programs, Materials and Strategies in Teaching Elementary Science (3) Analysis of new and innova- tive science teaching methods and the development and current curricular issues inherent in use of mate- rials. Prereq: Graduate course in elementary science, at least one year teaching experience, or consent of instructor. Sp.

566 Administering Instructional Media Programs (3) Leadership roles and responsibilities of professional media administrator in various of organizational set- tings. F, Sp.

567 Application of Theory in Early Childhood Education (K-3) (3) Principles and practices from selected theo- retical orientations. Prereq: Graduate education or consent of instructor. May be repeated. Maximum 6 hrs. F, Su.

568 Teacher-Parent-Community Relationships (3) Tech- niques for effective relationships between parents and teachers; examination of roles of parent-teacher-parent involve ment; volunteer programs; influence of community in educational process. Prereq: Consent of instructor. Sp, Su.

569 Advanced Production of Audiovisual Software (3) Hand and mechanical lettering, flat picture mounting- laminating, overhead projection, audio production, TV studio orientation, video presentation, and print procedures. (Same as Library and Information Science 569.) Sp, Su.

573 Utilization of Educational Television and Radio (3) Television and radio as instructional and training media. Selecting and evaluating instruction- al/training video and audio tapes. F.

577 Introduction To Data Processing in Curriculum and Instruction (3) Analysis of current activities in educational computing and data processing. Curriculum, instructional, research, and classroom management applications from microcomputers to super computers. Prereq: Consent of instructor. F, Su.


579 Career Development: Workshop (1-6) E.

580 Techniques for Research in Curriculum and Instruc- tion (3) Fundamentals of research methodology applicable to curriculum, instruction, and other areas of educational inquiry. Critical reading of research and development of skills needed for proposal devel- opment. E.


582 Teaching Enrichment Mathematics in Middle and Junior High Schools (2) Topics to enrich middle and/or junior high mathematics. Geometric, labora- tory, and problem solving activities. Special attention to manipulative system. Opportunities for individual projects. Prereq: 581. F, Sp.


586 Teaching Probability & Statistics (3) Teaching of probability and statistics in schools, elementary through college. Probabilities and statistical experiments, demon- strations, and applications. Prereq: 581. F.


588 Instructional Theory and Design (3) Relationship of curriculum to instruction; examination of instruc- tional and related learning theories, instructional models and teaching styles, E.
Field Experience (1-3) Application of curricular and instructional principles, methods, and materials in schools. Prereq: Program prerequisites and consent of instructor. May be repeated. Maximum 9 hrs. S/NC only. E

590 Seminar in Teaching English in Secondary Schools (3) Content varies. Theoretical and practical approaches to teaching English in secondary school. May be repeated. Su

592 Linguistics and the Teaching of English (3) Grammar, usage, semantics, dialectology, history of language, and lexicography. Su

593 Independent Study (1-3) May be repeated. S/NC or letter grade. E

594 Supervised Readings (1-3) May be repeated. S/NC or letter grade. E

595 Special Topics (1-3) May be repeated. S/NC or letter grade. E

596 Teaching of Natural Science and Environmental Education (3) Strategies, laboratory techniques, assessment, current programs and professional guidelines for middle, junior and senior high schools, and community colleges. Prereq: Consent of instructor. F

597 Teaching Drama Grades 7-12 (3) Strategies and materials for teaching creative dramatics, enacting and writing of plays, reading of scripts. Sp

598 Developing Speaking and Listening Skills, Grades 7-12 (3) Teaching approaches to nonverbal communication, interpersonal and group communication, public address and listening. Review of tests and materials. Sp

599 Seminar in Social Studies Education (3) Research, trends, and issues in secondary social studies. Su

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

601 Studies in English Education (3) Issues and research in teaching of English. Su

602 Seminar in Reading Education (1-8) May be repeated. Maximum 8 hrs. Su

603 Advanced Studies and Theoretical Models of Reading (3) Research on reading processes. Current theoretical models related to how learners process print. Prereq: 500-level courses in reading education or consent of instructor. Sp

604 Seminar in Curriculum and Instruction (1) Required 2 times for graduate students. S/NC only. E

605 Organizing and Administering Reading Programs (3) Analyzing and synthesizing instructional, learning, and materials components into classroom, school and system programs. Prereq: 2 500-level courses in reading education or consent of instructor. Su

606 Research in Elementary Education (3) Analysis of research in elementary education with application to classroom teaching. Prereq: research course. Su

608 Seminar in Philosophy of Education (3) Selected philosophical issues in education. Prereq: 2 courses in history or philosophy of education. May be repeated with consent of instructor. E

621 Seminar in Social Studies Research and Theory (2) Status of research and theory. Needed research, related research from other fields, and application of research. Prereq: Recent course in teaching of social studies or consent of instructor. May be repeated. Maximum 4 hrs. E

623 Programs for Curriculum Improvement (3) Research methodology; application to descriptive/ethnographic curricular materials. Critical reading of research, methodology development in descriptive and ethnographic areas. Sp

625 Seminar in History of Education (3) Selected historical issues in education. Prereq: 2 courses in history or philosophy of education. May be repeated with consent of instructor. Sp

628 Advanced Studies in Elementary School Science (4) Current research in elementary school science as applied to classroom practice. Prereq: Graduate course in science education or equivalent or consent of instructor. May be repeated. Maximum 4 hrs. E

635 Teacher Education in America (3) For students preparing to enter teacher education. Brief historical development, program analysis and evaluation, current issues, and future directions. F

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

648 Topics in Sociology of Education (3) May be repeated. Sp

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

651 Advanced Studies in Elementary School Language Arts (3) Selected issues in elementary school language arts. Prereq: Graduate course in elementary school language arts or consent of instructor. Sp

652 Advanced Studies in Educational Anthropology and/or Sociology (3) Ethnographic methods applied to formal and non-formal educational settings. Analysis of selected research in field. Prereq: 451, 2 courses in cultural anthropology, or consent of instructor. Sp

659 Instructional Media Research (3) Identification, location, and collection of developmental and experimental research on instructional media. Application of research. Sp

671 Advanced Educational Statistics (3) Applications of parametric and non-parametric statistical inference to educational and instructional problems. Use of microcomputers in educational research. Prereq: 561. Sp, Su

672 Interpretation and Application Curriculum and Instruction Research (3) Analysis of research in curriculum and instruction, newer methodologies and strategies. Utilization of research to improve curriculum and instruction practice, application of research principles in context of specific professional assignments. Prereq: Consent of instructor. Sp

675 Curriculum Evaluation: Theory and Application (3) Evaluation trends and issues. Theoretical framework to design evaluation studies for various educational programs. Sp

676 Curriculum Theory (3) Influential curriculum theories and approaches, implications for structure and design of educational programs. Nature and function of theory, theory building activities. Prereq: Consent of instructor. E

682 Advanced Studies in Elementary School Mathematics (2) Research in elementary school mathematics. Prereq: Graduate course in mathematics education or consent of instructor. Sp

685 Educational Leadership: Theory and Practice (3) Theories of leadership applied to variety of educational settings. Prereq: Consent of instructor. S, Su

689 Internship (1-3) Experiences in application of principles and practices of curriculum development and instructional improvement. Prereq: Program prerequisites and consent of instructor. May be repeated. Maximum 9 hrs. S/NC only. E

693 Independent Study (1-3) May be repeated. S/NC or letter grade. E

694 Supervised Readings (1-3) May be repeated. S/NC or letter grade. E

695 Special Topics (1-3) May be repeated. S/NC or letter grade. E

696 Advanced Studies in Secondary Science and Environmental Education (3) Trends in science and environmental education, materials methods and research for middle, junior and senior high schools, and community colleges. Prereq: 586 or equivalent and consent of instructor. Sp

Ecology

(College of Liberal Arts)

MAJOR

DEGREES

Ecoogy

M.S., Ph.D.

Dewey L. Bunting, Director
B. L. Dearden, Associate Director
Paul A. Delcourt, Associate Director

Shared Faculty:


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 including organic, mathematics including calculus, and 3 semester hours of ecology at the upper division level; (3) departmental application and 3 rating forms; (4) Graduate Record Examination.

Application forms for admission should be obtained from The Graduate School and the Ecology Program. Inquiries concerning the admission requirements should be addressed to the Director, Graduate Program in Ecology, University of Tennessee, Knoxville, Tennessee 37996-1610.

THE MASTER'S PROGRAM
Within the minimum requirements of The Graduate School, the program of study must include Ecology 573 and 574 or an approved equivalent and one course from an approved list of quantitative methods offerings. The list is available from the ecology office and is updated annually by the Ecology Curriculum Committee. The remainder of a student's course program is determined in consultation with the graduate committee. A listing of approved campus-wide ecology offerings is provided to each student during orientation. A graduate minor in ecology is available on an individual basis.

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 573 and 574 or an approved equivalent and one course from an approved list of quantitative methods offerings. A student cannot enroll for dissertation hours until the research proposal has been discussed and approved by the doctoral committee. A foreign language is required.

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 director of the program on the choice of a faculty committee. The Master's committee need not have more than two members. The doctoral committees consist of the major professor as chairperson, one additional member who should have an appointment in the same department, and at least two additional faculty from other departments.

500 Thesis (1-15) P/NP only. E
502 Registration for Use of Facilities (3-15) Required for the student not otherwise registered during any semester when student uses University facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. S/JNC only. E
510 Special Problems in Ecology (1-3) Individual investigations in ecology. May be repeated with consent of instructor. Maximum 6 hrs.
520 Ecology for Planners and Engineers (3) Ecological principles and effects that human-caused changes have on living organisms. Lectures and field trips. Appropriate for students in Planning and Environmental Engineering.
530 Implementation of Environmental Policy (3) Goals and problems of environmental legislation, National Environmental Policy Act; purpose, preparation, and evaluation of environmental impact statements and similar multidisciplinary studies. Prerequisite: 520 or 573 or course work or experience in environmental law.
537 Natural Resource Management and Environmental Assessment in Developing Nations (3) Assessment of environmental and resource development issues. Scientific basis for integrated resource management and environmental assessment in developing nations. Prerequisite: General ecology or equivalent. (Same as Planning 553 and Botany 537.)
552 Development Planning in the Third World (3) (Same as Planning 555.)
555 Environmental Planning (3) (Same as Planning 555.)
561 Environmental Toxicology (3) (Same as Biochemistry 561.)
562 Techniques in Environmental Toxicology (1) (Same as Biochemistry 563.)
573 Population Biology (3) (Same as Zoology 573 and Botany 573.)
574 Communities and Ecosystems (3) Patterns underling principles behind short and long term community and ecosystem organization, dynamics, energetics and nutrient cycling.
600 Doctoral Research and Dissertation (3-15) P/NP only.
604 Current Topics in Environmental Toxicology (1) (Same as Biochemistry 604.)
610 Special Topics in Ecology (3) Seminars on advanced topics and recent developments. Prerequisite: Consent of instructor. May be repeated. Maximum 9 hrs.
620 Seminar in Ecology (2) May be repeated. Maximum 12 hrs.
627 Applied Ecology (3) Review of contemporary and historical issues. Analysis of scientific basis of environmental assessment and natural resource management. Analysis of careers and career planning in applied ecology. Prerequisites: 573-74 or equivalent or consent of instructor. (Same as Botany 637.)

Economics
(Deere of Business Administration)

MAJORS: ECONOMICS: MA, PH.D.
BUSINESS ADMINISTRATION: MBA

Anne Mayhew, Head
Professors:
R. A. Bohm, Ph.D. Washington (St. Louis); R. L. Bowby, Ph.D. Texas; S. L. Carroll, Ph.D. Harvard; H. S. Chang, Ph.D. Vanderbilt; W. E. Cole, Ph.D. Texas; P. Davidson (Distinguished Professor), Ph.D.
Pennsylvania; G. R. Feiwel (Alumni Distinguished Service Professor), Ph.D. McGill; C. B. Garrison, Ph.D. Kentucky; H. W. Herzig, Ph.D. Maryland; H. E. Jensen, Ph.D. Texas; F. Y. Lee, Ph.D. Michigan State; A. Mayhew, Ph.D. Texas; J. R. Moore, Ph.D. Cornell; W. C. Neale, Ph.D. London School of Economics; K. E. Quinney (Emeritus), Ph.D. Kentucky; A. M. Schlottman, Ph.D. Washington (St. Louis); G. A. Spiva, Ph.D. Texas.

Associate Professors:
D. P. Clark, Ph.D. Michigan State; W. F. Fox, Ph.D. Ohio State; E. Glustoff, Ph.D. Stanford; K. E. Phillips, Ph.D. Washington (Seattle).

Assistant Professors:
J. A. Gauger, Ph.D. Iowa State; R. A. Hofler, Ph.D. North Carolina; D. M. Mandy, Ph.D. Illinois; J. W. Mayo, Ph.D. Washington (St. Louis); M. N. Murray, Ph.D. Syracuse; H. Thompson, Ph.D. Houston.

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

THE MASTER'S PROGRAM
Admission to the M.A. program is based on undergraduate academic performance and on scores from the general portion of the GRE or on scores from the GMAT. The student may choose either the thesis or non-thesis option. The non-thesis option requires 30 hours of course work at the 400 level or above. Of these, at least 24 hours (at least 18 hours of which are in economics) must be at the 500 level or above. Of the minimum of 18 hours in economics at the 500 level or above, 12 hours must consist of 511, 512 and 513, 514, and the remaining 6 hours must be in one field of economics. Of the 30 hours, a maximum of 9 hours in courses approved by the department may be taken in fields other than economics. Students electing the non-thesis option are required to pass a final comprehensive examination.

The thesis option requires 30 hours of course work at the 400 level or above, including at least 24 hours at the 500 level or above (no more than 6 hours of which may be thesis hours). Of these, a minimum of 18 hours at the 500 level or above, at least 15 hours must be in economics and must include 511, 512, 513, and 514. A maximum of 6 hours may be in an area other than economics.

THE DOCTORAL PROGRAM
Admission to the Ph.D. program is based on promise of outstanding scholarship, as demonstrated by previous academic performance and by scores achieved on the general portion of the GRE or on the GMAT. Requirements for successful completion of the program consist of the four components listed below.

Economics/Fields of Instruction 71
1. Students are required to complete the following core requirements:
   a. Economic Theory: Microeconomic theory by comprehensive examination or by completion of 511, 512 with a B+ average or higher, and macroeconomic theory by comprehensive examination or by completion of 513, 514 with a B+ average or higher.
   c. Mathematical and Quantitative Economics: 581, 582. The 582 requirement may be waived for students completing 581, 681.
   Students must achieve a grade average of B or higher over the courses offered to fulfill requirements in subparagraphs b and c, or, as an alternative, may petition to satisfy either or both of these two core areas by some other means such as a comprehensive written examination.
   2. Students are required to demonstrate their competence by comprehensive examination in two fields of specialization with the approval of the department, at least one of which must be selected from the following: comparative systems, economic development, economic history, economics of labor and human resources, industrial organization, international economics, public finance, and regional and urban economics.
   3. Students are required to complete with a grade of C or better two elective economics courses at the 600 level or above, outside the core subject areas and outside the two fields of specialization.
   4. Students are required to complete a dissertation, including an oral defense, to give at least 24 hours of graduate credit (600).

**BUSINESS ADMINISTRATION CONCENTRATION**

For complete listing of MBA program requirements, see Business Administration.

**MBA Concentration: Economics**

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

400 Special Topics (3) Topics vary. Prereq: Determined by department.

415 History of Economics (3) Methods of study of doctrinal history. Origins and evolution of major doctrines: classical and neoclassical economics, economics of Keynes and his followers, principal developments of second half of 20th century. Major writing requirement. Prereq: 201 or equivalent and consent of instructor.

424 Political Economy of World Development (3) Topics vary: Latin America, Asia, Soviet Union and Eastern Europe, major economic strategies, policies, and problems. Prereq: 201. This course includes a major writing requirement.


462 Economics of Resources and Environmental Policy (3) Economic analysis of environmental policy and allocation of resources. Benefits and costs of development of natural resources and impacts of growth on environment. Major writing requirement. Prereq: 201.

471 Public Finance: Optimal Government Functions and Expenditure Analysis (3) Problems of collective consumption, external effects, public investment, social decision making. Prereq: 201.

472 Public Finance: Taxation and Intergovernmental Relations (3) Analysis of individual taxes and of tax systems, major sources of revenue, fiscal federalism. Prereq: 201.

482 Introduction to Mathematical Economics (3) Application of algebra, matrix algebra, differential and integral calculus to micro and macroeconomics. Prereq: 201 and Mathematics 121-22 or 141-42.

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

501 Managerial Economics (3) Application of economic concepts to business decision making. Analysis and forecasting of demand, cost analysis, pricing behavior, and application of optimizing techniques.

502 Registration for Use of Facilities (3-15) Required at the semester when 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

503 Business Conditions Analysis (3) Macroeconomic environment, determination of level of output and prices for economy as whole. Implications of aggregate fluctuations for individual firms. Role of forecasting techniques and stabilization policies.

510 Fundamentals of Microeconomics (3) Theory of consumer behavior and demand, theory of production and cost, behavior of the firm in perfectly competitive and monopolistic environments. For non-economics majors. Not available for students with credit for 511. Prereq: 311 or equivalent.

511-12 Microeconomic Theory (3,3) Theory of consumer choice and demand, theory of revealed preference, attributes of goods and implicit prices, market demand, labor supply, individual behavior under uncertainty, theory of firm, theory of production and cost, market structures, derived demand and factor pricing, introduction to welfare economics, market failure and theory of second best, pure exchange.

512-14 Macroeconomic Theory (3,3) Determination of national income, prices, and employment. Results using Keynesian, market-clearing, monetarist, and rational expectations paradigms.

515 History of Economics (3) Purpose and methods of history of economics. Background for and origins, currents of development, and conclusions of classical political economy; from Adam Smith through J.S. Mill and K. Marx. Antecedents of neoclassicism: J. Dupuit and H.J. Gossen.

525 Economic History of Europe (3) Nature and functioning of economic systems and policies in history of Western civilization, major issues of method and interpretation. Prereq: Graduate standing in economics or consent of instructor.

526 Economic History of the U.S. (3) Interpretation of American economic structure and policies from colonial times. Prereq: Graduate standing in economics or consent of instructor.

562 Labor Relations and Collective Bargaining (3) (Same as Management 522.)


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

612 Advanced Microeconomic Theory (3) Prereq: 512 or equivalent.

613 Advanced Macroeconomic Theory (3) Prereq: 514 or equivalent.


623 Economic Development: Theories and Policies (3) Principal theories explaining economic behavior in developing countries and policies and strategies used to promote development. Prereq: Undergraduate degree in economics or consent of instructor.

624 Economic Development: Western Impact on Asia and Africa (3) Studies of consequences of contact between developed world and developing countries of Asia and Africa. Prereq: 21 hrs of upper division undergraduate social science or consent of instructor.


634 Comparative Economic Systems (3) Study and appraisal of alternative economic systems in comparative perspective.

641 Labor Economics (3) Theory of labor markets and wage determination under competitive conditions. Labor markets under conditions which interfere with competition, unions and discrimination. Human capital and estimation of returns to schooling. Topics vary. Prereq: 311 and 313, or equivalent.

642 Labor History and Legislation (3) Development of organized labor as important economic and political force in U.S., from Colonial times. Evolution of legal status of labor unions and of individual workers vis-a-vis their employers.

651 Monetary Theory (3) Study of money, credit, and liquidity as related to real output determination, interest rates, employment, and economic growth. Prereq: 513.

652 Topics in Monetary Theory (3) Advanced monetary models, issues in monetary policy, open economy monetary theory and policy. Student participation. Prereq: 615.

661 Regional and Urban Location and Development Theory (3) Theory of industrial and agricultural location and human migration. Economic basis for land-use patterns, central places, and urban form. Spatial interdependencies and urban systems. National policies for regional and urban assistance.

662 Methods of Regional and Urban Analysis (3) Theory of regional/urban economic structure and growth. Regional income and product accounts, shift and share analysis, economic base studies, and regional/urban input-output models. Theory and problem solution.

663 Environmental and Resource Economics (3) Topics in environmental quality, natural resource allocation by private markets, and issues in formulating public policy toward environmental problems.

Public Finance: Taxation and Intergovernmental Relations (3) Theory of taxation; tax incidence and tax efficiency; policy analysis of the U.S. tax structure at federal, state, and local levels. Theory of fiscal federalism and intergovernmental relations.

681-82 Econometric Methods (3,3) Theory and techniques of statistical testing of economic hypotheses and construction and estimation of econometric models. Review of classical least squares regression model, and approaches to simultaneous equation models with application to current econometric research. Prereq: 582 or equivalent.

690 Workshop (3) Advanced topics in economics. Student participation. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.

Education

(College of Education)

<table>
<thead>
<tr>
<th>MAJOR</th>
<th>DEGREE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Education</td>
<td>Ph.D.</td>
</tr>
</tbody>
</table>

The Ph.D. program with a major in Education provides six concentrations. The departments participating in the Ph.D. program are Curriculum and Instruction; Educational Leadership; Educational and Counseling Psychology; Health, Leisure, and Safety; Physical Education and Dance; Special Services Education; and Technological and Adult Education.

The program requirements and the concentrations and specializations are:

<table>
<thead>
<tr>
<th>Requirements</th>
<th>Minimum Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Research Area</td>
<td>14</td>
</tr>
<tr>
<td>Foreign or Computer Language</td>
<td>6</td>
</tr>
<tr>
<td>(demonstrate proficiency)</td>
<td></td>
</tr>
<tr>
<td>General Core Requirements</td>
<td></td>
</tr>
<tr>
<td>Courses in history of education</td>
<td></td>
</tr>
<tr>
<td>philosophy of education (two areas must be represented)</td>
<td>4</td>
</tr>
<tr>
<td>Courses in learning theory, curriculum theory, and administrative theory (three areas must be represented)</td>
<td>6</td>
</tr>
<tr>
<td>Trans-college seminar—three consecutive semesters</td>
<td>3</td>
</tr>
<tr>
<td>Alternative Core Requirements</td>
<td></td>
</tr>
<tr>
<td>Courses in philosophy of science</td>
<td>3</td>
</tr>
<tr>
<td>Courses in philosophy of science (including summer)</td>
<td>3</td>
</tr>
<tr>
<td>Courses in learning theory/group or independent study</td>
<td>3</td>
</tr>
<tr>
<td>Concentrations</td>
<td></td>
</tr>
<tr>
<td>Primary Concentration—A minimum of 16 hours normally selected from one or two specializations within the primary concentration</td>
<td>16</td>
</tr>
<tr>
<td>Supporting Specialization—A minimum of 9 hours selected from a specialization in a concentration other than the primary concentration</td>
<td>9</td>
</tr>
<tr>
<td>Cognitive—A minimum of 6 hours selected from outside the college in addition to the designated research courses</td>
<td>6</td>
</tr>
<tr>
<td>Dissertation</td>
<td>24</td>
</tr>
</tbody>
</table>

CONCENTRATIONS

Administrative Theory and Practice

Specializations
1. School administration
2. Higher education administration
3. Organizational leadership and policy studies

Theories of Curriculum Development and Foundations of Education

Specializations
1. Anthropological, historical, philosophical, and sociological bases for educational planning and curriculum
2. Principles and models for planning, developing, and evaluating educational programs
3. Research design for educational programs

Instructional Theory and Practice

Specializations
1. Principles and models for instructional improvement
2. Elementary and early childhood instruction and practice
3. Secondary/community colleges: (English, foreign language, mathematics, science, social studies education)
4. Elementary: mathematics, science, social studies education
5. Reading education
6. Instructional media and technology
7. Vocational-technical fields of instruction and practice
8. Special education and rehabilitation

Theories and Practice of Educational and Personal Adjustment

Specializations
1. Counselor education
2. Counseling psychology
3. Educational psychology

Foundations of Human Movement

Specializations
1. Adapted physical education
2. Philosophical foundations of sport
3. Sociological foundations of sport
4. Physical activity and positive health
5. Metabolic and cardiovascular adaptations to acute and chronic exercise
6. Motor behavior: motor control, motor learning, psychology of sport

Health Education

Specializations
1. Public health
2. Safety

See College of Education for additional departmental listings.

601 Trans-College Seminar (1) Introduction to Ph.D. program in Education: research requirements; meaning of scholarship in academic and applied problems in education. Minimum of two consecutive semesters preceded or followed by summer term required of all Ph.D. students. Prereq: Admission to Ph.D. program or consent of Ph.D. program coordinator. May be repeated. May not be used to meet 600 requirement. S/NC only.

Educational and Counseling Psychology

(College of Education)

MAJORS

<table>
<thead>
<tr>
<th>DEGREES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Guidance</td>
</tr>
<tr>
<td>Educational Psychology</td>
</tr>
<tr>
<td>Education</td>
</tr>
<tr>
<td>Guidance</td>
</tr>
</tbody>
</table>

Professors:


Associate Professors:


The Department of Educational and Counseling Psychology offers graduate programs leading to the following: Master of Science with a major in Educational Psychology, concentrations in educational psychology and community agency counseling; Master of Science with a major in Guidance, concentrations in elementary guidance, secondary guidance, and school counseling; Educational Specialist with a major in Educational Psychology and Guidance, concentrations in community agency counseling, educational psychology, school psychology, and school counseling; and Doctor of Education with a major in Educational Psychology, concentrations in counselor education and educational psychology. The department also participates in the college-wide Ph.D. program with a major in Education. The concentration area is theories and practice of educational and personal adjustment with specializations in counselor education, counseling psychology, and educational psychology. The application deadline for admission to the doctoral programs is March 1, and to the Ed.S. and M.S. programs, March 1 and November 1. For information about the various programs of study and admissions, write the departmental admissions secretary.

MASTER'S PROGRAMS

Admission requirements include up-to-date scores from the GRE, the departmental admissions application form and letters of recommendation. All programs include thesis and non-thesis options. The program in edu-
cational psychology requires a minimum of 36 hours, and the programs in guidance and counselor education and community agency counseling require 42 and 37 hours respectively. The programs in community agency counseling and in guidance each require supervised practicum and internship experiences working with clients. A final examination is required of all Master’s degree students.

SPECIALIST PROGRAMS

Admission requirements include up-to-date scores from the GRE, the departmental admissions application form and letters of recommendation. All programs include thesis and non-thesis options. The program in school psychology requires a minimum of 52 hours. When students are admitted to the Ed.S. programs in educational psychology, school counseling or community agency counseling, it is assumed that they have completed a Master’s degree. In this case, the minimum hours beyond the Master’s required to complete the Ed.S. are as follows: educational psychology, 24; school counseling, 22; and community agency counseling, 25. The specialist programs require supervised practicum and internship experiences with students or clients, either in the programs or in an in-community human services agency. A final examination is required of all specialist students.

THE DOCTORAL PROGRAMS

The Ph.D. with a major in Education includes concentrations and specializations as listed under Education. For students applying to the Ph.D. program for concentration in educational psychology, the following two applications are required: one for the Ph.D. in Education program and one for the department that specifies which specialization is desired (i.e. counseling psychology, counselor education, or educational psychology). Applicants for the Ed.D. with a concentration in either counselor education or educational psychology fill out only the departmental application form. Departmental admissions requirements include up-to-date scores from the GRE; the department admissions application form; letters of recommendation; a writing sample; and, in the case of the counselor education program, an in-community video-taped sample of the applicant’s counseling work with a client.

The following minimum number of hours is required in each program concentration/specialization: counseling psychology - 98; counselor education, Ph.D. - 98, Ed.D.- 79; educational psychology, Ph.D. - 92, Ed.D.- 89. Residency for the Ph.D. programs is four consecutive semesters of full-time course work and three consecutive semesters for the Ed.D. The Ph.D. program requires course work in both a supporting specialization in counseling psychology and counselor education each require a year-long counseling practicum sequence and the equivalent of a year’s full-time work as an intern in an appropriate counseling setting. The concentration/specializations in educational psychology and counselor education also require supervised practicum experience in classroom teaching. All doctoral students take written comprehensive examinations in the program concentration, supporting specialization and cognate areas. The guidelines for each program concentration may be consulted for further requirements.

404 Special Topics (1-3) Instructor-initiated course offered at convenience of department on topics of current interest. May be repeated. Maximum 15 hrs. S/NC or letter grade. E

410 Sex Role Development: Implications for Education and Counseling (3) Theories and research concerning development of person’s sex role and its relevance in educational and counseling settings. E

431 Personality and Mental Health (3) Various perspectives of mental health with application to education and other social institutions. E

432 The Disadvantaged Student: Psychopedagogical Perspectives (3) Theory and research regarding education, psychosocial behavior and appropriate interventions. E

450 Self-Management in the Helping Professions (3) Applications of self-management strategies to career, social, emotional, and health domains for both helping professionals and clientele. Prereq: Introductory course in psychology or consent of instructor. S/NC or letter grade. E

493 Independent Study (1-15) Independent investigation of problems in educational and counseling psychology. May be repeated. Maximum 15 hrs. S/NC or letter grade. E

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

502 Registration for Use of Facilities (3-15) Required or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. S/NC only. E

503 Problems in Lieu of Thesis (1-3) May be repeated. Maximum 12 hrs. S/NC only. E

504 Special Topics (1-3) Instructor-initiated course offered at convenience of department on topics of current interest. May be repeated. Maximum 15 hrs. S/NC or letter grade. E

510 Psychological Theories of Human Development Applied to Education (3) Theory and research on emotional, intellectual and development over life span with applications to educational and therapeutic settings. F,Su

511 Cognitive Development: Implications for Education (3) Applications of theory and research related to higher mental problem-solving. Prereq: 510 or consent of instructor. Sp

515 Educational Applications of Behavioral Theories of Learning (3) Behavioral theories and research, conditioning, observational learning, and ethological learning as systems apply to student motivation, discipline and learning. F,Su

516 Educational Applications of Cognitive Learning Theories (3) Cognitive theory and research, social learning, attention and information processing as systems apply to education. Prereq: 515 or consent of instructor. Sp

518 Educational Specialist Research and Thesis (1-9) May be repeated. Maximum 9 hrs. P/NP only. E

520 Statistics and Research Design: Conceptual (3) Consumer-oriented conceptual treatment of statistics, research design, and quantitative testing of basis. E

521 Statistics and Research Design: Application (3) Data collection and analysis. Descriptive techniques, estimation, hypothesis testing and selected parametric and nonparametric tests. For Master’s students conducting thesis and beginning doctoral students. Use of computer statistical packages. F,Su

525 Formal Measurement in Education and Counseling (3) Principles of test construction and item analysis. Survey of standardized tests of intelligence, achievement, aptitude, vocational interest, attitudes and personality. Prereq: 520. F

526 Informal Methods of Assessment (3) Development and use of rating scales, check-lists, observation, test scores and case reports in assessment and counseling of children and adults. Prereq: 525. Sp

540 Seminar in School Psychology (1) Essentials of theory and practice of school psychology as professional specialty. Consideration of history and current issues in school psychology. S/NC only. F

541 Psychoeducational Assessment (3) Direct, psychometric and naturalistic assessment methods in learning environments. Prereq: Admission to school psychology program or consent of instructor., and 525 or equivalent. May be repeated. Maximum 6 hrs. F,Sp

542 Practicum in Psychoeducational Assessment (3) Application of assessment skills to clients in learning environments. Coreq: 541 or consent of instructor. May be repeated. Maximum 6 hrs. F,Sp

545 Psychoeducational Consultation (3) Use of two and three person model with emphasis on behavioral and functional approaches and interventions. F

546 Practicum in Consultation (3) Application of consulting skills to educational settings. Coreq: 545. F

549 Internship in School Psychology (1-6) Supervised employment in departmentally approved school psychology internship sites. Prereq: Enrollment in school psychology program and consent of instructor. May be repeated. Maximum 12 hrs. (Same as Psychology 549.) S/NC only. E

550 Development and Operation of Pupil Personnel Services (3) History, philosophy, trends, standards of preparation, certification, and role identity of counselors and other personnel service specialists. Program administration and organization. F,Su

551 Theory and Practice of Counseling (3) Philosophical bases of helping relationship, development of counselor and client self-awareness; counseling theory/techniques. E

552 Career Development: Vocational Theory, Research and Practice (3) Relationship of vocational theory, career development research and societal factors to life career roles. F,Su

553 Career Development: Vocational and Educational Resources (3) Application and use of career and educational resources in personnel planning and program development. Sp,Su

554 Group Dynamics and Methods (3) Theory and types of groups, descriptions of group practices, methods, dynamics, and facilitative skills, supervision of leadership skills. E

555 Practicum in Counseling (3) Supervised practice and application of counseling skills with individual clients. Prereq: Admission to program, 431 525, 551 and consent of instructor. May be repeated. Maximum 5 hrs. E

556 Seminar in Community Agency Counseling (1) Supervising professionals, code of ethics, certification requirements, and role identity of community agency counselors. May be repeated. Maximum 2 hrs. E

558 Internship in School Counseling (1-6) Supervised postpracticum employment at departmentally approved site. Prereq: 550 and consent of instructor. May be repeated. Maximum 12 hrs. S/NC only. E

559 Internship in Community Agency Counseling (1-6) Supervised postpracticum employment at departmentally approved human services agency. Prereq: Admission to community agency program, 555 and consent of instructor. May be repeated. Maximum 12 hrs. S/NC only. E
669 Internship in Educational Psychology (1-6) Supervised employment in departmentally-approved educational psychology internship sites. May be repeated. Maximum 12 hrs. S/NC only. E


671 Personality and Vocational Assessment (3) Use and interpretation of personality and vocational measures in assessment of clients. Prereq: 525, 552 or consent of instructor. F

672 Psychological Dysfunction (3) Classification methods, dynamics and treatment of dysfunctional individuals in counseling. Prereq: 625 and course in abnormal psychology, or consent of instructor. Sp

673 Advanced Theory and Practice in Group Counseling (3) Theories and supervised practice. Prereq: 554, 555, and consent of instructor. Sp

674 Practicum in Counseling Psychology (3) Supervised practice of individual counseling. Minimum 125 clock hrs required each semester. Prereq: Admission to counseling psychology doctoral program, 555, and consent of instructor. May be repeated. Maximum 6 hrs. E

678 Theory and Practice of Counseling Supervision (3) Theory and practice of supervision in counseling. Prereq: 555, or 674, or consent of instructor. S/NC only. Sp

679 Internship in Counseling Psychology (1-6) Supervised employment in departmentally approved counseling psychology internship sites. Prereq: Admission to counseling psychology doctoral program and consent of instructor. May be repeated. Maximum 12 hrs. S/NC only. E

693 Independent Study (1-15) Independent investigation and research. Prereq: 525, 552 or consent of instructor. S/NC or letter grade. E

EDUCATIONAL LEADERSHIP (College of Education)

MAJORS

College Student Personnel .................................. M.S. Education and Supervision .................................. M.S., Ed.S., Ed.D. Education .................................. Ed.D.

Frederick P. Venditti, Acting Head


The Department of Educational Leadership offers graduate programs leading to the Master of Science with majors in Educational Administration and Supervision and in College Student Personnel (higher education), the Specialist in Education, the Doctor of Education with a major in Educational Administration and Supervision, and the Doctor of Philosophy with a major in Educational Administration. Specializations may be developed in research, major central office positions, the principalship, and in other educational and social roles.

The Ed.D. program also offers a concentration in higher education. The instructional program combines theory and practice in an innovative demonstration of scholarly study and research. A blend of classroom instruction, individualized advising, and supervised practice and internships allows students to develop a specialization in academic administration, community-junior college administration, student personnel administration, financial management, and college teaching.

For additional information, contact the department head.

ADMISSION REQUIREMENTS

General test of the Graduate Record Examination; writing sample if GRE verbal is below 50th percentile; leadership potential judged by activities in organizations; and rating forms or letters of recommendation. The Ed.D. applicant must also interview with at least 3 faculty members on campus or elsewhere. Application deadlines are February 1, July 1, and October 1.

M.S. IN EDUCATIONAL ADMINISTRATION AND SUPERVISION

Thesis Option

A minimum of 33 credit hours including 6 hours of Thesis 390 is required. A major concentration consists of a minimum of 18 hours. An internship is highly recommended but not required. A final oral examination is required with a written exam at the option of the committee.

Non-Thesis Option

A minimum of 36 credit hours is required with a minimum of 18 hours in the major. An internship is highly recommended but not required. A final written comprehensive examination is required with an oral exam at the option of the committee.

M.S. IN COLLEGE STUDENT PERSONNEL

This program is designed for individuals interested in entering the field of student personnel administration in colleges and universities and in community or junior colleges. The program has both a thesis and non-thesis option. A minimum of 39 hours, which includes 6 hours of practicum experience, is required in either option.

Students entering any of the M.S. options are advised to first complete the introductory core consisting of Educational Administration and Supervision 513, 515, 516, and 535 or a demonstration computer proficiency. The
courses are prerequisites to other courses in the department.

EDUCATIONAL SPECIALIST DEGREE

Thesis Option
A minimum of 60 hours beyond the baccalaureate degree including 6 hours of Educational Administration and Supervision 518 is required. Six hours must be in a cognate area within the college and 6 hours outside the college. An internship is highly recommended but not required. A written comprehensive examination is given as well as an oral exam over the thesis.

Non-Thesis Option
A minimum of 60 hours beyond the baccalaureate degree including 6 hours of Educational Administration and Supervision 503 is required. Six hours must be in a cognate area within the college and 6 hours outside the college. An internship is highly recommended but not required. A written comprehensive examination is given as well as an oral exam over the problem papers.

THE DOCTORAL PROGRAM
For the Ed.D. program, the minimum hours are determined by the student's doctoral committee. Six to 9 hours must be in a cognate area within the college and 6 hours outside the college. Students must have a Master's degree in a field outside the College of Education. Three consecutive semesters of 604 must be taken during residency. An internship is highly recommended but not required. A foreign language requirement is at the discretion of the committee. A written comprehensive examination is given as well as an oral exam over the dissertation.

The Ph.D. with a major in Education includes concentrations and specializations as listed under Education.

Educational Administration and Supervision

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

502 Registration for Use of Facilities (3-15) Required for the student not otherwise registered during any semester when 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

503 Problems in Lieu of Thesis (3-5) May be repeated. S/NC only. E

513 Administrative and Organizational Theory in Education (3) Introduction to theoretical administrative and organizational foundations of management and leadership of educational programs and institutions. F,Su

515 Human Relations and Communication in Administration (3) Development and use of effective interpersonal communication skills and channels, interpersonal relations, supportive work climates, personnel motivation, conflict management skills, and role of values, attitudes, and expectations in administration. F,Su

516 Research for School Administrators (3) Descriptive, experimental, and quasi-experimental designs to help students without quantitative backgrounds to read and understand technical professional literature, introduction to inferential statistics, needs assessment, and evaluation procedures. Sp,Su

518 Educational Specialist Research and Thesis (3) May be repeated. Maximum 6 hours. P/NP only. E

529 Politics of Education and Educational Environ- ments (3) Selected readings in political and social science literature on modern, complex society. Administrator and supervisory competencies: political, social, ethnic, cultural, and racial environments in which schools operate. Prereq: M.S. introductory core or consent of instructor. F,Su

535 Administrative Applications of Micro Computers (3) DOS, word processing, data base management, spreadsheets, computer graphics, research and development of specific administrative applications: scheduling, attendance, student record systems, and accounting. F,Su

544 School Finance and Business Management (3) For prospective building level administrators. Financial and logical management tasks and procedures in individual school setting. Prereq: M.S. introductory core or consent of instructor. F,Su

547 Educational Facility Planning (3) Concepts and skills for development, evaluation, construction, renovation, maintenance, and operations of quality educational environments and facilities. Prereq: M.S. Introductory core or consent of instructor. F,Su

548 Introductory Supervision and Personnel (3) Basic supervisory and personnel concepts and related competencies; building (or micro-organizational) level; interviewing, selecting, placing, evaluating, maintaining employee information, supervision of instructional and non-instructional personnel, clinical supervision, staff evaluation, and staff development. Prereq: Introductory M.S. core or consent of instructor. F,Su

553 Strategies of Educational Planning (3) Processes for improving decision-making function through use of both quantitative and qualitative planning techniques. Policy analysis, CPM, PERT, Delphi. Prereq: Introductory M.S. core or consent of instructor. F,Su

554 School Law (3) Legal arrangement of case and statutory materials for public school administrators and teachers; problems concerning law and public education. Prereq: Introductory, introductory core or consent of instructor. Sp,Su

556 Internship in Educational Administration (3) Field experience in appropriate educational setting working directly with administrator. At end of program assignment. Some experience in appropriate educational setting work. Placement by department assignment. Some on-campus classes in conjunction with 553 or 558. Prereq: 21 hrs in educational administration and supervision or consent of instructor. F,Su

557 Educational Leadership and District-Level (3) Role of central administrative team; relationships, behaviors, concepts and competencies for developing and maintaining effective school organization. At end of program assignment. Some experience in appropriate educational setting work. Placement by department assignment. Some on-campus classes in conjunction with 553 or 558. Prereq: 21 hrs in educational administration and supervision or consent of instructor. F,Su

558 Educational Leadership—Principalship (3) Knowledge, skills and relationships for principal to be effective instructional leader. Simulation materials and field-based activities. Culminating course with internship and problems paper. At end of planned program of study. Prereq: 21 hrs in educational administration and supervision or consent of instructor. F,Su

560 Special Topics (3) May be repeated. E

592 Field Problems in Educational Administration and Supervision (3) Topic to be assigned. May be repeated. S/NC or letter grade. E

593 Independent Study in Educational Administra- tion (3) Prereq: Consent of instructor. May be repeated. F,Su

595 Elementary Principals Seminar (1-3) For in-service training of elementary school administrators. Developments, problems, programs, and trends of elementary school administration. Prereq: Presently elementary school administrator or consent of instructor. May be repeated. S/NC or letter grade. F,Su

596 Elementary Principals Seminar (1-3) For in-service training of middle school administrators. Developments, problems, programs, and trends of middle school administration. Prereq: Presently middle school administrator or consent of instructor. May be repeated. S/NC or letter grade. F,Sp

597 Secondary Administrator Seminar (1-3) For in-service training of secondary school administrators. Developments, problems, programs, and trends of secondary schools and management skills of secondary school administrators. Prereq: Presently secondary school administrator or consent of instructor. May be repeated. S/NC or letter grade. F,Sp

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

604 Seminar in Educational Administration and Supervision (1) Current educational issues, problems and research. Required two consecutive semesters during doctoral residency. May be repeated. S/NC only. E

610 Internship in Educational Administration (3) Opportunity for doctoral students and advanced graduate students to gain experience in performance of critical educational administration under supervision of practitioner and University representative. May be repeated at discretion of student's committee. Maximum 12 hrs. S/NC only. E

611 Current Issues in Educational Administration (3) Current topics for educational administrators. Prereq: 21 hrs in educational administration and supervision or consent of instructor. Selected seminar group and/or faculty, selected each semester and presented by specialist. Prereq: Presently school supervisor or administrator, or consent of instructor. May be repeated. S/NC or letter grade. E

614 Statistical Methods for School Administrators (3) Descriptive and experimental research methods, parametric and non-parametric statistical techniques used in research in educational settings. F

615 Research Designs (3) Statistical methods through various techniques and applications to various research designs. Prereq: 614 or consent of instructor. Sp

616 Research Methods (3) Overview of descriptive and experimental research designs: data collection, analysis and interpretation. Prereq: E

622 Programs for the Professional Preparation of Educational Administrators and Supervisors (3) Exploring designs and methodology for training school administrators at both pre-service and in-service levels. F

629 Seminar in Politics of Education (3) Political theories and practices as they affect operation of public school systems and higher educational institutions. Interdisciplinary discussions of community power structures and their influence on school systems and curriculum. Use of the Internet and research from education, sociology, and political science. Field inquiry. Prereq: 529, 616 or equivalent or consent of instructor. F

638 Advanced Supervision (3) Supervision at district level; roles, responsibilities, and operations; goal development, instructional supervision, staff development, curriculum development, program evaluation, and personnel evaluation. Prereq: 548 or consent of instructor. F,Su

644 Educational Finance and Business Management (3) Contemporary educational finance policies and their influence upon education, nation and others. Superintendence team concept, management of school logistical services. Prereq: 544 or consent of instructor. F,Su

646 School Personnel Administration (3) Personnel administration of functions for professional and support 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. Prereq: 548 or consent of instructor. F,Su

653 Seminar in Educational Planning Methods (3) Exploration of alternative futures and advanced plan-
ning methodology. Sophisticated planning/forecasting techniques. Prereq: 553 or consent of instructor. F,Su.

655 State-Federal Relations in Education (3) Interrelationships of federal, state, and local responsibilities and organization for education by analysis of traditional, legal, fiscal and functional aspects of educational partnership. Funding partnerships; discussion of grant proposal development processes. Sp,Su.

656 Legal Foundations of Public Education (3) School law; constitutional foundations as they relate to public education at state and local levels. F,Su.

658 Conflict Management (3) Social conflict and its management. Causes of interpersonal, intergroup, and organizational conflict; skills and strategies used to manage conflict; conflict management models associated with different sectors of human activity, and current organizational practices for managing destructive conflict. F.

680 Administration of Complex Organizations (3) Concepts and theoretical formulations to understand, analyze, evaluate, and change complex educational programs and organizations. Prereq: 513 or consent of instructor. Sp,Su.

687 Seminar in Educational Facility Planning (3) Concepts and techniques for evaluating educational facilities, conducting comprehensive school surveys, and developing educational specifications. Prereq: 547 or consent of instructor. Sp.

690 Specialized Seminar (3) Prereq: Consent of instructor. May be repeated. E.

693 Independent Study in Educational Administration and Supervision (3) Prereq: Consent of instructor. May be repeated. E.

Higher Education

455 Seminar in Student Leadership (1) Knowledge and skills in leadership roles for resident assistants, student government leaders, student activities, and other student organizations. Topics to be assigned. May be repeated. E.

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

502 Registration for Use of Facilities (3-15) Required for the student not otherwise registered during any semester when 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.

503 Problems in Lieu of Thesis (3-6) May be repeated. S/NC only. E.

530 Special Topics (1-3) May be repeated. E.

542 The College Student and the Court (3) Legal precedent affecting student personnel services in public higher education. Student discipline, housing, dress, organizations, activities fees, tuition and related federal regulations. F.

543 American Higher Education in Transition (3) History, philosophy, purposes, functions, organizations and programs in American higher education. F.

570 Introduction to Student Personnel Work in Higher Education (3) Historical, philosophical and organizational perspective. Functional areas comprising field and major issues. F.

572 Theory and Practice in Student Personnel Services (3) Theoretical framework of college student personnel services and practical application of theory in student services environment. Applicable administrative theory, human development theory and evaluation assessment techniques. Sp.

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

593 Independent Study (3) Prereq: Consent of supervisory instructor. May be repeated. S/NC or letter grade. E.

599 Practicum in College Student Personnel (1-5) Prereq: Consent of instructor. May be repeated. S/NC only. E.

619 Administration and Governance of Higher Education (3) Trends, structure and process of collegiate governance. Development of understanding of administrative theory and practice in higher education. Prereq: 543 or consent of instructor. F.

630 Special Topics (1-3) May be repeated. E.

640 College and University Law (3) Legal precedent affecting organizations, administration, and finance of higher education: Academic freedom, faculty termination, religion, tort liability, administrative law, academic due process and affirmative action in employment. Sp.

645 Curriculum and Instruction in Undergraduate Higher Education (3) Content and organization of institutional strategies and curricular structure in higher education. F,Su.


653 Independent Study (3) Prereq: Consent of supervisory instructor. May be repeated. S/NC or letter grade. E.

655 Practicum in Higher Education (1-6) Supervised practice in selected areas of higher education administration. Prereq: Consent of instructor. May be repeated. S/NC only. E.

658 Seminar in Higher Education (3) Analysis of administrative and organizational structure, theory and practice in management of American colleges and universities. Prereq: 543 or consent of instructor. Su.

Associate Professors:

R. A. Belz (UTSI), Ph.D. Tennessee;
J. D. Birdwell, Ph.D. Massachusetts Institute of Technology; B. W. Bomar (UTSI), Ph.D. Tennessee;
J. S. Lawler, Ph.D. Michigan State;
A. Pujol (UTSI), Ph.D. Vanderbilt;
D. Rosenberg, Ph.D. Rhode Island;
J. M. Rochelle, Ph.D. Tennessee;
J. W. Waller, Ph.D. Tennessee.

Assistant Professors:

D. Brzakovic, Ph.D. Florida; J. A. Chapman (UTSI), Ph.D. Tennessee; M. A. Scott (UTSI), Ph.D. Tennessee.

The Electrical and Computer Engineering Department has a graduate committee to administer, promote, and evaluate the Master's degree program. The department has a graduate committee to administer, promote, and evaluate the Master's degree program. F.

The Department of Electrical and Computer Engineering and the Department of Nuclear Engineering jointly offer a Master's degree program in the field of energy. Students may have the opportunity to do their Master's thesis at the Fusion Energy Division of the Oak Ridge National Laboratory or at the Plasma Science Laboratory. The electrochemical Engineering and Computer Engineering Department at the University of Tennessee has a number of Graduate Research Assistants available at each location.

Further information about this program is available from the department.

MAJOR DEGREES

Electrical Engineering

MAJOR

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

Walter L. Green, Head

Professors:

I. Alexeff, Ph.D. Wisconsin, P.E.; J. M. Bailey, Ph.D. Georgia Institute of Technology; A. O. Bishop, Ph.D. Clemson; T. V. Blaiklock, Ph.D. Ph.D. Tennessee; R. E. Bodenheimer, Ph.D. Western Carolina; D. W. Boulind, Ph.D. Vanderbilt; J. W. Cunningham (UTSI), Ph.D. Tennessee; R. C. Gonzalez (Distinguished Professor), Ph.D. Florida; J. M. Gooch, Ph.D. Georgia Institute of Technology; W. L. Green, Ph.D. Texas A&M; M. W. Hoffman, Ph.D. Harvard; J. C. Hung (Distinguished Professor), Ph.D. New York, P.E.; E. J. Kennedy, Ph.D. Ph.D. Tennessee, P.E.; W. O. Loffit (Emeritus), M.S. Tennessee; W. McGregor (UTSI), Ph.D. Tennessee; H. P. Neff, Ph.D. Auburn, Ph.D.; M. O. Pace, Ph.D. Georgia Institute of Technology; J. F. Pierce (Distinguished Professor), Ph.D. Pittsburgh, P.E.; T. W. Reddoch, Ph.D. Louisiana State; R. W. Rochelle, Ph.D. Maryland; J. R. Roth, Ph.D. Cornell; F. W. Symonds, Ph.D. Nottingham (UK); J. D. Tifman, Ph.D. Auburn; C. H. Weaver, Ph.D. Wisconsin, P.E.

Electrical and Computer Engineering (College of Engineering)
361 and two 400-level courses in the student’s major area of concentration in the Master’s program. Students from fields other than electrical engineering who have met the admission standards will be admitted only as non-degree students until a program of study is developed by each student and his/her advisor and is approved by the Electrical and Computer Engineering Department Graduate Committee. The program of study should include recommended undergraduate courses and graduate courses in electrical and computer engineering.

MASTER’S DEGREE REQUIREMENTS

Specific degree requirements which must be met include:

1. Electrical and Computer Engineering 503 and 504.
2. Six semester hours of graduate credit in mathematics consisting of mathematics courses of 400 level or higher which have been approved by the E.C.E. Graduate Committee.
3. An additional 12 semester hours of 500-level work in electrical and computer engineering courses or 6 semester hours of 500-level work in electrical and computer engineering courses and 6 semester hours of 500-level work in another area approved by the student’s advisor and are approved by the Electrical and Computer Engineering Graduate Committee before the student is reported as al accepted by the student’s doctoral committee.
4. Master’s thesis, totaling 6 semester hours or more.
5. A final oral examination covering the thesis and related course work.

DOCTORAL PROGRAM

The Ph.D. with a major in Electrical Engineering may be pursued in the concentration areas of circuit theory, computers, electrophysics, communication theory, electromagnetics, plasma engineering, power systems, solid-state electronics, and control systems.

Applicants must submit scores on the General Graduate Record Examination. Specific departmental requirements for the Ph.D. include the following:

1. A Master of Science or Master of Engineering degree.
2. A minimum of 48 semester hours of course work beyond the B.S. excluding thesis, research, and dissertation credit.
   a. A minimum of 24 semester hours of work in electrical and computer engineering courses at the 500 and 600 levels.
   b. A minimum of 9 semester hours of 600-level course work. At least 3 semester hours of this work must be in an area other than the student’s major area.
   c. A minimum of 12 hours of mathematics courses approved by the Electrical and Computer Engineering Graduate Committee. All 12 hours must be 400-level or above, and at least 6 hours must be at 500-level or above.
3. One foreign language if the student’s faculty committee feels that a reading knowledge of a foreign language is crucial to the student’s research efforts.
4. Satisfactory performance on both a qualifying and comprehensive examination. The qualifying examination is prepared by the electrical and computer engineering faculty and consists of a 3-hour written examination in each of four areas. Areas (1) mathematics and transform methods, and (2) basic electrical network analysis, are required of all students. Areas (3) and (4) are usually chosen from two of the graduate course divisions in the department and cover material from undergraduate courses and first year graduate courses. A student who fails the qualifying examination must take and pass the examination the next time it is offered to remain in the Ph.D. program. The qualifying examination is normally taken after the completion of 24 hours of graduate course work or immediately after completion of a Master’s degree. A minimum of 18 hours of graduate course work must be completed after the student has taken the qualifying examination the first time.
5. Participation in departmental seminars.

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

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

Courses required in the Electrical and Computer Engineering graduate curriculum cannot be used in either the M.S. or Ph.D. programs. No 400-level course may be used toward a graduate degree in Electrical and Computer Engineering.

413 Passive and Active Network Synthesis (3) Review of network analysis techniques, passive network driving point synthesis, transfer function synthesis, approximation theory, topics in active network synthesis. Prereq: 312.
421 Power Systems (3) Bulk power system planning and control, reliability, system stability. Prereq: 322.
423 Power Electronics (3) Industrial motor controls, phase control, variable frequency, motor characteristics, power HVDC, rectification, inverter, electromagnetic compatibility, VAR control, uninterruptible power systems; surge arresters. Prereq: 322.
425 Direct Electrical Energy Conversion (3) Principles and practices of energy conversion devices and systems. Prereq: 313.
426 Machines Lab (1) Experiments and projects demonstrating laboratory. Coreq: 422.
429 Power Electronics Lab (1) Experiments and projects demonstrating power electronics.
431 Digital and Analog Integrated Electronics (3) Basic processing and fabrication of active and passive components for monolithic integrated circuits; characteristics of bipolar, MOS and JFET transistors in typical analog and digital integrated circuit designs; standard digital logic circuits including TTL, ECL, Schottky, NMOS, CMOS, and GaAs gates and arrays; design concepts for op-amps, comparators, regulators, and other linear functions. Prereq: 332. Coreq: 435.
432 Analog Signal Processing Electronics (3) Transducer signal and interfacing characteristics, analog integrated circuits: operational, instrumentation, isolation amplifiers, rms and logarithmic converters, multiplexers, and function generators; integrated circuit applications: active filters, level and phase detection, multiplexers, and demodulation, sample and hold circuits and comparators. Prereq: 332. Coreq: 436.
433 Electronic Amplifiers (3) Feedback amplifier principles: wideband linear amplifier design; radio frequency and audio power amplifier design; linear regulated power supply design; oscillator principles. Prereq: 332. Coreq: 438.
435 Digital and Analog Integrated Electronics Laboratory (1) Experiments and projects demonstrating electronics. Coreq 431.
439 Electronic Amplifiers Laboratory (1) Experiments and projects demonstrating electronic amplifiers. Coreq 439.
441 Digital Communications (3) Pulse and digital communication system principles. Sampling theorems; pulse amplitude, duration, and position modulation methods. Random signals and spectral analysis of noise as applied to communication systems. Quantization, coding, error detection, code conversion, digital signals, carrier modulation with digital waveforms. Delta, adaptive delta, delta-sigma, delta PCM systems. Networking and network standards. Prereq: 342.
442 Antennas and Propagation (3) Linear antennas, arrays, for example simple, multiple, broadside, planar monostatic, communication link parameters. Wave propagation in earth bound free space, earth’s troposphere and ionosphere. Reflections from earth; affects on link reliability. Prereq: 342.
449 Microwave Circuits and Electronics Laboratory (1) Experiments and projects demonstrating microwave circuit and electronics. Coreq: 443.
451 Microprocessors in Computer Engineering (3) Introduction to microprocessors, computer architecture, compiler/interfacing, monitor program and development system with cross-assemblers, file management, and emulation capability: interfacing and hardware/software trade-offs in
interrupt driven applications. Term grade dependent on number of projects completed, homework solutions, and engineering notebook. Prereq: 352. Coreq: 455.


455 Microprocessor Laboratory (1) Experiments and projects demonstrating microprocessors. Coreq: 451.

456 Digital System Design Laboratory (1) Experiments and projects demonstrating digital systems. Coreq: 452.

459 Data Acquisition Systems Laboratory (1) Experiments and projects demonstrating digital systems. Coreq: 452.

461 Plasma Magnetohydrodynamic Engineering (3) MHD approximation; MHD waves and instabilities; MHD in static and dynamic systems. MHD in pulsed and steady-state power plants. Theory of plasma aspects of fusion, industry, and astrophysics. Prereq: 361.

462 Plasma Kinetic Theory Engineering (3) Kinetic theory; beam-plasma system; driven waves in plasma; transition from multiple beams to continuum. Plasma and Landau theory; microwave generation in plasmas and traveling wave tubes; electron laser masers in circular geometry; gyrotron and orbitron. Design of plasma devices. Prereq: 361, 461 or consent of instructor.

463 Introduction to Fusion Energy I (3) High temperature plasma physics relevant to fusion plasmas, principles of fusion reactors, and engineering and physics constraints on fusion reactors. Prereq: 361 or consent of instructor. (Same as Nuclear Engineering 463.)

464 Introduction to Fusion Energy II (3) Principles and phenomenology of tokamak reactor, alternate magnetic confinement concepts, advanced fusion fuel and fusion fuel technology, plasma engineering, and fusion reactor design studies. Design project. Prereq: 463 or consent of instructor. (Same as Nuclear Engineering 464.)

469 Plasma Laboratory (1) Experiments and design projects for 461, 462, and 463. 464.

471 Introduction to Pattern Recognition (3) Design of learning and adaptive machines. Elementary decision theory, perception algorithm, Bayes classification rule, learning algorithms, elements of syntactic pattern recognition. Prereq: Consent of instructor.

472 Introduction to Digital Image Processing (3) Basic methods for digitizing, storing, processing, and displaying images. Computational procedures for image enhancement, restoration, coding, and segmentation. Prereq: Consent of instructor.


489 Electro-Optics Laboratory (1) Experiments and projects demonstrating electro-optics. Coreq: 481.

494 Special Problems in Electrical Engineering (1-3) Problems involving library and experimental research. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs.

495 Senior Seminar (1) Topics of interest discussed in weekly seminar. Prereq: Consent of instructor. May be repeated. Maximum 2 hrs.

499 Electro-Optics II Laboratory (1) Experiments and projects demonstrating electro-optics. Coreq: 482.

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

502 Registration for Use of Facilities (3-15) Required or faculty time before degree is completed. May not be repeated. Maximum 2 hrs.

505 Modern Transform Methods (3) Fourier and Laplace transform and complex variables theory. Z-transform, difference equations and distributed parameter systems.

504 Random Process Theory for Engineers (3) Probability and random variables as approached by set theory. Statistical averages and transformations of random variables. Random processes, stationarity, correlation functions and temporal analysis, power spectrum and spectral analysis as applied to response of systems to random signals.

511 Linear Systems Theory (3) State space models of linear dynamical systems, state space description, state transition map, matrix exponential, controllability, observability, realization theory, and stability theory.

512 Multivariable Linear Control System Design (3) Design of controllers, for multivariable systems, which satisfy constraints on robustness to plant uncertainties, disturbance rejection, command following. Prereq: 511.


516 Passive and Active Network Analysis and Synthesis I (3) Frequency and time domain techniques for network analysis, network reliability, synthesis algorithms.


521 Power Systems Analysis I (3) Matrix-vector representations of power networks, sequence modeling of power system components, unbalanced shunt and series faults. Formulating and solving problems in matrix-vector form with application to large scale power systems. Prereq: 421 or equivalent.

522 Power Systems Analysis II (3) Operation and control of interconnected power systems, transient and dynamic stability. Formulating and solving problems in matrix-vector form with application to large scale power systems. Prereq: 521.


528 Advanced Electrical Machines I (3) Fundamental processes of electromechanical energy conversion; application in conventional devices. Differential equations for magnetic circuit theory. Prereq: 522 or equivalent.

529 Advanced Electrical Machines II (3) Park's transformation and two-axis model, transient behavior of isolated and interconnected rotating machines. Prereq: 528.

531 Advanced Analog Electronics I (3) Physical operation of modern electronic devices: diodes, bipolar transistors, JFETs, and MOSFETs. Small-signal equivalent circuits and noise models of active devices. Operational amplifier theory. Prereq: 431, 432, 433, or consent of instructor.


541 Electromagnetic Fields (3) Maxwell's equations, special relativity, wave reflection and transmission, generalized media, guided waves, radiation from current sources, fields due to current sources, transformation of fields and near fields due to edge and surface diffraction. Horn, lens, and reflector antennas, computation of radar cross section. Prereq: 541.

543 Information Systems I (3) Mathematical treatment of information transmission in communication systems; modulation and demodulation; discrete and analog systems. System performance with noise and bandwidth limits, sampling theorem. Quantization effects, digital filter design in real time and real frequency, digital signal processing. Prereq: 504.


545 Introductory Microwave Networks and Components (3) Scattering and transfer representation for multipoles; unilateral and bilateral microwave and linear components. Design of microwave network meander measurement by modern network analyzers. Electronic oscillators and amplifiers, frequency swept oscillators, transistor time devices, parametric devices, mixers, switches.

551 Digital System Design I (3) Design considerations for combinational and sequential circuits, iterative networks. Fault diagnostics of logic circuits.

552 Digital System Design II (3) State identification and structure realizations of sequential machines. Digital system architecture design; microprogramming and interrupt control. Prereq: 551.

561 Plasma Diagnostics I (3) Principles of active, passive, perturbing and nonperturbing diagnostic methods, methods based in low power concepts, and high temperature plasmas of interest in fusion research. Laboratory safety, data reduction and presentation, microprocessor based data handling and analysis, and reduction of time series data. Prereq: 461, 463, or consent of instructor. (Same as Nuclear Engineering 561.)

562 Plasma Diagnostics II (3) Laboratory instruction in operation of plasma diagnostic instruments in plasma science laboratory, experience with high voltage, vacuum, RF, and digital data handling techniques. Prereq: Same as Nuclear Engineering 462.

563 Plasma Engineering (3) (Same as Nuclear Engineering 563.)

564 Fusion Technology (3) (Same as Nuclear Engineering 564.)

571 Pattern Recognition (3) Decision-theoretic and structural approaches to pattern recognition. Deterministic and statistical decision rules, feature extraction and feature selection, and systematic methods. Prereq: 472 or consent of instructor.


573 Robot Sensing (3) Design and applications of
various sensors such as vision, range, proximity, force, and torque, Multi-sensor integration and robotics applications. Prereq: 572 or consent of instructor.


588 Measurement Science I (3) (Same as Nuclear Engineering 588, Chemical Engineering 588, Civil Engineering 588, Engineering and Mechanics 588, Mechanical Engineering 589, and Aerospace Engineering 589.)

589 Measurement Science II (3) (Same as Nuclear Engineering 589, Chemical Engineering 589, Civil Engineering 589, Engineering and Mechanics 589, Mechanical Engineering 589, and Aerospace Engineering 589.)

598 Graduate Seminar (1) Topics of interest discussed in weekly seminar. May be repeated. Maximum 6 hrs.

599 Special Topics (1-3) May be repeated. Maximum 9 hrs.

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


612 Advanced Systems Theory (3) Game theory, dual control problem, hierarchical systems, and information structures. Prereq: 611.


614 Optimal Control (3) Deterministic and stochastic dynamic programming in continuous and discrete time, minimum principle and matrix minimum principle, computational methods in optimal control. Prereq: 611.

615 Analysis of Nonlinear Networks and Systems (3) Systematic study and analysis of nonlinear electric circuits. Network elements and equation, linear systems, nonlinear O.D.E.'s, geometric analysis and numerical techniques. Prereq: Consent of instructor.

616 Active Network Synthesis (3) Theory and design of active analog filters and practical RC realizations. Prereq: Consent of instructor.

617 Special Topics in Systems Theory I (3) Topics of current interest to students and faculty: large scale systems, model order reduction, algebraic and geometric system theories, and advanced design methods. Prereq: 503 and consent of instructor.

618 Special Topics in Systems Theory II (3) Topics of current interest to students and faculty: large scale systems, model order reduction, algebraic and geometric system theories, and advanced design methods. Prereq: 503 and consent of instructor.

621 Modern Techniques for Electric Energy Systems I (3) Analysis of electric energy systems. Prereq: Consent of instructor.

622 Modern Techniques for Electric Energy Systems II (3) Introduction to modern techniques for the design and analysis of equipment for electric energy systems. Prereq: 503 and consent of instructor.

631 Advanced Topics in Electronic Instrumentation I (3) Based on particular interests of students: Fundamental physical processes in instrumentation; transducers, thermoelectric, magnetoelectric, electromagnetic, and quantum-mechanical devices. Prereq: 531-52 and consent of instructor.


641 Electromagnetic Diffraction and Scattering (3) Diffraction of electromagnetic waves by spheres, corners and cylinders; ground wave propagation; modern approximate methods; creeping waves, leaky waves. Prereq: Consent of instructor.

642 Asymptotic Techniques in Wave Propagation (3) Electromagnetic waves with spatial and temporal dispersion and with fluctuations. Geometric theory of diffraction for electromagnetic waves, supported by results from canonical approximations of geometrical optics and physical optics. Field and power flux scattering. Single scattering radiative transport in turbulent particulate media; multiple scattering theory; coherent and incoherent scattering. Prereq: Consent of instructor.

643 Advanced Topics in Information Science I (3) Detection theory; coding theory; system identification. Signals with unknown parameters; optimal filter synthesis; adaptive systems; sequential detection, suboptimal detection. Prereq: 504 or consent of instructor.

644 Advanced Topics in Information Science II (3) Structure of algebraic and probabilistic codes; linear codes, convolutional codes, error-correcting codes, decoding methods; identification schemes, deterministic, stochastic, and hierarchical methods. Prereq: 643.

645 Advanced Topics in Microwave Networks (3) Multiport scattering and transfer representations. Narrow band and wide band synthesis of networks containing lumped and distributed components; interchange matching and response equalization. Low noise, low distortion and wideband post-amplifiers and oscillators. Prereq: Consent of instructor.

646 Advanced Topics in Microwave Networks (3) Reciprocal and nonreciprocal devices, directional devices, high frequency switches and multiplexers, oscillator theory, microwave active and passive microwave networks. Prereq: Consent of instructor.

651 Computer-Aided Design of VLSI Systems I (3) Fabrication of micr-electronic devices; computer architecture design; algorithmic state machines; partitioning; structured design methodology. Prereq: 551-52 or consent of instructor.

652 Computer-Aided Design of VLSI Systems II (3) Computer-aided design tools; design and implementation of full custom very large scale integrated (VLSI) circuits; design for testability; testing of fabricated chips. Prereq: 651.

653 Advanced Plasma Physics I (3) Basic concepts of high temperature plasma physics. Magnetohydrodynamics and kinetic descriptions of plasma, plasma transients, plasma waves, equilibrium, and stability. Prereq: Physics 541-42, 561-62 or 563-64, or consent of instructor. (Same as Physics 693.)

654 Advanced Plasma Physics II (3) Plasma heating and radiation phenomena. Advanced topics of current interest. Must be taken in sequence. Prereq: 663. (Same as Physics 664.)

671 Image Processing and Robotics I (3) Three-dimensional scene modeling and recognition, multi-sensor systems. Prereq: 572 or 573 or consent of instructor.

672 Image Processing and Robotics II (3) Stereovision, shape theory. Prereq: 671.

673 Image Processing and Robotics III (3) Time-varying imagery, path planning and navigation. Prereq: 672.

681-82 Quantum Electronics (3, 3) Prereq: Consent of instructor.

691 Advanced Graduate Seminar (1) Research in department. May be repeated.

692 Special Topics (1-3) Advanced topics of current interest to Ph.D. students in Electrical Engineering. May be repeated. Maximum 9 hrs.

Engineering Science and Mechanics (College of Engineering)

MAJOR

DEGREES

Engineering Science.............................. M.S., Ph.D.

Jerry E. Stoneking, Head

Professors:


Research Professor:

T. F. Moriarty, Ph.D. Illinois, P.E.

Associate Professors:

J. E. Caruthers (UTSI), Ph.D. Georgia Institute of Technology, R. C. Engels (UTSI), Ph.D. Virginia Polytechnic Institute; A. Mathews, Ph.D. Illinois, P.E.; M. H. McCoy (UTSI), Ph.D. Florida; C. J. Myers (UTSI), Ph.D. Indiana; M. O. Soliman, Ph.D. Tennessee, P.E.; J. S. Steinhoff (UTSI), Ph.D. Chicago.

Assistant Professors:

J. A. M. Boulet, Ph.D. Stanford; G. N. Brooks, Ph.D. Stanford.

Graduate programs leading to the degree of Master of Science and Doctor of Philosophy with a major in Engineering Science are available to graduates of recognized curricula in engineering, mathematics, or one of the physical or biological sciences. Program concentrations include solid mechanics, fluid mechanics, computational mechanics, biomedical engineering, and optical engineering (UTSI only) in each of these concentrations, interdisciplinary programs are arranged to meet individual needs or interests. Each applicant is advised as to any prerequisite
The second plan is normally restricted to students whose graduate advisory committee must be on the faculty of the Department of Engineering Science and Mechanics; however, at least one member of the student's graduate advisory committee must be on the faculty of the Department of Engineering Science and Mechanics.

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

The flexibility and interdisciplinary aspect of the program concentrations are intended to be of particular interest to prospective students currently employed in research, development, or design activities and whose interests in 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. options are offered: option I requires a thesis, while option II does not.

The second plan is normally restricted to those students who have had significant engineering work experience.

In option I, a minimum of 30 semester hours, including the thesis, is required. In option II, a minimum of 33 hours is required.

The requirements include the following:

<table>
<thead>
<tr>
<th>Hours Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mathematics</td>
</tr>
<tr>
<td>Engineering courses (Major concentration may include but is not restricted to courses offered by the Engineering Science and Mechanics Department.)</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>
</tr>
<tr>
<td>Thesis</td>
</tr>
</tbody>
</table>

*Engineering courses under option II may include advanced laboratory work or special problem work; for example, Engineering Science and and Mechanics 581 or analogous courses in other departments.

A final examination is required under both options covering graduate course work and the thesis.

THE DOCTORAL PROGRAM

Specific departmental requirements for the Ph.D. include:

1. A minimum of 72 semester hours beyond the Bachelor's degree, exclusive of credit for the Master's thesis. These shall include a minimum of 24 semester hours in Doctoral Research and Dissertation and a minimum of 48 semester hours in other courses.

2. A minimum of 24 semester hours in engineering graduate courses, exclusive of thesis and dissertation credit. These courses will normally be numbered 500 and above, with at least 9 semester hours of 600-level courses, which constitute one or two areas of concentration selected by the student. The number of courses in this group to be taken will depend on the program selected by the student and the approval of his/her advisory committee.

3. A minimum of 12 semester hours in mathematics or computer science in courses numbered 400 and above, exclusive of a first course in ordinary differential equations.

4. A minimum of 6 semester hours of courses numbered 500 and above, offered in departments other than mathematics, computer science, and the student's major department and not included in the areas of committees.

5. Attendance and participation in graduate seminars and colloquia.

6. Two doctoral examinations must be passed to be admitted to candidacy for the Ph.D. in Engineering.

After being admitted as a potential candidate for the Ph.D., a qualifying examination must be taken at the first offering after the student has either completed a Master's degree or completed one or two areas of graduate credit. The purposes of qualifying examinations are:

a. To determine the qualifications of the student to continue the Ph.D. program and;

b. To identify the areas of strengths and weaknesses to guide the student's graduate course work and research.

The qualifying examination will be administered by the department's Graduate Studies Committee. The examination will be written and will cover at least four graduate level subject areas. One subject area will be mathematics, and the others will be designated by the student subject to the approval of the department's Graduate Studies Committee.

The comprehensive examination is to be taken by students within 6 credit hours of completion of graduate course work required for the Ph.D. degree. This examination is to be administered by the student's advisory committee and shall consist of both a written and oral portion.

7. After successfully passing the qualifying and comprehensive examinations, the student must present the Ph.D. dissertation research proposal to the student's advisory committee and receive committee approval of the proposal before being admitted to candidacy for the Ph.D.

8. A final examination on the student's dissertation research within the student's concentration will be taken by the student after completion of the Ph.D. dissertation and course requirements.

GRADUATE CREDIT FOR 400-LEVEL COURSES

Four hundred-level courses in engineering may be used for graduate credit at the discretion of the advising committee. However, at least two-thirds of the required credit hours in a Master's degree program must be at or above the 500 level.

421 Materials of Engineering (3) Mechanical properties of engineering materials; data collection and processing; time dependent and cyclic dependent properties.

Prereq: 321, Materials Science and Engineering 201. 3 hrs or 2 hrs and 1 lab.

423 Fracture-Safe Design (3) Critical review of variables controlling fracture toughness, including geometry, temperature, loading rate, section thickness, and a variety of fracture mechanisms; student work includes tests of fracture toughness data in design.

Prereq: 321 and Materials Science and Engineering 201. (Same as Metallurgical Engineering 451.) 3 hrs or 2 hrs and 1 lab.

425 Principles of Nondestructive Testing (3) Principles and theory of nondestructive testing methods; liquid penetrant, magnetic particle, eddy current, ultrasonic, acoustic emission, and radiographic methods.

Laboratory: Prereq: 321, Materials Science and Engineering 201. (Same as Physics 475.)

431 Fundamentals of Vibrations (3) Free and forced vibrations of damped and undamped lumped parameter systems; energy methods; free vibration of continuous bodies.

Prereq: 231, Mathematics 231.

433 Dynamic Systems (3) Three dimensional dynamics of particles and mechanics; rigid body mass systems; central force motion; Lagrange's equations; stability; transfer functions.

Prereq: 231, 431.

434 Engineering Acoustics (3) Concepts of acoustics, measures of sound and their units; noise generation and transmission; noise control principles and applications, materials and procedures for noise abatement.

Prereq: Introductory course in vibrations or acoustics.

442 Fluid Mechanics I (3) Inertial and gravitational forces of basic laws; compressibility, isentropic flow, shocks, duct flows with heat transfer and friction; open channel flow, critical flow, energy methods; internal and external viscous flows, boundary layers, small turbulent flow closure models.

Prereq: 341, Mathematics 231.

451 Similitude and Dimensional Analysis (3) Dimensional analysis, Buckingham's theorem, dynamic similarity, scale modeling; dimensionless forms of well-known equations, invariance of differential equations under transformation groups; reduction of systems using group invariants.

Prereq: 321, 341, Mathematics 231.

455 Computer-Aided Design (3) Use of computer graphics and analysis programs for design of selected machine and structural components and systems; evaluation of design alternatives.

Prereq: 341.

461 Experimental Stress Analysis (3) Theory, techniques, and instrumentation of resistance strain gauges; theory and techniques of brittle fracture testing; introduction to other strain measuring devices; Prereq: 311, Electrical and Computer Engineering 301, 2 hrs and 1 lab.

463 Photomechanics (3) Introduction to photoelasticity, photoelastic testing methods, Moiré method, interferometry, and holography.

Prereq: 321, Physics 232, 2 hrs and 1 lab.

465 Dynamic Data Acquisition (3) Use and calibration of instrumentation for measuring and recording dynamic events; Fourier analysis, transfer function analysis, digital signal processing, transducer and experimental parameter estimation with applications to modal vibration analysis.

Prereq: 431, Electrical and Computer Engineering 301, 1 lab.

471 Clinical Engineering and Bioinstrumentation (3) Function and characteristics of health care delivery systems: hospital organization and health care economics; development and management principles for hospital-based clinical engineering program. Biomedical instrumentation system operational characteristics; performance of cardiac, respiratory, and hospital monitoring systems; equipment maintenance and control programs for hospitals. Ethical issues and professionalism in clinical engineering.

Prereq: 271, Electrical and Computer Engineering 302.

472 Biomechanics (3) Mechanical properties of living
431 or 435.
tering. Resonators, filters, absorption mechanisms, waves, transmission phenomenon, radiation and scattering; applications to microphones, ultrasonics, sonar transducers. Prereq: 531, 532.
454-95 Special Engineering Science Topics (3,3) Problems related to recent developments and practice. Open to juniors or seniors. Prereq: Consent of instructor. May be repeated. Maximum 8 hrs.
500 Thesis (1-15) P/NP only. E
502 Registration for Use of Facilities (3,3) Required for the student not otherwise registered during any semester who wishes to use University facilities or facilities owned by the University. May be used toward degree requirements. May be repeated.
521-22 Advanced Mechanics of Materials (3,3) Three-dimensional transformations for stress and strain, unsymmetrical bending, energy methods, thick-walled pressure vessels, beams on elastic foundation, beam columns, introduction to elementary theory of plasticity. Prereq: 322 and Mathematics 431.
523-24 Theory of Elasticity (3,3) Equations of equilibrium, strain-displacement relations compatibility, and constitutive equations in three dimensions. Beams, disks, thick-walled tubes, plates with holes; stress concentrations. Airy and complex potential stress functions, plane stress and plane strain in rectangular and polar coordinates. Thermal stresses in beams, rings, plates, and shells; thermal buckling problems.
525 Theory of Plates (3) Classical bending theory of thin plates; thick plates; buckling and large deflection problems. Prereq: 523 or 535.
536 Advanced Engineering Acoustics (3) Introduction to the mathematical description of acoustic analysis; vibration of continuous systems, plane and spherical waves, transmission phenomenon, radiation and scattering. Ref: Rayleigh's Introduction to the Mathematical Theory of Vibrations, wave propagation; microphones, ultrasonics, sonar transducers. Prereq: 431 or 435.
539 Introduction to Continuum Mechanics (3) Cartes-ian tensors, transformation laws, basic continuum mechanics concepts; stress, strain, deformation, constitutive equations; laws of mass, momentum, energy. Applications in solid and fluid mechanics.
541 Fluid Dynamics I (3) Kinetic and thermodynamic properties of fluids. Development of rate equations and constitutive equations; energy conservation relationships; non-dimensionlization. Applications of Euler and Navier-Stokes equations: exact solutions, potential flow, transonic, boundary layer approximations; coupled heat/mass transfer models. Coreq: 539.
542 Fluid Dynamics II (3) Development of basic concepts and governing equations for turbulence and turbulent flow. Flow through corrugated correlation function, energy spectra, diffusion. Introduction to turbulent transport processes, free turbulence, wall turbulence; turbulence closure models; examination of modern numerical and experimental methods. Prereq: 541.
559 Computational Mechanics Laboratory I (1) Introduc-tion to networked computer/engineering work station environment for CAD/graphics/engineering numeri-cal analysis. Coreq: 551.
559 Computational Mechanics Laboratory I (1) Introduction to networked computer/engineering work station environment for CAD/graphics/engineering numerical analysis. Coreq: 551.
561 Photoelasticity (3) Polarized light; basic principles of photoelasticity; experimental techniques and equipment; numerical methods in photoelastic stress analysis; three-dimensional photoelasticity; applications. Prereq: Mathematics 431. 2 hrs and 1 lab.
568 Optical Engineering I (4) Wave optics; scalar diffraction theory; introduction to Fourier optics; ray or geometric optics; lens, mirror, gratings; paraxial design methods; aberrations. Prereq: Mathematics 431. Coreq: 569.
567 Optical Engineering Laboratory I (2) Laboratory in support of Optical Engineering I (564). Prereq or coreq: 565.
571 Biomechanics of Hard and Soft Tissue (3) Intro-duction to terminology, physiology, and analytical meth-ods for mechanics of living tissue. Continuum mechanics analysis of hard and soft tissue, biological fluid flows. Flow characteristics of blood, rheology of blood in micro vessels; bioelasticity of fluids and solid body mechanics; properties of blood vessels; skeletal, heart and smooth muscle; bone and cartilage. Research paper.
581 Special Topics in Engineering Mechanics (3) Mechanics of beams, plates, shells, and bodies. Prereq: Consent of instructor. May be repeated with consent of department.
588 Measurement Science I (3) (Same as Nuclear Engineering 588, Chemical Engineering 588, Civil Engineering 588, Electrical and Computer Engineering 586, Aerospace Engineering 588, and Mechanical Engineering 588.)
599 Measurement Science II (3) (Same as Nuclear Engineering 589, Chemical Engineering 589, Civil Engineering 589, Electrical and Computer Engineering 589, Aerospace Engineering 589, and Mechanical Engineering 589.)
600 Doctoral Research and Dissertation (3-15) P/NP only. E
621 Analysis and Design of Thin Shell Structures (3) Geometry of surfaces, derivation of thin shell theory for arbitrary shell geometry; selected applications of theory in structural engineering. Prereq: 525 or Civil Engineering 561.
624 Viscoelasticity (3) Viscoelastic constitutive relations; isothermal boundary value problems; wave propagation in viscoelastic materials; stability problems; determination of viscoelastic properties. Prereq: 523 and 535 or Polymer Engineering 541.
625 Theory of Plasticity (3,3) Yield conditions; strain hardening; general constitutive equations; plastic potential; uniqueness theorems; extremum and variational principles. Problems in perfectly plastic solids; finite plastic deformations; piecewise linear plasticity. Applications. Prereq: 523.
634 Advanced Topics in Fluid Mechanics and Convective Heat Transfer (3) Convective momentum, heat and mass transfer; boundary layer analysis, stability, transition, turbulence, closure models. Navier-Stokes equations, closure procedures: time- and ensemble-average large scale structures; high speed flow, free turbulence; boundary layer and free shear flows. Applications. Prereq: 542, (Same as Aerospace Engineering 645.)
651-52 Advanced Topics in Computational Fluid Dynamics (3,3) Approximation theory; analysis of accuracy, convergence, and stability for smooth and nonsmooth solutions; shocks, artificial dissipation; two- and three-dimensional; compressible viscous and inviscid flows; potential flows and complete Navier-Stokes descriptions; modified subsonic supersonic flow codes; grid generation and finite element and finite difference constructions; finite element, finite difference, and finite volume methods; solutions of Navier-Stokes equations; applications to engineering and astrophysics; finite difference methods; solutions of conservation laws; applications to turbulence and combustion; finite element methods; applications to geometric design and computational fluid dynamics.
approximate factorization, flux vector splitting, finite volume; generalized coordinate and adaptive grids; steady flows including second-order turbulence closure. Thin layer and parabolic Navier-Stokes equations; multi-dimensional, turbulent and reacting flows. Computer project. Prereq: 552.

563-54 Advanced Topics in Finite Element Structural Analysis 3 credit hours. Mechanics: singularity solutions; non-linear constitutive problems, variable stiffness, initial strain and initial stress methods, plasticity, creep; upper and lower bound theory; geometrically non-linear problems, large deflection, stability; shell structures; analysis of accuracy, convergence; adaptive grids. Prereq: 553.

661 Advanced Photoelasticity (3) Scattered light three-dimensional photoelasticity, dynamic photoelasticity; photoplasticity and photoviscoelasticity; holographic photoelasticity. Recent developments. Prereq: 561. 2 hrs and 1 lab.

581 Advanced Topics in Engineering Mechanics (3) Advanced problems in mechanics, group or individually. Prereq. Consent of Instructor. May be repeated with consent of department.

English
(College of Liberal Arts)

MAJOR DEGREES

English............................ M.A., Ph.D.

Joseph B. Trahern, Head

Professors:
J. M. Armistead, Ph.D. Duke; E. W. Bratton (Associate Head), Ph.D. Illinois;
R. Y. Drake, Jr., Ph.D. Yale; A. R. Ensor, Ph.D. Indiana;
J. H. Fisher (John C. Hodges Professor), Ph.D. Pennsylvania; R. M. Kelly, Ph.D. Duke;
D. Leggitt, Ph.D. Florida; R. B. Miller, Ph.D.
W. Brown, A. R. Penner, Ph.D. Colorado;
J. E. Reese (Chancellor), Ph.D. Kentucky;
N. J. Sanders (Lindsay Young Professor), Ph.D. Shakespeare Institute, Stratford-upon-Avon;
D. Schneider (Alumni Distinguished Service Professor), Ph.D. Northwestern;

Associate Professors:
L. H. Burghardt, Ph.D. Chicago; D. A. Carroll, Ph.D. Northwestern; D. R. Cox, Ph.D. Missouri; B. K. Dumas, Ph.D. Arkansas; D. F. Goseke, Ph.D. Yale; N. M. Goseke, (Director of Graduate Studies). Ph.D. Yale;
J. E. Gill, Ph.D. North Carolina;
T. J. A. Heffernan, Ph.D. Cambridge;
M. Kallet, Ph.D. Rutgers; M. Keene, Ph.D. Texas; I. Leik, Ph.D. Illinois; M. A. Lofaro, Ph.D. Maryland; C. J. Malden, Ph.D. Michigan; M. P. Richards, Ph.D. Wisconsin;
F. K. Robinson, Ph.D. Texas.

Assistant Professors:
K. Adams, Ph.D. Florida State; L. D. Bensel, Ph.D. Oregon; D. L. Denniston, Ph.D. Brown; A. Dunn, Ph.D. Washington; J. K. Forte, Ph.D. Washington;
P. G. Hammond, Ph.D. Tennessee;
G. Hutchinson, Ph.D. Indiana; K. Riley, Ph.D. Maryland; Ph.D. Louisiana State; D. Samson, Ph.D. North Carolina; R. Stillman, Ph.D. Pennsylvania; R. Wallace, D.A. Illinois State; J. Zomchick, Ph.D. Columbia.

Visiting Lecturer:
W. Dykeman, B.A. Northwestern.

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

THE MASTER'S PROGRAM

1. A minimum of 24 semester hours in the Department of English beyond the B.A.
   a. Six hours.
   b. Twelve additional hours at the 500-600 level.
   (A student may apply only 3 hours of 593 - Independent Study - toward the M.A. in English.)
   c. Six hours for graduate credit at any level, including the 400 level.

In this course work, students must maintain at least a B average.

2. A thesis, for which 6 semester hours credit are given, will be written under the direction of a faculty member of the department and approved by him or her and two other members; or (non-thesis option) 6 hours of additional courses at the 500-600 level, making a total of 30 hours.

3. Evidence of proficiency in one foreign language, to be fulfilled in one of the following ways:
   a. The completion of a second year of a language college level with a grade of C or better.
   b. The completion of French 302 or German 332 at The University of Tennessee with a grade of B or better.
   c. The passing of the regular Ph.D. foreign language examination as currently administered at The University of Tennessee.

4. A final examination. A candidate presenting a thesis must pass a ninety-minute oral examination, consisting chiefly of questions covering the general history of English and American literature, not merely the courses he or she has taken; a reading list of primary works designed to help the student prepare for these questions is available in the office of the Director of Graduate Studies in English. A non-thesis student must pass a written examination. A candidate presenting a thesis must pass the oral examination, consisting of a short thesis defense, but chiefly of questions covering the general history and interpretation of English and American literature, not merely the courses which he or she has taken; a reading list of primary works designed to help the student prepare for these questions is available in the office of the Director of Graduate Studies in English.

Writing Concentration

The Master's with writing concentration is intended for those students who plan to do free-lance writing, specialize in teaching writing courses at the college level, or work as professionals in business or industry. Students who go on to complete the Ph.D. may also find the Master's with writing concentration helpful when they are seeking employment as professional writers in business or industry.

1. A minimum of 24 semester hours beyond the B.A.
   a. Six hours at the 600 level.
   b. Twelve additional hours at the 500-600 level. (A student may apply only 3 hours of 593 - Independent Study - toward the M.A. in English.)
   c. Six hours of graduate credit at any level, including the 400 level. (Note: Writing students may substitute two 400-level writing courses for two 500-level courses.)

In this course work, students must maintain at least a B average.

A student must take at least 9 hours in writing and 9 in literature, the remaining 6 to be selected from any English courses at the proper level. Of the course credits in writing at least 5 hours must be taken at the 500 level; additional 500-level courses are strongly recommended.

2. Students in the program may choose one of the following writing projects, each for six hours:
   a. A thesis, using research to analyze some aspect of writing or rhetorical theory. The nature and length of each project will be determined by the Director of Graduate Studies after consulting with the student and his or her project director. In addition to the director, two other English Department faculty members will supervise and approve the project; at least one should be drawn from the literature faculty.
   b. A creative project. A collection of poems or short stories, a short novel, a play, or a creative work of non-fiction prose are acceptable as creative projects. The nature and length of each project will be determined by the Director of Graduate Studies after consulting with the student and his or her project director. In addition to the director, two other English Department faculty members will supervise and approve the project; at least one should be drawn from the literature faculty.

3. Evidence of proficiency in one foreign language, to be fulfilled in one of the following ways:
   a. The completion of a second year of language at college level with a grade of C or better.
   b. The completion of French 302 or German 332 at The University of Tennessee with a grade of B or better.
   c. The passing of the regular Ph.D. foreign language examination currently administered at The University of Tennessee.

4. A final examination. A candidate presenting a thesis must pass a ninety-minute oral examination, consisting of a short thesis defense, but chiefly of questions covering the general history and interpretation of English and American literature, not merely the courses which he or she has taken; a reading list of primary works designed to help the student prepare for these questions is available in the office of the Director of Graduate Studies in English.

THE DOCTORAL PROGRAM

1. Completion of a program of study normally 6 full semesters - approved by the candidate's committee or the Director of
Graduate Studies in English. This program will include:

a. At least 57 semester hours beyond the B.A., divided as follows:
   (1) At least 24 semester hours at the 600 level.
   (2) At least 15 semester hours at the 500 level or above (a student may apply only 3 hours of 593 - Independent Study - toward the M.A. and 3 after the M.A.).
   (3) A special course in teaching composition.
(4) Fifteen additional hours at any level, including the 400 level. Up to six of these hours may be taken in some cognate field or fields such as history, philosophy, French, or some other related disciplines. These courses must be drawn from those approved for graduate credit.

In this course work, students must normally maintain a 3.5 average.

NOTE: Students who have taken the M.A. with a thesis at The University of Tennessee, Knoxville, may omit one 500-level course and one 600-level course. Upon recommendation of the department, other doctoral candidates may include M.A. thesis credits as part of the required course hours. If the student has an M.A. from another institution, he or she may normally transfer at least 24 hours, but the level of credit (400, 500, 500 level) for each course transferred will be determined by the Director of Graduate Studies in English after the student has entered the doctoral program.

b. Twenty-four semester hours of dissertation. These represent the research for and writing of the dissertation. It will be directed by a faculty member of the department and approved by him or her and three or four other faculty members, including one from a field other than English. NOTE: Once a student has completed course work and foreign languages, he or she normally registers for English 600. Once a student does register for it, however, he or she must continue to do so, including the summer term, unless granted a leave of absence from The Graduate School. Such leaves are considered at the recommendation of the Director of Graduate Studies in English.

c. Successful completion of a language requirement in one of the following ways:
   (1) Two languages approved by the Director of Graduate Studies. The requirement for each language may be fulfilled in any of the following ways:
      (a) Completion of French 302 or German 332 with a grade of B or better.
      (b) Completion at The University of Tennessee of any two courses on the 300 level, or above, in the foreign language or literature with at least a grade of B in each course.
   (c) The passing of the regular Ph.D. foreign language examination as currently administered at The University of Tennessee.
   (2) One modern language approved by the Director of Graduate Studies in English. This requirement must be fulfilled in the following way: a passing mark on the language examination given by The University of Tennessee and completion of two courses given in the foreign language at the 400 level or above, one course at least to be at the 500 or 600 level. A minimum grade of B must be received in each course.
   (3) One modern language approved by the Director of Graduate Studies in English and intense study of the English language. This requirement must be fulfilled in the following way: completion of a, b, c in option 1 for one foreign language; completion of 6 semester hours in English language courses with grades of B or better, at least three of which must be from English 508 or 509, History of the English Language. For the other 3 hours, the student may either complete the history of the language sequence or choose one other course in language taught in the sequence or choose one other course in language taught in the Department of English at the 500 or 600 level and approved by the Director of Graduate Studies in English. These courses will not count toward the minimum number of courses for the Ph.D., and anyone electing this language option may not take the Ph.D. linguistics examination.
   d. Successful completion of several written comprehensive examinations divided as the department directs; see the English Department Graduate Studies brochures. The comprehensive examinations are given twice a year, normally in February and September. Before a student may begin to take them, he or she must have completed nearly all the course work required. A student must have met requirements for at least one of the foreign languages before beginning to take these comprehensive examinations; he or she must complete all language requirements before completing the examinations. Normal grading is P or F; an unusually fine examination may receive a grade of Distinction.
   e. A one-hour examination on the dissertation and other related areas.
   2. Teaching two courses under the supervision of a faculty member of the department.
   3. Residency for 2 consecutive semesters as a full-time student. For students not on teaching assistantships, full-time employment consists of 9 or more hours of course work or dissertation hours each semester. For students on assistantships, full-time employment consists of at least 6 hours of courses or dissertation hours and 3 hours of teaching each semester.

401 Medieval Literature (3) Reading and analysis of selected medieval literary masterpieces in modern English.

402 Chaucer (3) Reading and analysis of Canterbury Tales and Troilus and Criseyde in Middle English.

404 Shakespeare I: Early Plays (3) Shakespeare’s dramatic achievement before 1601. Reading and discussion of selected plays from romantic comedies, including Twelfth Night; English histories, including Henry IV; and early tragedies, including Hamlet.

405 Shakespeare II: Later Plays (3) Shakespeare’s dramatic achievement between 1601 and 1613. Reading and discussion of selected plays from great tragedies, including Othello; problem plays, including Measure for Measure, and dramatic romances, including The Tempest.

406 Renaissance Drama (3) English theatre between 1590 and 1640 through reading of representative plays by Shakespeare’s contemporaries: Marlowe, Webster, Jonson.

409 Spenser and his Contemporaries (3) Principal achievements in prose and poetry of sixteenth-century authors; Spenser, Wyatt, Marlowe, More, Sidney, and Bacon.

410 Milton, Donne and their Contemporaries (3) Principal achievements in prose and poetry of first two-thirds of seventeenth century; poetry of Milton, Donne, Marvell; and prose of Browne, Bacon, Walton.

411 Restoration and Eighteenth-Century Poetry and Prose (3) Dryden, Swift, Pope, Johnson, and their contemporaries; major works: Mac Flecknoe, Rape of the Lock, Gulliver’s Travels, and Rasselas.

412 British Drama from 1660 to 1800 (3) Playwrights from Dryden and Wycherley to Goldsmith and Sheridan; formal developments: heroic play, cynical comedy, affective tragedy, and exemplary drama.

413 The Eighteenth-Century British Novel (3) Defoe to Austen.

414 Romantic Poetry and Prose I (3) Wordsworth, Coleridge, and Blake; readings from Lamb, De Quincey, and other prose writers.

415 Romantic Poetry and Prose II (3) Keats, Shelley and Byron; readings from Hazlitt, Peacock, and other prose writers.

416 Victorian Poetry and Prose I (3) Tennyson, P-Raphaelæs, Carlyle, Newman, and Mill.

419 Victorian Poetry and Prose II (3) Browning, Arnold, Hopkins, Hardy, Ruskins, Darwin, and Wilde.

420 The Nineteenth-Century British Novel (3) Scott to Hardy.

421 Modern British Novel (3) Lawrence, Joyce, and Woolf.

422 Women Writers in England (3) Literary consciousness and works of British women writers in nineteenth and twentieth centuries. (Same as Women’s Studies 422.)

431 Colonial, Federal, and Early National American Literature (3)

432 American Romanticism and Transcendentalism (3)

433 American Realism and Naturalism (3)

434 Modern American Literature (3) World War I to present.

435 American Novel before 1900 (3) From earliest sentimental novels through Brown and Cooper, and major figures to 1900: Hawthorne, Melville, Stowe, Clemens, and James.


441 Southern Literature (3) Southern writing from colonial period into twentieth century: frontier humorists, local color writers, and Southern literary renaissance.

442 American Humor (3) Early nineteenth century into twentieth century: Mark Twain.

443 Topics in Black Literature (3) Contents vary: particular genres, authors, or theories from 1845 to present: Langston Hughes and Harlem Renaissance, Richard Wright and Gwendolyn Brooks, writing by Black women, international Black literature in English, and Black American autobiography.

451 Modern British and American Poetry (3) From Yeats and Frost to Auden, Stevens, and more recent poets.

452 Modern British and American Drama (3) O’Neill’s works as precursors to modern dramatists: Williams,
484 Special Topics in Writing (3) Admission by consent of department.
489 Senior Honors II (3) Admission by consent of department.

500 Thesis (1-15) P/NP only. E
502 Registration for Use of Facilities (3-15) Required for the student not otherwise registered during any semester when student uses University facilities and/or spends one or more academic days on service before degree is completed. May not be used toward degree requirements. May be repeated. S/NC only. E
505 Teaching Freshman Composition (3) Introduction to teaching Freshman English through study of various techniques and philosophies of composition. Required of all first-year teaching assistants.

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

507 Applied Criticism: The Rhetoric of Literary Forms (3) Study and application of ways in which major critics have analyzed form in poetry and prose fiction.

508 History of the English Language I (3) Historical and theoretical focus. Large-scale units: tribes, nations, social groups. Prereq: 458 and 459, or consent of instructor.

513-14 Readings in Medieval Literature (3,3) Reading and analysis of selected masterpieces of Old and Middle English literature and their Continental sources in Modern English.

520-21 Readings and Analysis in Selected Areas of Restoration and Eighteenth-Century Poetry, Prose, and Drama (3,3) Content varies: genre, theme, literary movement, or other coherent emphasis.

530-31 Readings in English Literature of the Restoration and Eighteenth Century (3,3) Topics vary. Genres, poetry, prose, fiction, drama; or period: Restoration, earlier eighteenth century, later eighteenth century.

540-41 Readings in English Literature of the Nineteenth Century I and II (3,3) Content varies: genre, theme literary movement, or other coherent emphasis.

550-51 Readings in American Literature from the Colonial Period to the Present (3,3) Content varies: genre, theme literary movement, or other coherent emphasis.

552 Readings in Black American Literature (3) Content varies: genre, theme literary movement, or other coherent emphasis.

560-61 Readings in Twentieth-Century Literature (3,3) Content varies: genre, theme literary movement, or other coherent emphasis.

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

581 Colloquium in Poetry Writing (3) Major poetic project or continuation of project begun in 483. Individual consultation with instructor supplements class analysis, readings in contemporary poetry and theory. Prereq: 483 or consent of instructor.

582 Special Topics in Writing (1-3) Topics vary. May be repeated. Maximum 6 hrs. Enrollment by consent of director of graduate studies only.

583 Analysis of Technical Writing (3) Theory and practice of technical writing. Exploration of current theories of economic, business, technical, academic, and government rhetoric. Analysis of shared elements and practice in producing such writing. Prereq: 490 or consent of instructor.

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

590 Topics in Critical Theory (3) Topics vary.

591 Foreign Study (1-15) See page 31.

592 Off-Campus Study (1-15) See page 31.

593 Independent Study (1-15) See page 31.

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

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

610 Studies in Old English Language and Literature (3) Old English grammar with readings in prose and poetry.

611 Studies in Beowulf (3) Translation and critical study of Beowulf. Prereq: English 610 or consent of instructor.

620 Studies in Medieval English Literature (3) Seminar in literature and literary genres of Medieval English literature, read in Old and Middle English. Subject matter varies from year to year.

621 Studies in Chaucer (3) Seminar in text, interpretation, and criticism of Chaucer's writings. Prereq: Previous course in Chaucer.


650 Studies in English Romanticism (3) Seminar content varies: particular literary figure or figures, genres, theme, or other coherent focus.

651-52 Studies in Victorian Literature (3,3) Seminar content varies: particular literary figure or figures, genres, theme, or other coherent focus.

660-61-62 Studies in American Literature (3,3,3) Southem literature before 1830, frontier, regionalism, women's literature, Irving, Cooper, Poe, Emerson, Thoreau, Hawthorne, Melville, Whittman, Dickinson, James, and Twain.

670-71-72 Studies in Twentieth-Century Literature (3,3,3) Seminar content varies: particular literary figure or figures, genres, theme, or other coherent focus.

680 Topics in English Language (3) May be repeated with consent of director of graduate studies. Maximum 9 hrs.

690 Special Topics (3) Content varies. History of ideas, humor, biography, autobiography, extra-literary disciplines.

Entomology and Plant Pathology (College of Agriculture)

MAJOR

Entomology and Plant Pathology

DEGREE

Carroll J. Southards, Head

Professors:
E. C. Bernard, Ph.D. Georgia; R. R. Gerhardt, Ph.D. North Carolina State; J. W. Hilty, Ph.D. Ohio State; L. F. Johnson, Ph.D. Louisiana State; P. L. Lambdin, Ph.D. Virginia Polytechnic Institute; C. D. Piess, Ph.D.
The Department of Entomology and Plant Pathology offers a graduate program leading to the Master of Science with a concentration in entomology or plant pathology. Students may specialize in crop entomology, medical and veterinary entomology, insect ecology, insect pest management, or biological control. Students in plant pathology may specialize in fungal, bacterial, and viral diseases, soil-borne diseases, plant nematology, or virology. For specific information, contact the department head.

ADMISSION REQUIREMENTS
For admission to the M.S. degree program, a student must meet all requirements of The University of Tennessee Graduate School and must have completed (1) general botany or biology, 8 hours; (2) advanced biological sciences, 8 hours; (3) general inorganic chemistry, 6-8 hours; (4) organic chemistry, 3 hours. In addition, three completed rating forms and a written statement of career goals and interest in entomology or plant pathology are required.

DEGREE REQUIREMENTS
The program requires a written thesis based on original research and the completion of a minimum of 24 hours of course work for graduate credit, approved by the student's advisory committee. Included in the course requirements are two acceptable seminar presentations for 1 hour each. An oral final exam must be completed to the satisfaction of the advisory committee after the thesis has been completed. A minor is not required but may be selected at the option of the student. The minor will include at least 6 hours and not more than 10 hours of graduate-level credit in the minor department. The student's committee shall include a member of the faculty from the minor department to assist in designing courses required for the minor.

Environmental Practice
(College of Veterinary Medicine)

MAJOR
Veterinary Medicine .................................. D.V.M.

J.B. Jones, Head

Professors:

Associate Professors:

Assistant Professors:

Instructors:
R. S. Funk, D.V.M. Ohio State; P. J. Morris, D.V.M. California (Davis).

See Veterinary Medicine for program description.

PROFESSIONAL COURSES

861 Pharmacology (4) Principles of pharmacokinetcs and pharmacodynamic properties of veterinary drugs: mode of action, pharmacologic effects, chemical and physical properties, metabolism, toxicities, important idiosyncrasies and clinical application.

865 Clinical Rotation in Environmental Practice (2) Clinical training in avian medicine, laboratory animal and zoo animal medicine, epidemiology, public health, and other related disciplines.

857 Special Problems in Environmental Practice (1-8) Extramural and specially designed study for students interested in select topics in avian medicine, laboratory animal medicine, zoo animal medicine, epidemiology, public health, pharmacology or toxicology.

GRADUATE COURSES

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

502 Registration for Use of Facilities (3-15) Required for the student not otherwise registered during any semester when 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

510 Plant Disease Fungi (4) Morphology, taxonomy, biology, and genetics of plant pathogenic fungi. Isolation and identification of pathogenic fungi. Prereq: 313 or consent of instructor. 2 hrs and 2 labs. F, A

511 Plant Disease Diagnosis (3) Diagnosis of plant diseases, disease symptoms, causal agents and control measures. Prereq: 510 or consent of instructor. 1 hr and 2 labs. Su, A

512 Soil-Borne Plant Diseases (3) Causal agents, host-parasite-soil environment interactions, epidemiology, and control of soil-borne plant diseases. Prereq: 313, 2 hrs and 1 lab. F, A

520 Plant Parasitic Nematodes (4) Morphology, physiology, taxonomy, ecology, and management of plant parasitic nematodes, host-parasite relationships. Prereq: 6 hrs biological science or consent of instructor. 2 hrs and 2 labs. Sp, A

521 Plant Virology (3) Symptomatology, epidemiology, and management of virus infection: structure, morphology, replication, transmission, purification, characterization, and classification of plant viruses; serology; plant pathogenic viroids, virocaps, and virospermas. Prereq: 313 or consent of instructor. 2 hrs and 1 lab. F, A

525 Medical and Veterinary Entomology (3) Morphology, taxonomy, biology and control of arthropod parasites and vectors of pathogens of humans and animals. Ecology and behavior of vectors in relation to pathogen transmission and control. Prereq: 321 or 325, or Zoology 380, or consent of instructor. 2 hrs and 1 lab. Sp, A

530 Integrated Pest Management (3) Principles and application of biological, cultural, genetic, behavioral, and chemical methods of control to maintain pest populations below economic threshold levels. Prereq: 321, or consent of instructor. (Same as Plant and Soil Science 330.) F, A

531 Special Problems in Entomology (1-3) Comprehensive individual study of current problems. May be repeated. Maximum 6 hrs. E

532 Special Problems in Plant Pathology (1-4) Comprehensive individual study of current problems. May be repeated. Maximum 6 hrs. E

533 Concentrated Study in Entomology (1-3) Selected subjects in entomology for advanced students, concentrated in time and subject matter. Prereq: 321 or basic entomology course. May be repeated. Maximum 6 hrs. F, Sp

541 Seminar (1) Review of literature and current research in entomology and plant pathology. May be repeated. Maximum 3 hrs. E

561 Pharmacology (4) Principles of pharmacokinetics and pharmacodynamics properties of drugs: mode of action, pharmacologic effects, chemical and physical properties, metabolism, toxicities, important idiosyncrasies and clinical applications. Prereq: Consent of instructor. F

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

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

Finance
(College of Business Administration)

MAJOR
Business Administration .................. MBA, Ph.D.

H. A. Black, Head

Professors:
H. A. Black, Ph.D. Ohio State; W. W. Dotterweich (Wm. Voigt Professor of Insurance), Ph.D. Pennsylvania; W. C. Goolsby, Ph.D. Wisconsin (Milwaukee); G. C. Philippios (Distinguished Chaired Professor of Banking and Finance), Ph.D. New York; R. E. Shrivees (Faculty Scholar), Ph.D. California (Los Angeles).

Associate Professors:
A. L. Auxier, Ph.D. Iowa; T. P. Boehm, Ph.D. Washington (St. Louis); R. J. Clayton, Ph.D. Georgia; J. M. Wachowicz, Jr., Ph.D. Illinois (Champaign-Urbana), C.P.A.

Assistant Professors:
M. C. Ehhardt, Ph.D. Georgia Institute of
Food Technology and Science/Fields of Instruction

Food Technology and Science (College of Agriculture)

MAJOR DEGREES

Food Technology and Science .... M.S., Ph.D.
Hugh O. Jaynes, Head

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

Associate Professors:
P. M. Davidson, Ph.D. Washington State; B. J. Demott, Ph.D. Michigan State; F. A. Draughon, Ph.D. Georgia; H. D. Loveday, Ph.D. Kansas State; J. R. Mount, Ph.D. Ohio State; M. J. Riemann, Ph.D. Kansas State.

Assistant Professors:

The Department of Food Technology and Science offers the Master of Science and Doctor of Philosophy degrees. Students in the doctoral program may choose research in the concentration area of food products, food chemistry, food microbiology, or sensory evaluation of foods. Course work may be emphasized in any of the areas by careful selection of courses and the research topic. Minors are available in cognate fields.

Graduate School rating forms or letters of recommendation from at least three people are required. Respondents should be familiar with the applicant's scholastic ability and professional potential.

THE MASTER'S PROGRAM
1. Applicants must have a B.S. in food technology, food science, or a related agricultural or scientific discipline.
2. A thesis is required for the Master's program. Prior to research for the thesis, the student must develop a detailed written research plan. Registration for a minimum of 6 hours of 500 Thesis is required.
3. In addition to the thesis requirement, a minimum of 24 semester hours of graduate course work is required. This work must be approved by the student's committee and a minimum of 14 hours must be courses numbered above 600. The committee may require additional course work if the student's progress or background indicates such need.
4. All students are required to include 2 hours of 501 Seminar in their program and are expected to attend this course and participate in discussions during their Master's program. Completion of 510 or equivalent is also required.
5. An oral examination covering the thesis and course work is required.

THE DOCTORAL PROGRAM
1. Completion of a Master's degree in the field, or a closely related field, or passing a special qualifying examination is required for admission. Scores on the GRE aptitude test are also required.
2. A dissertation is required for the Ph.D. Each student must develop a detailed written plan for the dissertation research.
3. A minimum of 72 hours beyond the Bachelor's degree, excluding credit for the Master's thesis, is required. Of this, 24 semester hours must be 600 Doctoral Research and Dissertation.
4. At least 24 hours of course work numbered above 500 are required exclusive of doctoral research and dissertation. At least 6 of the 24 hours must be courses numbered above 690.
5. A minimum of 6 hours of courses for graduate credit must be taken outside the Department of Food Technology and Science.
6. All candidates will complete the following courses or their equivalent: 510, 521, 540, Animal Science 571, 572, and Nutrition and Food Sciences 511. All candidates must complete 601 and 640 and are expected to attend 601 during their Ph.D. program.
7. Each candidate must pass both written and oral comprehensive examinations prior to admission to candidacy. A final oral examination is required that includes a defense of the dissertation and subject matter that the student's committee considers appropriate.

410 Food Chemistry I (3) Reactions of proteins, enzymes, and additives in foods. Physicochemical interactions of food materials. Prereq: Chemistry 110 or equivalent. 2 hrs and 1 lab. F
411 Food Chemistry II (3) Reactions of inorganic compounds, carbohydrates and vitamins in foods. Prereq: Chemistry 110 or equivalent. 2 hrs and 1 lab. Sp
420 Food Microbiology (3) Physical, chemical and environmental factors moderating growth and survival of foodborne microorganisms, pathogenic and spoilage microorganisms affecting quality of foods and their control. Prereq: Microbiology 210. Coreq: 429. F


430 Sensory Evaluation of Food (3) Principles and methods of sensory evaluation of foods. Prereq: Basic statistics. 2 hrs and 1 lab. Sp

440 Preservation of Food (3) Prevention of deterioration and spoilage of foods. Methods of preservation. Prereq: Agricultural Engineering Technology 422. 2 hrs and 1 lab. Sp

450 Dairy Products I (3) Procurement, processing and distribution of fluid milk. Manufacture of butter, frozen and condensed dairy products. Prereq: 140 or consent of instructor. 2 hrs and 1 lab. F

451 Dairy Products II (3) Manufacture of cheese and specialized dairy products. Market standards and grades, product defects, scoring of dairy products. Prereq: 144 or consent of instructor. 1 hr and 2 labs. F

460 Meat Products Technology (4) Processing methods for making cured, smoked, fresh, flaked and formed products. Effect of processing methods on product characteristics. Prereq: 350 or consent of instructor. 3 hrs and 1 lab. F

470 Food Crop Products (3) Food products from plants; types, manufacturing systems, quality attributes and utility. Prereq: 3 hrs biological science. 2 hrs and 1 lab. Sp, A

480 Cereal Science and Bakery Products (3) Chemistry and technology of processing cereal grains, interactions of ingredients during production and storage of baked products. Prereq: 410 or 411 or equivalent. 2 hrs and 1 lab. F, A

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

501 Seminar (1) Individual reports and discussion on topics from current literature. May be repeated. Maximum 3 hrs. E

502 Registration for Use of Facilities (1-15) P/NP only. E

510 Instrumental Analysis of Food (3) Modern instrumental methods for control of food properties; texture, instrumental methods for control of food properties; texture, flavor and color characteristics. Prereq: 440, 510, 511 or consent of instructor. Sp, A

511 Color and Flavor of Foods (3) Chemical basis, measurement, and reactions involved in color and flavor changes in foods. Manufacture and application of materials used to modify color and flavor. Prereq: 410-11. 2 hrs and 1 lab. F

512 Food and Industrial Fermentations (3) Microbiology, biochemistry and technology of food-related fermentations involving dairy products, meat, cereals, fruits and vegetables. Production of food ingredients and by-product utilization. Prereq: 420-29, 440, Biochemistry 410 or equivalent. 2 hrs and 1 lab. Sp, A

521 Advanced Food Microbiology (3) Microorganisms in foods, their identification, characterization and relationship to food processing. Isolation of microorganisms from foods and plant equipment. Prereq: 420-29, 2 hrs and 2 labs. Sp

540 Food Product Development (3) Art, science and technology of developing and marketing new food products. Prereq: 440. 2 hrs and 1 lab. F

560 Advanced Meat Science (3) Physical and chemical changes that occur in conversion of muscle to meat and their postmortem treatments to achieve meat quality, composition and palatability; packaging, preservation and quality control. Prereq: 460. 2 hrs and 1 lab. Sp

580 Oilseed Products (3) Chemistry and technology of foods and food ingredients produced from oilseeds. Prereq: 410-11 or equivalent. 2 hrs and 1 lab. Sp, A

590 Special Topics in Food Technology and Science (1) Critical reviews of current research and production concerns of food industry. May be repeated. Maximum 3 hrs. F, Sp

593 Directed Studies (1-3) Research on non-thesis topics chosen by student and major professor. Supervised experience in food industry or governmental laboratories. May be repeated. Maximum 5 hrs. E

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

601 Seminar (1) Reports and directed discussion on research topics from current literature. May be repeated. Maximum 3 hrs. F, Sp

620 Food Toxicology (2) Basic and applied concepts in food toxicology; toxicological aspects of processed foods. Mode of action, prevention and control of food toxicants. Prereq: 410-11, 521 or consent of instructor. Sp, A

640 Advanced Food Processing (3) Role of processing treatments in modification of food properties; texture, flavor and color characteristics. Prereq: 440, 510, 511 or consent of instructor. Sp, A

Forestry, Wildlife and Fisheries (College of Agriculture)

MAJORS

FORESTRY

MAJORS

FORESTRY

DEGREES

M.S.

FORESTRY

Fishing Science

M.S.

Wildlife and Fisheries Science

Professors:

J. W. Barrett (Emeritus), Ph.D. Syracuse; E. R. Buckner, Ph.D. North Carolina State; J. L. Byford, Ph.D. Auburn; H. A. Core (Emeritus), Ph.D. Syracuse; R. W. Dimmick, Ph.D. Wyoming; W. E. Hammitt, Ph.D. Michigan; R. L. Little, Ph.D. North Carolina State;

C. E. McGee (Adjunct), D. F. Duke;

D. M. Ostermeier, Ph.D. Syracuse; M. R. Pelton, Ph.D. Georgia; T. H. Ripley (Adjunct), Ph.D. Virginia Polytechnic Institute;


Associate Professors:

B. L. Dearden, Ph.D. Colorado State;


Assistant Professors:

G. M. Hopper, Ph.D. Virginia Polytechnic Institute; S. E. Schlarbaum, Ph.D. Colorado State; P. M. Winstorfer, Ph.D. Colorado State.

Graduate study leading to the Master of Science with majors in Forestry and in Wildlife and Fisheries Science is offered by the Department of Forestry, Wildlife and Fisheries. The Master of Business Administration, with a concentration in forest industries management, is available for qualified students. This degree program is offered by the College of Business Administration with participation by the Department of Forestry, Wildlife and Fisheries. The Doctor of Philosophy with a specialization in forest biology, wildlife science, or fisheries science can be achieved within the University's Intercollegiate Graduate Program in Ecology.

THE MASTER'S PROGRAMS

Both thesis and non-thesis options are available for the major in Forestry; a thesis is required in Wildlife and Fisheries Science. For admission, the student must have a Bachelor's degree from an accredited institution in forestry, wildlife, fisheries, or other natural resource area. Applicants must also have taken the general Graduate Record Examination (GRE). Graduate School rating forms or letters of recommendation from three individuals familiar with the applicant's academic ability are required. The department also has an application that must be submitted at the time of application to The Graduate School.

Thesis Option

1. Prior to research for the thesis, the student is required to develop a detailed written research proposal. This proposal should include a minimum of 6 hours of Thesis (Forestry 500 or Wildlife and Fisheries Science 500) is required.

2. A graduate committee of no fewer than 3 faculty members must be selected by the second semester of residence. At least one member shall be from outside the department. In addition to the thesis requirement, a minimum of 24 hours of graduate course work is required. This work must be approved by the student's committee and no more than 10 hours of the minimum 30 can be below the 500 level. The committee may require additional course work if the student's progress or background indicates such need.

3. All students are required to include Forestry 512 or Wildlife and Fisheries 512 in seminar in their programs. This is required of each graduate student in residence fall semester.

4. An oral examination covering the thesis and course work is required.

Non-Thesis Option (Forestry only)

1. Thirty-five hours of graduate course work of which 23 must be at the 500 level or above is required.

2. A graduate committee of no fewer than 3 faculty members will be selected. At least one member shall be from outside the department. The committee will meet and schedule the student's program during the second semester of residence. At least one member shall be from outside the department. A minimum of 10 hours of the minimum 30 can be below the 500 level. The committee may require additional course work if the student's progress or background indicates such need.

3. Three hours of Forestry 511 are required.

4. Nine hours of course work in the department must be at the 500 level or above, exclusive of Forestry 511.

5. Final comprehensive written and oral examinations shall be taken upon completion of no fewer than 28 hours of approved study.
555 Forest Recreation Research Methods

556 Industrial Forestry I (3)

560 Industrial Forestry II (3)

565 Industrial Forestry III (3)

570 Management & Policy of Forest Resource Organization

580 Advanced Silviculture

581 Cytogenetics

585 Advanced Forest Biometry

590 Predator Ecology

595 Independent Study in Forestry

593 Independent Study in Wildlife and Fisheries Science

596 Wildlife and Fisheries Science

WILDLIFE AND FISHERIES SCIENCE

441 Wildlife and Fisheries Techniques (3)

443 Fisheries Science (3)

444 Ecology and Management of Wild Mammals (3)

445 Ecology and Management of Wild Birds (3)

446 Ecology and Management of Wild Mammals (3)

447 Ecology and Management of Wild Birds (3)

448 Ecology and Management of Wild Mammals (3)

449 Ecology and Management of Wild Birds (3)

450 Genetics in Forestry (3)

451 Forest Recreation Research Methods (3)

452 Forest and Wildland Resource Economics (3)

453 Wood Composites and Gluing (3)

454 Measurement and Marketing of Wood Products (3)

455 Solid Wood Processing (3)

456 Measurement and Marketing of Wood Products (3)

500 Thesis (1-15)

502 Registration for Use of Facilities (3-15)

503 Wildlife Diseases

504 Predator Ecology

505 Fish Physiology

506 Management & Policy of Forest Resource Organization

507 Management & Policy of Forest Resource Organization

508 Advanced Silviculture

509 Independent Study in Forestry

510 Advanced Forest Resource Management

511 Problem Analysis in Forest Resources

512 Seminar

513 Seminar in Forest Resources

514 Seminar in Forest Resources

515 Seminar in Forest Resources

516 Seminar in Forest Resources

517 Seminar in Forest Resources

518 Seminar in Forest Resources

519 Seminar in Forest Resources

520 Advanced Forest Tree Biology

521 Forest and Wildland Resource Economics

522 Forest and Wildland Resource Policy

523 Forest Recreation Planning and Management

524 Forest and Wildland Resource Policy (3)

525 Forest Recreation Planning and Management

526 Forest Recreation Planning and Management

527 Forest Recreation Planning and Management

528 Forest Recreation Planning and Management

529 Forest Recreation Planning and Management

530 Advanced Forest Resource Management

531 Forest and Wildland Resource Economics

532 Forest and Wildland Resource Policy

533 Forest Recreation Planning and Management

534 Forest Recreation Planning and Management

535 Forest Recreation Planning and Management

536 Forest Recreation Planning and Management

537 Forest Recreation Planning and Management

538 Forest Recreation Planning and Management

539 Forest Recreation Planning and Management

540 Predator Ecology

541 Wildlife Disease

542 Forest and Wildland Resource Economics

543 Forest and Wildland Resource Policy

544 Forest Recreation Planning and Management

545 Forest Recreation Planning and Management

546 Forest Recreation Planning and Management

547 Forest Recreation Planning and Management

548 Forest Recreation Planning and Management

549 Forest Recreation Planning and Management

550 Forest Recreation Planning and Management

551 Problem Analysis in Forest Resources

552 Registration for Use of Facilities

553 Wildlife Diseases

554 Predator Ecology

555 Fish Physiology

556 Management & Policy of Forest Resource Organization

557 Management & Policy of Forest Resource Organization

558 Advanced Silviculture

559 Independent Study in Forestry

560 Industrial Forestry I

561 Industrial Forestry II

562 Industrial Forestry III

563 Management & Policy of Forest Resource Organization

564 Advanced Silviculture

565 Cytogenetics

566 Advanced Forest Biometry

567 Predator Ecology

568 Fish Physiology

569 Independent Study in Forestry

570 Management & Policy of Forest Resource Organization

571 Problem Analysis in Forest Resources

572 Seminar

573 Seminar in Forest Resources

574 Seminar in Forest Resources

575 Seminar in Forest Resources

576 Seminar in Forest Resources

577 Seminar in Forest Resources

578 Seminar in Forest Resources

579 Seminar in Forest Resources

580 Advanced Forest Tree Biology

581 Forest and Wildland Resource Economics

582 Forest and Wildland Resource Policy

583 Forest Recreation Planning and Management

584 Forest Recreation Planning and Management

585 Advanced Forest Biometry

586 Forest and Wildland Resource Economics

587 Forest and Wildland Resource Policy

588 Forest Recreation Planning and Management

589 Forest Recreation Planning and Management

590 Predator Ecology

591 Wildlife Diseases

592 Forest and Wildland Resource Economics

593 Forest and Wildland Resource Policy

594 Forest Recreation Planning and Management

595 Independent Study in Forestry

596 Wildlife and Fisheries Science

597 Wildlife and Fisheries Science

598 Wildlife and Fisheries Science

599 Wildlife and Fisheries Science

600 Wildlife and Fisheries Science

601 Wildlife and Fisheries Science

602 Wildlife and Fisheries Science

603 Wildlife and Fisheries Science

604 Wildlife and Fisheries Science

605 Wildlife and Fisheries Science

606 Wildlife and Fisheries Science

607 Wildlife and Fisheries Science

608 Wildlife and Fisheries Science

609 Wildlife and Fisheries Science

610 Wildlife and Fisheries Science

611 Wildlife and Fisheries Science
Assistant Professor: T. J. Blasing (Adjunct), Ph.D. Wisconsin.

The department offers the Master of Science and Doctor of Philosophy degrees. The Master of Science includes 301 (at least 12 credits of instruction) and 12-hr lab. Graduate concentration and Doctor of Philosophy degrees. The T. J. Biasing (Adjunct), Ph.D. Wisconsin.

to design, compilation, and reproduction of maps and other graphics. Prereq: 310 or consent of instructor. 2 hrs and 1-2 hr lab.

413 Remote Sensing: Types and Applications (3) Principles and uses of remote sensing imagery, digital data, and spectral data. Remote sensing and mapping techniques. Prereq: 310 or consent of instructor.

415 Quantitative Methods in Geography (3) Geographical application of statistical techniques, point pattern analysis, and analysis of areal units. Prereq: Mathematics 115 or two semesters of calculus or consent of instructor.

421 Geography of Folk Societies (3) Geographical study of folk culture, traditional material culture and rural settlement patterns, examples from eastern North America and selected foreign areas. Prereq: 101-02 or 320 or consent of instructor.

425 Historical Geography of the United States (3) Survey of changing human geography of United States during four centuries of settlement and development. Changing population patterns, development of agricultural regions, and patterns of urban-industrial development. Prereq: 361 or consent of instructor.

433 The Land-Surface System (3) Nature and regional variations in relationships among surface form, water, vegetation, and surface materials. People as evaluators and agents of change. Prereq: 131-32 or 330 or consent of instructor.

434 Climatology (3) Overview of general circulation system leading to world pattern of climates. Climatic change and modification, and interrelationships of climate and human activity. Prereq: 131-32 or 330 or 334 or consent of instructor.

441 Urban Geography (3) Concepts and theories concerning development and significance of systems of cities and urban morphology. Prereq: 101-02 or 141 or 340 or consent of instructor. (Same as Urban Studies 441.)

443 Rural Geography (3) Geographical appraisal of rural areas of United States: small towns and urban fringes. Problems and potentials of rural America. Prereq: 101-02 or 141 or 340 or consent of instructor.

445 Geography of Resources (3) Study of factors related to variations in resource availability from time to time and place to place; energy and metallic resources. Prereq: 101-02 or 141 or 340 or consent of instructor.

449 Geography of Transportation (3) Examination of transportation systems, their effects on trade patterns, land use, location problems, and development. Prereq: 141 or 340 or consent of instructor.

450 Process Geomorphology (3) (Same as Geology 450.)

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

501 Colloquium in Geography (1) Discussion of departmental research, current research literature, and general topics. Registration required of resident graduate students whenever offered. May be repeated. Maximum 4 hrs. May be applied toward graduate degree. S/NC only.

502 Registration for Use of Facilities (3-15) Required for the student not otherwise registered during any semester when 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

503 Introduction to Geographical Research (3) Aims of geographical research; survey of printed source materials; practice in effective presentation of research findings.

504 Research Design (3) Development of research problems, preparation of appropriate study designs, and practical field application. Prereq: 503 or consent of instructor.

505 Directed Research (2-6) Research on problems as defined by individual students. Prereq: Written consent of instructor and department prior to registration. May be repeated with consent of instructor. Maximum 9 hrs. S/NC only.

560 Directed Readings (2-6) Readings on topics of interest as defined by individual students. Prereq: Written consent of instructor and department prior to registration. May be repeated with consent of instructor. Maximum 9 hrs. S/NC only.

569 Geographic Concept and Method (3) Traditional and emerging geographic techniques: readings on natural geography, problems, and methods of geography. Prereq: Consent of instructor.

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

625 Seminar in Historical Geography (3) Prereq: 525 or consent of instructor. May be repeated. Maximum 6 hrs.
and GRE scores, including the subject exam transcripts of previous university work, two Geology. Persons interested in these pro-

California Institute of Technology; T. W. Broadhead, Ph.D. Iowa; D. W. Byerly, Associate Professors: J. G. Walls (Emeritus), Ph.D. North Carolina.

Associate Professors: T. W. Broadhead, Ph.D. Iowa; D. W. Byerly, Ph.D. Tennessee; H. J. Klepser (Emeritus), Ph.D. Ohio State; O. C. Kopp, Ph.D. Columbia; R. E. McLaughlin (Emeritus), Ph.D. Tennessee; K. C. Misra, Ph.D. Western Ontario; L. A. Taylor, Ph.D. Lehigh; K. R. Walker (Carden Professor), Ph.D. Yale; J. G. Walls (Emeritus), Ph.D. North Carolina.

Assistant Professor: R. W. Arnseth, Ph.D. Northwestern; P. A. Delcourt, Ph.D. Minnesota; S. G. Driese, Ph.D. California Institute of Technology; H. Y. McSween, Ph.D. Harvard; R. T. Williams II, Ph.D. Virginia Polytechnic Institute.

The Department of Geological Sciences offers both the M.S. and Ph.D. degrees in Geology. Persons interested in these pro-

The Department of Geological Sciences offers both the M.S. and Ph.D. degrees in Geology. Persons interested in these pro-

Completion of the degree includes mainte-

nance of a minimum 3.0 average in all graduate course work and successful defense of the thesis. Failure to achieve a 3.0 GPA for two successive semesters will terminate a student’s status in the degree program.

Course requirements include a minimum of 30 hours of graduate credit that include 6 hours of Thes 500 and at least 14 hours of graduate course work at or above the 500 level. At least 23 hours must be taken within the department. Students who have not had an undergraduate field course must take 440 or an approved equivalent. Registration for 595 is required each semester; however, not more than 2 hours S/NC credit may be applied toward the degree.

THE DOCTORAL PROGRAM

Prerequisites are the Bachelor’s degree requirements of the M.S. plus a Master’s degree in geology or related field.

Completion of the degree includes mainte-

nance of a minimum 3.0 average in all graduate course work, satisfactory performance on the comprehensive exam taken not later than the end of the second year, and successful defense of the dissertation. Fail-

ure to achieve a 3.0 GPA for two successive semesters will terminate the student’s status in the degree program.

Course requirements include a minimum of 26 hours of graded courses for graduate credit and at least 24 hours of Dissertation 600. The 26 hours must include a minimum of 18 hours of 500 level or higher of which at least 6 hours must be at the 600 level. Stu-

ents who have been granted the opportunity to bypass the M.S. must take at least 38 hours of graded courses for gradu-

ate credit of which a minimum of 26 hours must be at the 500 level or above with at least 6 hours at the 600 level.

410 Advanced Mineralogy (3) Crystal chemistry of rock-forming minerals. Interaction of electromagnetic radiation and crystalline solids. Optical properties of minerals, visible and infrared spectroscopy, and x-ray diffraction. Historical emphasis on thin section and x-ray diffraction methods of mineralog-

y. Prereq: 310. 2 hrs and 1 lab.

420 Paleocology (4) Principles of ecological analysis as applied to fossils and fossil assemblages: data collection and interpretation. Laboratory designed around preparation of scientific reports based on field and laboratory analysis. Writing emphasis. course. 3 hrs and 1 lab.

421 Invertebrate Paleontology I (3) Survey of preser-

vational processes and geologically important representatives of Protista, Porifera, Cnidaria, Bryozoa, and Brachiopoda. Functional morphology, skeletal struc-
tures, ecology, and stratigraphic distribution. Prereq: 320 or consent of instructor. 2 hrs and 1 2-hr lab.

422 Invertebrate Paleontology II (3) Survey of higher invertebrates: Annelida and other worms, Mollusca, Arthropoda, Echinodermata, Crustacea, Chordata. Functional morphology, skeletal struc-
tures, ecology, and stratigraphic distribution. Prereq: 320 or consent of instructor. 2 hrs and 1 2-hr lab.

425 Evolution and Geologic Record (3) Evolution of life viewed from fossil record. Extinction, macroevolu-
tion and evolutionary rates. Prereq: 320. 2 hrs and 1 seminar.

426 Paleobotany and Palynology (3) Evolutionary his-
tory of terrestrial plant life through examination of fossil record of macrobotanical remains, spores, and pollen grains. Origin and diversification of Gymno-
sperms and Angiosperms, changes in floras of different types of mineral deposits with examples, and metallogeny. Prereq: 310 and 350 or equiva-

lents. Recommended prereq: 490. 2 hrs and 1 2-hr lab.

450 Principles of Economic Geology (3) Ore-forming prop-
esthes, classification of mineral deposits, survey of different types of mineral deposits with examples, and metallogeny. Prereq: 310 and 350 or equiva-

lents. Recommended prereq: 490. 2 hrs and 1 2-hr lab.

455 Basic Environmental Geology (3) Applications of geological sciences toward comprehension of effects of geological processes on humans and effects of human activities on earth’s environment. Prereq: 12 hrs of geology courses. 2 hrs and 1 3-hr lab or field period.

460 Principles of Geochemistry (3) Application of chemical principles to geologic problems. Crystal chem-

tistry and relation between basic atomic structure and distribution and behavior of elements in earth’s crust. Prereq: Chemistry 120-30. Recommend prereq: 330. 2 hrs and 1 lab.

470 Applied Geophysics (3) Basics principles and appli-
cations of seismic, gravity, magnetic, and electrical prospecting methods. Recommended prereq: Math-
ematics 141-42 or 147-48 and Physics 131. 2 hrs and 1 lab.

480 Principles of Economic Geology (3) Ore-forming processes, classification of mineral deposits, survey of different types of mineral deposits with examples, and metallogeny. Prereq: 310 and 350 or equiva-

lents. Recommended prereq: 490. 2 hrs and 1 2-hr lab.

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

502 Registration for Use of Facilities (3-15) Required for the student not otherwise registered during any semester when students use University facilities and/or are not otherwise registered during any semester. Prereq: 12 hrs of geology courses. 2 hrs and 1 3-hr lab or field period.

510 Clay Mineralogy (3) Origin, chemistry, structures, and properties of clay minerals; application of miner-

alogical techniques to clay mineral studies. Prereq: 310 and 568 or equivalent. 2 hrs and 1 lab.

520 Advanced Paleontology (3) Detailed analysis of selected groups of fossils (organisms; functional mor-

phology, evolutionary development.

521 Data Analysis in Geology and Paleobiology (3) Application of statistical and other quantitative tech-
niques to geological and paleontological data. 2 hrs and 1 seminar.

525 Biostratigraphy (3) Examination of principles of stratigraphy and biostratigraphy through selected case histories. 1 hr and 1 2-hr seminar.

530 Petrogenesis of Crystalline Rocks (4) Origin and tech-
niques of igneous and metamorphic rocks, magmat-
ism and subsolidus processes and physical conditions. Laboratory involves petrographic study of crystalline rocks in thin section. Prereq: 410. 3 hrs and 1 lab.

540 Seminar in Local Geology (1) Introduction of geology of Southern Appalachians. 1 hr plus field-

trips.

545 Sandstone Petrology/Physical Sedimentology (4) Field and microscopic analysis of terrigenous clastic rock types; physical processes of sedimentation, transport of sediment, and formation of sedimentary structures. Prereq: 340 or equivalent, 3 hrs and 1 lab.

546 Carbonate Sedimentology (4) Environments of deposition of carbonate rocks; facies relationships and diagenesis of resultant rocks; field and laboratory analysis of sample material and preparation of scientific reports. 3 hrs and 1 lab.
550 Regional Geomorphology (3) Integrative approach to study of natural geomorphological regions stressing links and similarities across boundaries, unique characteristics of major divisions, provinces, sections, and districts. May be repeated with consent of instructor. Maximum 6 hrs. (Same as Geography 560.)

555 Seminar in Quaternary Studies (3) Interdisciplinary research on major issues in the study of patterns and processes in Quaternary landscapes; responses of plants and animals to environmental changes during glacial/interglacial cycles. Prereq: Consent of instructor. May be repeated with consent of instructor. Maximum 6 hrs. (Same as Botany 555 and Zoology 555.)

556 Quaternary Geology of North America (3) Interpretation of geomorphic, stratigraphic, and geochronologic evidence in order to reconstruct Quaternary landscapes in glaciated, periglacial, and nonglacial regions of North America; correlation of major episodes of North American glaciation with paleo-oceanographic changes in Atlantic and Pacific Oceans. Prereq: 101 or consent of instructor.

557 Quaternary Paleocology (3) Perturbation, process, and pattern within Quaternary ecosystems; climatic change and vegetational responses during last 2.5 million years. Prereq: Consent of instructor.


561 Aqueous Geochemistry (4) Introduction to and applications of equilibrium thermodynamics to earth surface environments; geochemistry of natural water, weathering reactions, and early sediment diagenesis. Prereq: Chemistry 120-30. 3 hrs and 1 lab or seminar.

565 Chemical Petrology (3) Application of thermodynamics to geologic materials. Thermodynamic properties of condensed phases, solutions, and heterogeneous multiphase systems; equilibria and conduct of heat through earth. Prereq: Chemistry 120-30, Mathematics 141-42. Recommended prereq: Physical Chemistry.

566 Geochemoal Analysis (3) Collection and treatment of geochemical data using electron microprobe, x-ray fluorescence, and atomic absorption spectrophotometry techniques. Prereq: 310 or consent of instructor. 2 hrs and 1 lab.

569 Experimental Geochemistry Laboratory (1-3) Independent lab study of problems in geochemistry using experimental and analytical techniques. Prereq: Consent of instructor.

570 Advanced Structural Geology (4) Current topics in structural geology and tectonics of mountain belts; recent literature. Prereq: 370 or equivalent, or consent of instructor. 3 hrs and 1 lab or seminar.

575 Plate Tectonics and Orogeny (4) Tectonic development of orogenic belts in context of newest aspects of plate tectonic theory current literature and ongoing research for both modern and ancient examples. Prereq: 370 or consent of instructor. 3 hrs and 1 seminar.

580 Ore Petrology (3) Detailed study of selected ore deposits; petrology of ore-ganizing assemblages. Prereq: 480 or consent of instructor. 2 hrs and 1-2 hr lab.

590 Special Problems in Geology (1-3) Directed study or special topics. Prereq: Consent of instructor. May be repeated. Maximum 19 hrs.

591 Foreign Study (1-15) See page 31.

592 Off-Campus Study (1-15) See page 31.

593 Independent Study (1-15) See page 31.

594 Field Problems in Geology (1-2) Literature study and seminars on specific regions of geologic interest, supplemented by extended field trip. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.

596 Selected Topics in Geology (1-3) Presentation of graduate, faculty, and visiting scientist research. Registration required each semester except summer for resident full-time graduate students. S/N/NC only.

600 Doctoral Research and Dissertation (3-15) Pr, NP only. E

610 Seminar in Mineralogy (2) May be repeated with consent of department. Maximum 6 hrs.

620 Seminar in Paleontology (2) May be repeated with consent of department. Maximum 6 hrs.

630 Seminar in Petrology (2) May be repeated with consent of department. Maximum 6 hrs.

640 Seminar in Sedimentary Geology (2) May be repeated with consent of department. Maximum 6 hrs.

650 Seminar in Geomorphology and Quaternary Geology (2) May be repeated with consent of department. Maximum 6 hrs.

660 Seminar in Geochemistry (2) May be repeated with consent of department. Maximum 6 hrs.

670 Seminar in Structural Geology (2) May be repeated with consent of department. Maximum 6 hrs.

680 Seminar in Economic Geology (2) May be repeated with consent of department. Maximum 6 hrs.

---

**Germanic and Slavic Languages**

**(College of Liberal Arts)**

**MAJORS**

<table>
<thead>
<tr>
<th>DEGREES</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>German</td>
</tr>
<tr>
<td></td>
<td>Modern Foreign Languages</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>M.A.</td>
</tr>
<tr>
<td></td>
<td>Ph.D.</td>
</tr>
</tbody>
</table>

**Henry Kratz, Head**

**Professors:**

- J. E. Felsen, Ph.D., Pennsylvania
- D. M. Fiene, Ph.D., Indiana
- H. W. Fuller (Emeritus), Ph.D., Wisconsin
- R. H. Kratz, Ph.D., Ohio State
- J. C. Osborne, Ph.D., Northwestern
- M. P. Rice, Ph.D., Vanderbilt

**Associate Professors:**

- N. A. Laukner, Ph.D., Wisconsin
- D. E. Lee, Ph.D., Stanford
- C. J. Mellor, Ph.D., Chicago
- U. Ritenhoff, Ph.D., Connecticut

**Assistant Professors:**

- C. Hodges, Ph.D., Chicago
- J. I. Kolodziej, Ph.D., Indiana

The Department of Germanic and Slavic Languages offers two advanced degrees: the Master of Arts in German and the Doctor of Philosophy in Modern Foreign Languages. Inquiries should be addressed to the head of the department.

**The Master's Program**

The department requires a minimum of 30 semester hours including 15 hours of course work above the 500 level and 6 hours of Thesis 500.

**The Doctoral Program**

The Ph.D. in Modern Foreign Languages is offered jointly by the Department of Germanic and Slavic Languages and the Department of Romance Languages and requires advanced training in at least two foreign languages.

**Admission Requirements**

Applicants must have completed a B.A. in either French, German or Spanish to be accepted into this program. Both graduates of institutions in the United States and those with undergraduate degrees from institutions outside the United States must have a grade point average of at least 3.0. Consideration will also be given to applicants who do not have an undergraduate degree in one of the three foreign languages but do have the equivalent of an undergraduate major in one of them. Applicants should present scores that are no lower than the 40th percentile on the Graduate Record Examination (GRE) subject test in the foreign language of their first concentration.

**Requirements for the Ph.D.**

Candidates must complete a minimum of 63 semester hours of course work beyond the Bachelor's degree in addition to 24 hours of doctoral research and dissertation. The program shall consist of a first concentration, a second concentration, and a cognate field.

1. **First Concentration:** French, German or Spanish. It will consist of a minimum of 39 semester hours beyond the Bachelor's degree, distributed as follows:

   - A minimum of 21 hours at the 500 level (exclusive of thesis hours) including French 584 (3), German 560 (3), or Spanish 550 (3); and French 521-22 (1,1), German 512 (2), or Spanish 512 (2); French 515-16 (2,2), or German 520 (3).
   - At least 12 hours at the 600 level (exclusive of dissertation hours).

2. **Second Concentration:** French, German, Italian, or Spanish (different from the first concentration). It shall consist of at least 18 hours beyond the Bachelor's degree, at least 12 of which must be at the 500 or 600 level.

3. **Cognate Field:** Six hours must be in courses numbered 400 and above in a field outside the department of the first concentration but related to the student's principal area of research. If the cognate field is yet a third foreign language, a reading proficiency exam will be administered after completion of the 6 cognate hours by the language section concerned.

4. **Additional Requirements:** A student must demonstrate competence in languages of both his/her first and second concentrations by taking a test in each language. The test will include reading, writing, listening and speaking, and should be completed by the time the student reaches 40 hours of study beyond the Bachelor's degree. Standardized examinations that may be used for this purpose include applicable portions of either the National Teachers Examination, the MLA Examination for Teachers and Advanced Students, or the proficiency standards of the United States Foreign Service Institute (FSI).

   If the student has not chosen a third language as his or her cognate area, basic competence (determined by a reading examination of translation into English administered by the department concerned) in a third language is required. If the student's first and second languages are Romance languages, the third language should be chosen from another language branch.

5. **Comprehensive Examination:** A comprehensive examination on the language and literature of the first and second concentrations must be passed before the student may be admitted to candidacy. The candidate will be required to defend his/her
dissertation in an oral examination. Central emphasis is put on the doctoral dissertation as a final test of the candidate's scholarly qualifications.

Graduate Teaching Assistants in the program should have the opportunity and will be strongly encouraged to instruct in at least two foreign languages, subject to staffing needs. Doctoral students will be strongly encouraged to reside and study abroad and will be assisted in identifying potential sources of financial support (e.g., Fulbright, McClure, Rotary fellowships).

For additional courses, refer to Romance Languages.

German

411-12 Advanced Conversation and Composition (3,3) Prereq: 311-12 or equivalent or consent of department.

420 Selected Topics in German Literature from 1750 to the Present (3) Prereq: 6 hrs of 300-level courses (excluding 331-32 and courses in English translation) or equivalent.

421 German Lyric Poetry (3) Prereq: 6 hrs of 300-level courses (excluding 331-32 and courses in English translation) or equivalent.

422 German Drama (3) Prereq: 6 hrs of 300-level courses (excluding 331-32 and courses in English translation) or equivalent.

423 German Narrative Prose (3) Prereq: 6 hrs of 300-level courses (excluding 331-32 and courses in English translation) or equivalent.

424 German Literary Movements (3) Survey of major periods in development of German literature since 1750: problems and pitfalls of periodization.

425 Introduction to Descriptive Linguistics (3) (Same as French 425, Spanish 425, Linguistics 425, and Russian 425.)

426 Methods of Historical Linguistics (3) (Same as French 426, Spanish 426, and Linguistics 426.)

435 Structure of the German Language (3) Contrasts English-German segmental and suprasegmental phonemes, contrasting Germanic and Germanic structures, selected topics in advanced German grammar and syntactic analysis. Prereq: 6 hrs of upper-division German language courses (excluding courses in translation and graduate reading courses). (Same as Linguistics 435.)

436 History of the German Language (3) Development of German language from Indo-European through Proto-Germanic, Old High German, Middle High German to New High German. Internal and external linguistic history of German speech. Prereq: 6 hrs of upper-division German language courses (excluding courses in translation and graduate reading courses). (Same as Linguistics 436.)

485 Business German (3) Survey of German used in fields of business, government, administration and economics. Prereq: 6 hrs of upper-division German excluding courses in translation and graduate courses.

500 Thesis (1-15) P/NP only, E

502 Registration for Use of Facilities (3-15) Required for the student not otherwise registered during any semester when 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

510 German Phonetics and Advanced Grammar (3) Advanced work in phonetics, pronunciation, and selected topics in German grammar. For teachers and prospective teachers. Prereq: Consent of instructor.

520 Prossemn (3) Bibliography; methods; illustrative problems; preparation of papers.

521-22 College Teaching of German (1,1) Required for all M.A. or Ph.D. candidates except those whose previous teaching experience warrants excuse from this requirement or those who wish to pursue voca- tions other than teaching.

541-42 Medieval German Language and Literature (3,3) 541—Introduction to Middle High German; 542—Readings in Medieval German Literature.

550 Studies in German Literature (3) Content varies. May be repeated. Maximum 6 hrs.

551 German Humanism, Reformation and Baroque (3)

552 German Enlightenment, Rococo and Sturm und Drang (3)

553 German Classicism and Romanticism (3)

554 German Realism and Naturalism (3)

555 Modern German Literature 1890-1945 (3)

556 Modern German Literature 1945-Present (3)

560 German Literary Theory and Criticism (3)

561-62 Directed Readings in German Language and Literature (3,3)

571-72 Old Norse Language and Literature (3,3)

591 Foreign Study (1-15) See page 31.

592 Off-Campus Study (1-15) See page 31.

593 Independent Study (1-15) See page 31.

600 Doctoral Research and Dissertation (3-15) P/NP only, E

610 Gothic (3) Phonology, morphology, and syntax of Gothic language. Relationship to Indo-European languages and other Germanic languages. Readings from Gothic Bible.

611 Old High German (3) Phonology, morphology, and syntax of Old High German. Representative readings.

612 Old Saxon (3) Phonology, morphology, and syntax of Old Saxon. Representative readings.

621-22 Seminar in German Literature (3,3) May be repeated. Maximum 18 hrs.

631-32 Seminar in German and Germanic Philology (3,3)

Russian

425 Introduction to Descriptive Linguistics (3) (Same as French 425, German 425, Spanish 425, and Linguistics 425.)

426 Methods of Historical Linguistics (3) (Same as French 426, German 426, Spanish 426, and Linguistics 426.)
425 Women's Health (3) Factors influencing women's health and women consumers in nation's health services delivery systems. Health problems/concerns of women and techniques for prevention, maintenance and/or correction. (Same as Women's Studies 425.) E

430 Suicide and Crisis Intervention (3) Factors which cause suicide and crisis situations. Assessment, intervention, and prevention techniques. Sp

435 Substance Use and Abuse (3) Drug and alcohol abuse problems and surped causes; pharmacology of drugs and effects on society; strategies for intervention and education. Sp

465 Aging and Health (3) Aging process in health perspective as related to health promotion and wellness of aged. F, Sp

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

502 Registration for Use of Facilities (3-15) Required for the student not otherwise registered during any semester when 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

510 Trends and Issues in Health Education (2) Comprehensive study and analysis of history, philosophy, problems, principles and trends of health education. F

520 Sex Education and Human Sexuality (3) Advanced in-depth discussion of educational and health counseling theory, techniques, materials used in school, community, or health care facility. Sp

530 Curriculum Development for Health Education Program Planning (3) Analysis of current health education curricula for elementary and secondary schools, community and health care settings. Sp

540 Evaluation in Health Education (3) Principles of evaluation of health instruction and programs in regard to health knowledge, attitudes, and behavior. Construction of instruments and criticism of existing instruments. Sp

560 Graduate Workshop (1-3) Specific health/wellness or health promotion issues. Special health problems in concentrated period of time. May be repeated. Maximum 12 hrs.

570 Special Topics (1-3) For graduate students, in-service teachers and other health professionals. Health/wellness or health promotion issues. May be repeated. Maximum 12 hrs.

590 Research Methods in Health (3) Basic research techniques in variety of health settings. Development of critical thinking and problem identification for research topics. (Same as Public Health 590.) F

593 Directed Independent Studies (1-3) Individual identification and study of health/wellness of health promotion problem/issue. Specific proposal to instructor before registration. May be repeated. Maximum 12 hrs. E

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

601 Internship/Research in Safety and Health (3-6) (Same as Safety 601.)

610 Critical Analysis of Writing and Research (3) F

620 Advanced Research Techniques in Health (3) Advanced theory and techniques of research design and methodology in health discipline. Prereq: 590, 610. Sp

650 Health Aspects of Gerontology (3) Knowledge and understanding of biological, psychological and sociological aspects of aging as related to health and wellness of individual. (Same as Public Health 650.) Su

655 Seminar in Nation's Health (3) Comprehensive study of definition, determinants, resources and health status of nation. (Same as Public Health 655.) F

660 International Health (3) Study of quality of health, health promotion and health services in countries throughout world. (Same as Public Health 660.) Sp

680 Seminar in Health (3) Ramifications of health and health education innovations in relation to evolving field and discipline. Prereq: Advanced standing as doctoral candidate. Sp

Public Health

Graduate study with a major in Public Health leads to the Master of Public Health (M.P.H.). Three professional preparation concentrations are available: community health education (accredited by the Council on Education for Public Health), health planning/methods, and organizational/ environmental health and safety. ADMISSION REQUIREMENTS

A statement of the applicant's educational and career goals and three rating forms are required. Appropriate forms are available from the department's program in Public Health. Preferential consideration for admission to degree status shall be given to those with a minimum undergraduate grade point average of 2.8 and with one year of professional experience in a related health-related occupation.

THE MASTER'S PROGRAM

The M.P.H. is a non-thesis program requiring completion of 58 semester hours of course work including 10 weeks of field practice. Field practice provides a full-time experience with an affiliated health agency or organization offering one or more health programs. Of importance, field practice allows the student to apply academic theories, concepts, and skills in a realistic setting. Students must complete two-thirds of their courses with a minimum overall GPA of 3.0 prior to placement in the field.

400 Consumer Health (3) (Same as Health 400.)

410 Health in the Work Environment (3) Fundamental activities in field of industrial health aimed at reducing health problems for employees. Workplace health hazards and problems of concern to nurses, medical staff, management, engineers and others in industrial health and safety fields. Prereq: Consent of Instructor. May not be used toward degree requirements. May be repeated for credit by occupational health concentration majors. F, Su

480 Special Topics (3) Prereq: Consent of Instructor. May be repeated under different topic. Maximum 6 hrs.

493 Directed Independent Study (1-3) Individual in-depth study of selected issues. Prereq: Consent of Instructor. May be repeated. Maximum 6 hrs. E

502 Registration for Use of Facilities (3-15) Required for the student not otherwise registered during any semester when 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

505 Continuing Education in Public Health (1-3) Selected learning activities and experiences in specialized areas of public health utilizing workshop format. May be repeated. Maximum 9 hrs.

509 Graduate Seminar in Public Health (1) In-depth discussion of timely topics reflecting scope of public health as a science, and its impact in the social and political arena. Prereq: 493 or consent of instructor. Maximum 6 hrs. F, Su

510 Environmental and Occupational Health (3) Complexities of personal and ambient environment recognizing health as individual's response to diverse and dynamic world. Principles of occupational safety and health. Survey of contemporary issues and their implications for healthful living today and in future. F

511 Fundamentals of Industrial Hygiene (3) Occupational health theory, principles and regulations: recognition, evaluation and control of workplace health hazards. Pertinent workplace problems and situations. F


513 Industrial Hygiene Instrumentation and Sampling (4) Instrument design and methods for sampling industrial environment for personal exposure to chemical and physical stressors affecting worker's health. Lecture, demonstration, and lab. Prereq: 511 or consent of instructor. Sp

514 Industrial Toxicology and Occupational Exposures (3) Principles of industrial toxicology, basic toxic mechanisms, portals of entry, physiologic and biochemical responses. Occupational exposure assessment, physiologic factors and environmental conditions that influence exposure characterization, statistical aspects of sampling and transport of contaminants into general environment. Sp

530 Public Health Policy and Administration (3) Administrative considerations of community-based health care programs and public health practice. Health policy formulation, political environment and governmental involvement in health, legal responsibilities, and managerial concepts/techniques/process. F, Su

521 Organization Theory and Health Care Delivery (3) Administrative and Organization theory related to health care delivery: operation and management of community hospital. Case discussions and problem-solving exercises; managerial functions and skills. F

523 Management in Extended Care Settings (3) Managerial concepts and theoretical foundations essential to supervising and administering facilities and programs of domiciliary health service programs. Management and operation of health services programs for patients and clients in settings which provide activities of daily living and special psychosocial environmental needs. Programs for home health services, comprehensive medical rehabilitation, nursing homes, congregating living centers and similar type health programs. Prereq: 521 or consent of instructor. Sp

525 Financial Management of Health Programs (3) Financial management and application of financial principal concepts and techniques applied to health service programs. Functions of budgeting, costing, financing, rate setting, financial reporting and control. Opportunities for further techniques. Prereq: 520 or consent of instructor. Sp

530 Biostatistics (3) Application of descriptive and inferential statistical methods to health-related programs and problems. Microcomputer applications, use and interpretation of vital statistics and introductory research methodology preparatory for first course in epidemiology. Prereq: Introductory statistics or consent of instructor. F

540 Research Methods in Epidemiology (3) Basic measurement science of public health. Epidemiologic principles; application of discipline's research methods. Basic measures of risk, concepts of bias and causality reasoning. Study design options and analytic approaches. Prereq: 530. Sp

542 Advanced Epidemiologic Methods (3) Classes in cohort and case-control study designs; conduct and interpret an experiment. Use of computer programs and techniques. Essentials of introductory research methodology preparatory for first course in epidemiology. Prereq: 540 or consent of instructor. F

550 Principles and Practices of Community Health Education (3) Theoretical foundations for community health education: application of discipline for skill development in variety of educational processes; and introduction to community health analysis. F

552 Community Health Problem Solving (4) Dynamics of community organization, community needs assessment, educational interventions, and applica-
tion of program planning and evaluation techniques. Opportunity to practice skills in realistic setting. Prereq: 550 or consent of instructor. Sp

555 Health and Society (3) Understanding of social and behavioral factors which influence health status and social conditions in the community. Application of behavioral sciences to health-related organization. Social and psychological aspects of disease, sociological aspects of health care delivery systems, political economy of health and illness, impact of social movements on health, and social consequences of health legislation. Sp

560 Theories and Techniques in Health Planning (4) Overview of health planning concepts and methodologies; systems-oriented planning process. Major elements of planning: formulation and conceptualization of problem, plan design, evaluation and implementation. Health problems of institutions, communities and selected population groups, appropriate diagnoses, and programs for addressing needs. Sp

562 Group Processes in Health Planning (3) Application of group process techniques used in health planning. Tailoring group processes, leadership roles and techniques to encourage innovation and creativity in health planning groups. Su

568 Physical Activity and Positive Health (3) (Same as Physical Education 568.)

569 Fitness Testing, Programming, and Leadership for Diverse Populations (1) (Same as Physical Education 569.)

580 Special Topics (3) Prereq: Consent of instructor. May be repeated under different topic. Maximum 6 hrs.

587-88-89 Internship (3,3,3) Internship in either approved organizational or research setting under supervision of designated preceptor. Prereq: MHR major, one semester advance notice and consent of major advisor. S/NC only. E

590 Research Methods in Health (3) (Same as Health 590.)

593 Directed Independent Study (1-3) Prereq: Consent of instructor. May be repeated. Maximum 6 hrs. E

600 Health Aspects of Gerontology (3) (Same as Health 650.)

655 Seminar in Nation's Health (3) (Same as Health 655.)

660 International Health (3) (Same as Health 660.)

Recreation and Leisure Studies

Graduate study with a major in Recreation and Leisure Studies leads to the Master of Science. Professional preparation concentrations are available in therapeutic recreation, general recreation, and sport administration/management. The third concentration is an interdisciplinary program with the department of Physical Education and Dance. The M.S., with thesis and non-thesis options, requires completion of 32 semester hours.

410 Maintenance and Management of Recreation and Sports Related Facilities (3) Principles for operating modern facility maintenance systems and management strategies. Cost tracking, inventory systems, specialized maintenance techniques, safety guidelines, maintenance management systems and security. Prereq: 110, 310 or consent of instructor. F

430 Organization and Administration of Leisure Services (3) Principles of administration applied to provision of leisure services. Application to behavior in commercial or commercial enterprises. Organizational structure, personnel management, evaluation, legal authority, introduction to budgeting and fiscal procedures. Prereq: 310 or consent of instructor. F

440 Dimensions of Private and Commercial Recreation Businesses (3) Nature and function of recreation in private, commercial, and industrial settings. Survey of development and management of commercial goods and services offered in leisure market. Factors influencing participation, management considerations, and research in commercial recreation and tourism. Prereq: 110, junior standing, or consent of instructor. Sp

450 Specialized Study in Leisure Education (1-6) Special interest leisure activities; developing positive attitudes toward leisure. Demonstrates how leisure contributes to mental and physical health. May be repeated. Maximum 6 hrs. E

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

502 Registration for Use of Facilities (3-15) Required for the student not otherwise registered during any semester when 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

510 Perspectives and Trends in Leisure Studies and Services (3) Basic role of leisure delivery systems in today's society, scope of leisure services, determinants of leisure behavior, developmental features of leisure and recreation. Current trends, problems, laws, and issues affected by and/or affecting delivery of leisure services. Prereq: Consent of instructor. Sp

515 Philosophical and Conceptual Foundations of Leisure (3) Philosophy of leisure and recreation; nature of philosophy, concepts of leisure, recreation, play work, and other, history of field, and relationship of ideas to contemporary society and to professional practice. Prereq: Consent of instructor.

520 Program Design and Evaluation in Therapeutic Recreation (3) History, philosophy, nature, purpose, special populations served, programming process, professional aspects of therapeutic recreation. Basic overview of design and delivery systems. Prereq: Consent of instructor. F

521 Leisure Counseling and Facilitation Techniques (3) Investigation of concepts and techniques of leisure counseling; introduction to and practice of various leisure facilitative techniques; use of increased personal leisure awareness as desired but concomitant goal. Prereq: 520 or consent of instructor. Sp

522 Clinical Aspects in Therapeutic Recreation (3) History, philosophy, nature, purpose, special populations served, programming process, professional aspects of therapeutic recreation. Basic overview of design and delivery systems. Prereq: Consent of instructor. F

540 Fiscal Policies for Recreation and Sports Related Organizations and Facilities (3) Application of fiscal policies and procedures to operation of recreation and sports related organizations and facilities. Finance, revenue generating strategies, cash and inventory control, commercial/public cooperative ventures and microcomputer applications. Prereq: 430 or consent of instructor. Sp

590 Graduate Practicum (1-6) Required of all graduate students. 100 clock hours during semester with agency for 2 hrs credit. Two major phases: work experience and written paper.

591 Directed Study in Leisure & Recreation (1-6) Detailed study of theme, issue, or concern. Designed to meet needs of individual students. May be repeated. Maximum 6 hrs. E

592 Special Topics in Recreation & Leisure Studies (1-6) May be repeated. Maximum 6 hrs. E

Safety

Graduate programs are available leading to the Master of Science with a major in Safety Education and Service (thesis and non-thesis options) and to the Specialist in Education with a major in Safety Education and Service.

The M.S., with thesis and non-thesis options, requires completion of 30 semester hours.

The Specialist in Education (Ed.S.) requires 30 semester hours beyond the M.S.
John Morrow, Head

Professors:
- P. H. Bargeron, Ph.D. Vanderbilt;
- E. V. Chmielowski, Ph.D. Harvard;
- R. E. Duncan, Ph.D. California (Berkeley);
- J. R. Finger, Ph.D. Washington; L. P. Graf (Emeritus) (Distinguished Service Professor);
- Ph.D. Harvard; A. G. Haas, Ph.D. Chicago;
- Y. P. Hao, Ph.D. Harvard; R. W. Haskins (Emeritus), Ph.D. California (Berkeley);
- C. O. Jackson, Ph.D. Emory; M. M. Klein (Emeritus) (Alumni Distinguished Service Professor);
- Ph.D. Columbia; J. Morrow, Ph.D. Pennsylvania.

Associate Professors:
- S. D. Becker, Ph.D. Case-Western Reserve;
- J. D. Bing, Ph.D. Indiana; J. Bohstedt, Ph.D. Harvard;
- C. W. Johnson, Ph.D. Michigan;
- M. J. McDonald, Ph.D. Pennsylvania;
- J. Muldowny (Associate Head), Ph.D. Yale;
- P. J. Pinckney, Ph.D. Vanderbilt;

Assistant Professors:
- R. Brummett, Ph.D. Chicago; J. R. Farr, Ph.D. Northwestern;
- W. W. Farris, Ph.D. Harvard;
- C. G. Fleming, Ph.D. Duke; C. L. Lansing, Ph.D. Michican;
- C. D. Matson, Ph.D. Columbia; J. D. Miller, Ph.D. Duke.

The Department of History offers graduate study leading to the Master of Arts and Doctor of Philosophy. The M.A. program includes a thesis and non-thesis option and also offers a non-thesis concentration in historic preservation. The doctoral program has concentrations in American or European history with specializations in regional/local American, military/foreign relations, and socioeconomic history. Detailed information may be obtained from the Director of Graduate Studies in History.

All incoming students will be advised by the Director of Graduate Studies.

THE MASTER'S PROGRAM

Admission Requirements
1. Successful completion of a baccalaureate degree, preferably with a major in History.
2. Acceptable scores on the Graduate Record Examination (general and subject history).

Academic Standards
A 3.0 overall GPA is required of graduate students to remain in good standing. The Graduate Awards and Review Committee monitors the progress of all graduate students each semester.

Thesis Option
Twenty-four hours of course work and 6 hours of Thesis 500 for a total of 30 hours are required. The student must complete 510, 3 hours of reading courses (521) and 3 hours of a 600-level seminar. A two-hour oral examination covering both the thesis and the general field in which the thesis is written is given at the end of the program.

Non-Thesis Option
A total of 30 hours of course work is required. A student must complete 510, 6 hours of reading courses (521) and 6 hours of 600-level seminars. A two-hour written examination on one field and a one-hour oral examination on the second field are given at the end of the program. As many as 5 related hours may be taken in courses outside the department for either option.

Concentration in Historic Preservation
This option is a non-thesis program requiring 33 total hours: 18 hours outside the history department and 15 hours within. Required courses are 6 hours of 521, 3 in historic preservation and 3 in either early American or regional/local American history. Students will be examined in two fields: historic preservation and either early American or recent American history.

THE DOCTORAL PROGRAM

Admission Requirements
1. Acceptable scores on the Graduate Record Examination (general and subject history).
2. Successful completion of the M.A.

Residence and Course Work
Students are required to complete a minimum of 50 hours in course work beyond the Bachelor's degree. Students must take 510 or an equivalent. Students transferring from another institution may count up to 24 hours of course work toward the required 50 hours. All students must take a minimum of 6 hours outside the department. No fewer than 3 semesters of the 6 semesters of residence work (2 of which must be consecutive semesters) shall be under the supervision of the staff of UTK.

Language Requirements
Candidates must possess a reading knowledge of one foreign language and such additional languages as may be determined by the student's committee. Under normal circumstances, those concentrating in European history will need two languages. The committee may also specify any other research tools, such as statistics, essential for the student's preparation. Upon student petition, the committee may accept in place of a language a B or better performance in an appropriate statistical course and History 526.

The foreign language requirements may be satisfied in one of two ways:
1. By examination. When the student is ready to take a language examination, he/she should consult with an advisor. The appropriate forms and the time of the examination may be obtained from The Graduate School.
2. By course work. Upon consultation with the advisor, a student may elect to complete an appropriate sequence in a language department (or an intermediate sequence in a language in which no appropriate sequence is available). Satisfactory completion requires that a student must have at least a B in the final semester.

Comprehensive Examination
The comprehensive examination which will be both written and oral must be taken after all course work is completed, language requirements fulfilled, and at least nine months before the degree is expected. This exam should normally be taken before beginning the sixth semester of work toward the doctorate. The candidate must present two fields, one from group I and one from group II.

Group I
- Premodern Europe
- Modern Europe
- Early American
- Recent United States

Group II
- Socio-economic
- Military/Foreign Relations
- Regional/Local (U.S.)
- National/Regional (non-U.S.)

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

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

502 Registration for Use of Facilities (3-15) Required for the student not otherwise registered during any semester when 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.

510 Foundations to Graduate Study in History (3) Assumptions and methods of historians. Required of all candidates for advanced degrees. F.


533 Topics in European National History (3) Reading seminar: secondary sources on intra-national topics, usually British, Russian, German or French. Focus varies. May be repeated. Maximum 15 hrs.

541 Topics in Early American History (3) Reading seminar: secondary sources on early North American history. Focus varies. May be repeated. Maximum 15 hrs.

542 Topics in 19th- and 20th-Century United States (3) Reading seminar: secondary sources on 19th- and 20th-century United States. Focus varies. May be repeated. Maximum 15 hrs.

551 Topics in the History of Foreign Relations (3) Reading seminar: secondary sources on foreign relations. Focus varies. May be repeated. Maximum 15 hrs.

552 Topics in Military History (3) Reading seminar: secondary sources on military history; military operations, social impact of war and national strategy in foreign policy. May be repeated. Maximum 15 hrs.

554 Topics in Comparative Social and Economic History (3) Reading seminar: secondary sources on multinational topics, comparatively structured. Focus varies. May be repeated. Maximum 15 hrs.

555 Topics in United States Social and Economic History (3) Reading seminar: secondary sources on
U.S. social and economic history. Focus varies. May be repeated. Maximum 15 hrs.

558 Topics in European Social and Economic History (3) Reading seminar: secondary sources on social or economic history of European nations. Focus varies. May be repeated. Maximum 15 hrs.

557 Topics in Cultural and Intellectual History (3) Reading seminar: secondary sources on cultural and intellectual history. Focus varies. May be repeated. Maximum 15 hrs.

558 Topics in United States Regional and Local History (3) Reading seminar: secondary sources on regions, states, and cities of the South. Focus varies. May be repeated. Maximum 15 hrs.

561 Topics in Latin American History (3) Reading seminar: secondary sources in Latin America. Focus varies. May be repeated. Maximum 15 hrs.

562 Topics in Asian History (3) Reading seminar: secondary sources on Asian history; East Asia and Middle East. Focus varies. May be repeated. Maximum 15 hrs.

566 Topics in U.S. Religious History (3) (Same as Religious Studies 566.)

571 Topics in Applied History (3) Seminar to develop practical skills applicable to museology, historical preservation, and maintenance of historic agencies, historical editing, and other areas of applied history. Focus varies. May be repeated. Maximum 15 hrs.

580 Topics in History (3) Reading seminar: secondary sources for new topics. Focus varies. May be repeated. Maximum 15 hrs.

591 Foreign Study (1-15) See page 31.

592 Off-Campus Study (1-15) See page 31.

593 Independent Study (1-15) See page 31.

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

621 Directed Readings (3) Directed readings to prepare candidate for doctoral comprehensive examination. May be repeated. Maximum 1 per doctoral field. S/J NC only.


632 Seminar in Modern European History (3) Seminar in primary sources culminating in scholarly paper in modern European history. Focus varies. May be repeated. Maximum 15 hrs.

641 Seminar in Early American History (3) Seminar in primary sources culminating in scholarly paper in American history. Focus varies. May be repeated. Maximum 15 hrs.


658 Seminar in United States Regional and Local History (3) Research seminar in primary sources culminating in scholarly paper in regional and local history. Focus varies. May be repeated. Maximum 15 hrs.


680 Seminar in History (3) Research seminar in primary sources culminating in scholarly paper in aspect of history not covered in another 600-level research seminar. Focus varies. May be repeated. Maximum 15 hrs.

Home Economics

(College of Human Ecology)

MAJOR DEGREE

Home Economics..............................M.S.

THE MASTER'S PROGRAMS

Students pursuing graduate study in Home Economics Education or Extension are encouraged to enroll in the multidisciplinary Master's degree in Home Economics. Home Economics Education courses (HEED prefix) may be selected to meet requirements of that program. Graduate course work in Home Economics Education may also be selected for development of a concentration or minor within other areas of specialization.

The M.S. in Home Economics is designed to meet graduate study needs of professionals who work in programs encompassing all areas of home economics. Home economics teachers may choose courses within this area for updating and certification renewal. Thesis (33 hours) and non-thesis (36 hours) options are offered. The program includes 3-6 hours in research methodology, 6-9 hours in program planning and implementation (agricultural extension, home economics education, other areas of education), 3 hours in the integrative nature of home economics, and 12-15 (thesis) to 15-18 (non-thesis) hours in home economics subject matter. At least one course is to be from each department in the college. The non-thesis option requires a practicum. An oral/written comprehensive examination will be administered at the end of the program.

510 Curriculum in Home Economics (3) Development of home economics educational materials and instruction. Prereq: 420 or equivalent or consent of instructor. F.

515 Evaluation in Home Economics Education (3) Assessment of programs and pupil progress; techniques, methods and purposes. Prereq: 420 or equivalent. F,Sp,A.

520 Supervision of Home Economics in the Public Schools (3) Program planning, organization and administration of vocational home economics education. Supervision of pre-service and in-service home economics professionals. Prereq: Classroom teaching experience. Su,A.

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

530 College Teaching in Home Economics (3) Instructional effectiveness, techniques, organization, and evaluation. Prereq: Consent of instructor. F,A.

563 Family Life Education Programs (3) Same as Child & Family Studies 563.

580 Special Topics in Home Economics Education (1-3) Current issues and trends in home economics. Prereq: Consent of instructor. May be repeated. Su,A.

581 Directed Study in Home Economics Education (1-3) Prereq: Consent of instructor. May be repeated. E.

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

501 Microcomputer Research Applications in Human Ecology (3) Advanced microcomputer concepts and applications for research. Overview of statistical anal-
ADMISSION REQUIREMENTS
Applicants for admission should request information and application forms from both The Graduate Office and the Director, Industrial and Organizational Psychology Program, 408 Stokely Management Center, The University of Tennessee, Knoxville, TN 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: New students are admitted in fall semester only, and applications must be received by the Graduate Admissions and Records Office by March 1.

General Requirements
At least one year of college mathematics and one course in statistics are required. Ordinarily, an undergraduate grade point average of 3.0 or above is required with no evidence of special weakness in mathematics and physical sciences.

Test scores on each section of the general portion (verbal and quantitative) of the Graduate Record Examination (GRE) and the Subject GRE (Psychology-81) are required. Customarily, those students admitted to the program have performed at or above the 68-79th percentile on the general tests. (This corresponds to a raw score of approximately 600 on each of the tests.) The Subject GRE (Psychology-81) 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
A thesis is required with a minimum of 6 semester hours of Management or Psychology 500.

The Master's degree can be completed with a minimum of 33 semester hours in the major as follows:
Management 567, 588 or Psychology 517-18; Psychology 557; Statistics 537, 538.

Twelve hours of additional course work to be selected primarily from the following:
Management 511, 522, 610; Management/ Psychology 625, 626, 627, 638; Psychology 550, 610, 629, 634.

Electives, as approved for an individual's plan of study, may be selected from graduate courses in psychology, social work, sociology, management, education, planning, etc. Students who wish to pursue special research interests aside from their dissertation may register for Management 525, 526 or Psychology 690.

An internship, practicum, or field experience is recommended. A student is expected to be in residence full time one year (two years recommended).

Doctoral candidates must pass a final oral examination on their dissertation research. In addition to course requirements, a doctoral student must attain a score of 650 (90th percentile) on the Subject GRE (Psychology-81) within two years of entry, successfully complete the comprehensive examination part I covering scientific methodology before or during the third fall semester, and successfully complete the comprehensive examination part II in the areas of the student's major research and professional interests.

An overall B average is required in the course sequence Management 567-68 or Psychology 517-18 to continue in the program beyond the first year.

THE DOCTORAL PROGRAM
(NO: 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.)

A dissertation is required with a minimum of 24 semester hours of Management or Psychology 600.

The doctoral degree can be completed with a minimum of 54 semester hours in the major as follows:
Management 567-68 or Psychology 517-18; Psychology 557; Statistics 537-38.

A minimum of five doctoral seminars (15 hours) selected from: Management 610; Management/Psychology 625, 626, 627, 638; Psychology 620, 624. (Five doctoral seminars are viewed as the absolute minimum; more are recommended. Statistics 671 is recommended.)

Electives, as approved for an individual's plan of study, may be selected from graduate courses in psychology, social work, sociology, management, education, planning, etc. Students who wish to pursue special research interests aside from their dissertation may register for Management 525, 526 or Psychology 690.

An internship, practicum, or field experience is strongly recommended. A student is expected to be in residence full time one year (two years recommended).

Industrial and Organizational Psychology
(College of Business Administration and College of Liberal Arts)

MAJOR DEGREES
Industrial and Organizational Psychology.......................... M.S., Ph.D.

Committee:

(The 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 program emphasizes a scientist/practitioner model in applying and conducting research based on accepted theory, organizational behavior, psychology, management, and statistics. The programs are administered by a joint committee of the two departments, appointed by the Vice Provost and Dean of The Graduate School on recommendation from the two department heads.

It is intended that students entering the I/O Program will represent widely different undergraduate and graduate backgrounds including students with advanced degrees in psychology, engineering, science, and liberal arts. The first-year program provides the opportunity to take courses that will assist the students in attaining a reasonable level of sophistication in areas of deficiency.

THE DOCTORAL PROGRAM
(NO: 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.)

A dissertation is required with a minimum of 24 semester hours of Management or Psychology 600.

The doctoral degree can be completed with a minimum of 54 semester hours in the major as follows:
Management 567-68 or Psychology 517-18; Psychology 557; Statistics 537-38.

A minimum of five doctoral seminars (15 hours) selected from: Management 610; Management/Psychology 625, 626, 627, 638; Psychology 620, 624. (Five doctoral seminars are viewed as the absolute minimum; more are recommended. Statistics 671 is recommended.)

Electives, as approved for an individual's plan of study, may be selected from graduate courses in psychology, social work, sociology, management, education, planning, etc. Students who wish to pursue special research interests aside from their dissertation may register for Management 525, 526 or Psychology 690.

An internship, practicum, or field experience is recommended. A student is expected to be in residence full time one year (two years recommended).

Doctoral candidates must pass a final oral examination on their dissertation research. In addition to course requirements, a doctoral student must attain a score of 650 (90th percentile) on the Subject GRE (Psychology-81) within two years of entry, successfully complete the comprehensive examination part I covering scientific methodology before or during the third fall semester, and successfully complete the comprehensive examination part II in the areas of the student's major research and professional interests.

An overall B average is required in the course sequence Management 567-68 or Psychology 517-18 to continue in the program beyond the first year.

Industrial Engineering
(College of Engineering)

MAJOR DEGREE
Industrial Engineering.......................... M.S.

John N. Snider, Head

Professors:
W. W. Claycombe, Ph.D. Virginia Polytechnic Institute, P.E.; E. L. DePorter, Ph.D. Virginia Polytechnic Institute; D. C. Doulet, M.S. Tennessee, P.E.; H. P. Emerson (Emeritus), S.B. Massachusetts Institute of Technology, P.E.; G. Garrison (Part-time) (UTSI), Ph.D. North Carolina State; R. M. LaForge (Emeritus) M.S. Georgia Institute of

Associate Professors:
J. C. Hungerford, Ph.D. Ohio; D. H. Hutchinson, Ph.D. Georgia Institute of Technology, K. E. Kirby, Ph.D. Tennessee.

Assistant Professors:
C. H. Aiken, Ph.D. Tennessee, P.E.; M. K. Goodman, M.S. Tennessee, P.E.

Instructor:
D. F. Jackson, M.S. Tennessee.

Lecturers:
J. A. Bontadelli (Part-time), Ph.D. Ohio State; S. Douglas (Part-time), Ph.D. Tennessee; J. C. Mitchell (Part-time) (UTSB), Ph.D. Vanderbilt.

THE MASTER OF SCIENCE PROGRAM
A graduate program leading to the degree of Master of Science in Industrial Engineering is open to the graduates of A.B.E.T.-accredited undergraduate curricula in industrial engineering or to graduates of other technical curricula who take prerequisite course work depending on their academic background. These courses will be determined by the graduate committee. The thesis program requires 24 hours of course work and 6 hours of Thesis. A non-thesis option with 30 hours of course work plus a 3-hour design project is available.

Graduate work in Industrial Engineering provides for concentrations in operations research, engineering management, manufacturing systems, human factors engineering, information systems, reliability and quality control, and traditional industrial engineering. Either one or two minors can be elected in engineering, mathematics, psychology, business, computer science, statistics or economics.

Any 400-level course required in the Bachelor of Science in Industrial Engineering program at The University of Tennessee may not be used for graduate credit in the M.S. graduate program in Industrial Engineering.


402 Production System Planning and Control (3) Theory and application of forecasting systems, regression and time series models, independent demand inventory models, development of safety stock. Coverage of all modules of Manufacturing Resource Planning (MRP) Systems: master production scheduling, resource requirements planning, bill of material and inventory file structures, material requirements planning, capacity planning, shop floor and purchase order control. Overview of just-in-time inventory concepts and MRP's role in manufacturing automation. Prereq: 401.

403 Production Facilities Design and Material Handling (3) Design of production facilities: plant layout, analysis and planning for overall moving, packaging and storage of materials. Office layout and service areas. Design of facilities for such diverse groups as hospitals, banking, industry. Prereq: 302, 401.

405 Engineering Economy (2) Methods and problems in selecting, locating, and comparing facility designs; among engineering alternatives involving capital recovery, economic life of equipment, and rate of return on investment.


412 Quantitative Methods in Project Management (2) Project planning, scheduling, and control based on networking and precedence diagramming methods. Resource allocation and time-cost trade off algorithms. Work measurement, computer applications, and PERT methods of handling uncertainty in activity time estimates.

413 Research Methods in Industrial Engineering (3) Methods to collect and analyze data. Process control, statistical modeling of processes, behavioral sampling, single subject experimental designs, classical experimental design methods, and time series models of experimental design. Validity and reliability concepts as related to measurement and design of data. Strategies to control rival hypotheses: randomization, matching, blocking. Related laboratory study and experiment. Extraneous variables into experiment. Selection of appropriate experimental designs for given research situations and data. Prereq: 300 and senior standing, Statistics 251.


421 Informational Systems I (3) Systems engineering approach to design, development, implementation, and evaluation of systems of information. Information aspects of IE systems: Data structure, task analysis, database management systems. Prereq: 200 and senior standing.

422 Senior Industrial Engineering Problems Analysis (3) Application of industrial engineering to field assignments in local organizations, problem definition, analysis and presentation. Prereq: 402, 403, and 405.


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

501 Design Project (1-3) Enrolled limited to industrial engineering graduate students on approval. May be repeated. Maximum 6 hrs. S/NC only.

502 Registration for Use of Facilities (3-15) Required for the student not otherwise registered during any semester when 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


513 Facilities Planning and Design (3) Modern materials handling techniques, computer-aided layout techniques, application of MRP systems, and use of these to design manufacturing facility. Prereq: Production facilities planning or consent of instructor.

514 Information Systems II (3) Systems analysis and systems control concepts applied to systems of information. Role of IE in office and factory of future. Management support systems, decision support systems, and integrated support systems.


520 Human Factors Engineering II (3) Design of man-machine interfaces and environment. Specific applications of human factors engineering and special problem areas. Prereq: 519.

521 Human Factors Engineering Methodology (3) Background in methodology used by human factors engineering designer and systems analyst. Observational methods, questionnaires, task analysis, design of experiment techniques, computerized methods, human reliability and human error prediction, training analysis, evaluation of man-machine interface, subjective and objective techniques, scaling techniques, questionnaire and survey design, critical incident technique, concept analysis techniques (Delphi), accident investigation, behavioral instrumentation, performance measurement, statistical techniques in experimental design, and expert systems. Prereq: 520.

522 Optimization Methods in Industrial Engineering (3) Classical optimization theory, unidimensional and N-dimensional search techniques, Lagrangean relaxation, iterative and separable programming, linearization techniques, quadratic programming, and dynamic programming. Prereq: 301 or 537.

523 Linear Programming and Extensions (3) Simplex and revised simplex methods, duality, parametric and post-optimality analysis, use of LP software integer programming techniques, brand and bound and cutting planes, network programming. Prereq: 301 or 537.


531 Motivational Theories, Systems and Practices in Organizations (3) Application of motivational theories and concepts in use in technology based organizations. Impact of concepts evaluated according to results in various types of organization structures.

532 Productivity and Quality Engineering (3) Production and quality measures defined and used to analyze current competitive position of important sectors of American industry with respect to both internal and external factors. Typical constraints which promote or inhibit productivity or quality improvements.

533 Theory and Practice of Engineering Management I (3) Comparison of modern management principles and theory with environment, needs, and practices of research and development and other scientific-engineering organizations. Cases used to illustrate contemporary problems and environments. Technical management function, marketing of technical services and products.

534 Engineering Management Control Systems (3) Underlying framework of accounting principles and practice reviewed as basis for evaluating productivity costs, requirements for new ventures, changes in strategy, financial condition. Computer data bases examined for control system alternatives.

535 Organizational Behavior and Managerial Decisions (3) Theories of individual and group behavior and their applications to managerial decision making processes. Role of various people categories in managerial decision making processes in normal mode. Case studies used to identify causes of irrational decisions, policies, and organizational behavior and to suggest corrective action.

536 Project Management (3) Management and control of multifaceted engineering and technological projects. Coordination and interactions between client and vendor. Progress reports, decision making, role of various people categories, manager and progress and management, typical problems associated with various phases of life cycle of project. Case studies illustrate theories and concepts.

537 Industrial Engineering Analysis and Control Techniques (3) Survey of management analysis and control systems through IE techniques. Qualitative and quantitative systems: methods analysis, work measurement, incentive systems, wage and salary development, production and inventory control, linear programming, and applied operations research techniques. Not for credit for students with undergraduate degrees in industrial engineering.

538 Industrial Development (3) Factors other than mechanical or chemical which enter into successful establishment of manufacturing or service enterprise. Organizational and financial planning and evaluation. Cost and control techniques and marketing analysis to determine commercial feasibility of new ventures.

591-92-93 Special Topics in Industrial Engineering (3,3,3) Individual or group research projects. Prereq: Consent of instructor. May be repeated.

601 Operations Research Models in Engineering Economy (3) Mathematical programming techniques applied to capital budgeting; advanced topics in multiple attribute decision analysis; Bayesian analysis of sequential decision making; cost and statistical inference in complex decision analysis. Prereq: 518, 523.


604 Advanced Topics in Optimization (3) Multi-stage optimization theory. Sate increment dynamic programming adaptive optimization theory. Prereq: 603.


691-92-93 Advanced Topics in Industrial Engineering (3,3,3) Forum to study individually or in groups. Prereq: Graduate standing and consent of instructor. May be repeated with consent of instructor.

**Journalism**

(Beat of Communications)

**MAJOR**

**COMMUNICATIONS**

**DEGREE**

M.S.

James A. Crook, Director

Professors:

P. G. Ashdown, Ph.D. Bowling Green; J. A. Crook, Ph.D. Iowa State; G. A. Everett, Ph.D. Iowa; B. K. Leiter, Ph.D. Southern Illinois; M. W. Singletary, Ph.D. Southern Illinois.

Associate Professors:

J. N. Adamson, M.S. Tennessee; M. M. Miller, Ph.D. Michigan State; J. L. Morrow, Ph.D. Toledo; S. L. Puett, M.S. Tennessee.

Assistant Professors:

C. E. Cauthill, Ph.D. North Carolina; M. L. Kern-Foxworth, Ph.D. Wisconsin; R. B. Heller, M.A. Syracuse.

Adjunct Professor:

Alex Haley

The School of Journalism offers a concentration area for the Master's with a major in Communications. See Communications for additional information.

403 International Communications (3) Development and operations of international communications channels and agencies. Comparative analysis of media, media practices, and flow of news throughout world. Print and broadcast systems in terms of relevance to national, political, economic, and cultural factors. Relation of communication practices to international affairs and understanding. Sp

412 Opinion Writing (3) Analysis of editorial positions, practices, and pages. Writing of editorials and columns for newspapers, magazines, and company publications. Prereq: Communications 200, or consent of instructor. Sp

414 Magazine Article Writing (3) Techniques of writing in-depth articles of mass circulation and specialized magazines. Organizing and presenting material, problems in specialized areas: business, science, agriculture, humanities. Prereq: Communications 200, or consent of instructor. F

416 Issues in Journalism (3) Topics vary. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.

420 Print Media Management (3) Current business practice among print media, especially newspapers. Problems in management and production and outlook for new technologies. Prereq: 6 hrs mathematics and/or accounting and senior standing.


433 Advanced Editing (3) Sensitivity to language and editing skills. Headline writing, layout, and production. Prereq: 203.

469 Mass Communications History (3) Development of press and role of mass communications in American history. Newspapers, radio, television, and magazines. F

470 Public Relations Campaigns (3) Preparation of communications materials to implement planned public relations programs. Preparation of news releases—written and video—and broadcasting copy. Research, planning, communication, and evaluation of major public relations projects and campaigns. Prereq: 203, 270, and senior standing. E

480 Journalism in the High School (3) Functions and methods of high school publications. Problems related to layout, photography, printing, advertising, and business. Planning course outlines and curricula for journalism/mass media studies. Su

490 Advanced Photojournalism (3) Advanced principles and methods of black-and-white photography. Introduction to color photography. News and feature photographs and photo essays. Prereq: 290 or consent of instructor.

516 Seminar in Journalism Issues (3) Topics vary. May be repeated. Maximum 6 hrs.


525 Public Opinion (3) Role of press in developing public opinion. Use of press by candidates and incumbents. Social theories of public opinion and analysis of mass media's response. F

535 Publications Management (3) Problems in management, production, market analysis, and design. Techniques of writing, editing, and presenting comprehensive articles and other material; regional and specialized magazines. Individual editorial projects. Prereq: 420 or consent of instructor. Su

540 Seminar in Newspaper Operations (3) On-site study of newspaper management operations. Positioning medium for its target audience and how this affects profitability. Prereq: 550 or consent of instructor. Sp

550 Writing and Editing Projects (3) Specialized writing or editing interests: agriculture, politics, labor, finance, science, technical, general publications. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs. E

571 Seminar in Public Relations (3) Analysis and management of problems in communication between institutions and organizations and their publics. Measurement and evaluation of effectiveness of communication programs. Prereq: 470 or consent of instructor. F

580 Seminar in Visual Communication (3) Behavioral aspects of communication with images. Theories of psychological effect in color, shape, texture, and other design elements. Prereq: 203 or Advertising 350 or Broadcasting 430 or equivalent.

590 Communications and International Development (3) Relationship between mass communications and development of nations. Role of communications media of developed nations in Third World regions of globe. Communications as facilitator of international cooperation. E

597 Independent Study (3) Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.

598 Internship (3) Professional work in journalism supervised by editor or manager with faculty approval. No retroactive credit for previous work experience. Prereq: Completion of core curriculum. E

James A. Crook, Director