Statistics

MAJOR

DEGREE

Statistics

M.S.

Professors:

D. L. Sylvester (Chairman), Ph.D. Stanford;
D. S. Chambers (Emeritus), M.B.A Texas;
R. A. Mclean, Ph.D. Purdue; J. W. Philpot, Ph.D.
Virginia Polytechnic Institute; C. C. Thigpen, Ph.D.
Virginia Polytechnic Institute.

Associate Professors:

G. B. Ranney, Ph.D. North Carolina State;
R. R. Brien, Ph.D. North Carolina; R. D. Sanders,
Ph.D. Texas; M. S. Younger, Ph.D. Virginia
Polytechnic Institute.

Assistant Professors:

M. G. Lethnak, Ph.D. Kentucky;
J. L. Schmidhammer, Ph.D. Pittsburgh.

THE MASTER’S PROGRAM

The Master of Science program in Statistics is designed to provide students with a basic foundation in theoretical and applied statistics for careers as consulting and practicing statisticians. A special industrial statistics concentration is available for students wishing to focus on industrial applications of statistics. A candidate should possess an undergraduate degree with a background in calculus, but no restrictions are imposed regarding the undergraduate major.

The department offers both thesis and non-thesis options for work towards the degree. With Options I and II, two-thirds of the total hours in each program must be at or above the 5000 level. Option I or II must be approved by the department.

Option I: The student must present a minimum of 48 quarter hours of approved coursework to include:

1) A minimum of 27 hours in graduate statistics courses,
2) A minimum of 9 hours in collateral work outside the department, and
3) A minimum of 3 hours credit for a directed study project.

Option II: The student may be approved for a thesis option consisting of a minimum of 45 quarter hours to include:

1) A minimum of 24 hours in graduate statistics courses, and
2) 9 hours credit for master’s thesis.

Option I or II must be approved by the department. An industrial statistics concentration is available within the framework of either option.

MBA CONCENTRATION

For students whose concentration area is Statistics, the MBA Core is revised to substitute Statistics 5110 for 5010. The concentration area must include 5120 and 5130. Normally, Statistics 5250-60-70 are also included which require 3450 as a prerequisite.

Course Prerequisites: Statistics courses numbered 4000 and above presuppose familiarity with the basic probability distributions in statistics and with the general concepts of statistical estimation and hypothesis testing. Students unfamiliar with these concepts should seek advice from a statistics advisor concerning prerequisite course work.


4310 Regression Analysis (3) Linear regression and correlation, multiple regression, stepwise methods, polynomial regression, use of dummy variables. Use of standard regression computer programs. Elementary theory and applications. Prereq: 6 hrs. in statistics. E

4415 Sampling Techniques and Theory (3) Procedures used in probability sampling for a variety of arrangements of statistical universes and development of estimators and standard errors associated with the sampling schemes. Some properties of estimators. Determination of sample size. Not available for credit to students with credit for 3410. Prereq: 6 hrs in statistics. E

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

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

5010 Probability and Statistical Inference (3) Fundamentals of probability, discrete and continuous probability models, mathematical expectation, and inference concerning means. Prereq: Mathematics 2562 or equivalent and a computer programming course. May not be taken for credit by students who receive credit for 5110. W

5020 Statistical Methods (3) Regression and correlation models, basic time series analysis and forecasting; inferences about one or more proportions, and tests for independence. Prereq: 5010. Sp


5110 Introduction to Probability Theory (3) Classical probability and distribution theory. Prereq: Elementary linear algebra and calculus of several variables. F

5120-30 Theory of Statistical Inference (3, 3) Introductory theory underlying common statistical procedures of hypothesis testing and estimation. Prereq: 5110. W: Sp

5150-60-70 Statistics for Researchers in the Behavioral and Biological Sciences (3,3,3) Principles and applications of statistical methodology, integrated with interactive use of major data analysis systems. 5150—Probability and probability distributions; forming and testing hypotheses using parametric and nonparametric methods. 5160—General linear model; regression methods using matrix algebra. Least-square estimation and general normal-theory testing; simple, multiple, and partial correlation; model selection and diagnostic techniques. 5170—General linear model; analysis of variance methods. One-way, factorial, and nested designs; preplanned and post-hoc tests of contrasts; blocking factors and covariates; random-effects and repeated-measures designs. Must be taken in sequence. Intended primarily for doctoral students. Credit not available to students taking 5050-60-70. Prereq: One year undergraduate mathematics and one undergraduate course in statistics. F, W, Sp

5211 Elementary Statistics (3) Introductory statistics for graduate students. Probability, sampling distributions, estimation, and hypothesis testing. Emphasis on interpretation and decision making. Not available for credit in any College of Business Administration degree program. F, Su

5250 Parametric and Nonparametric Statistics (3) Methods for inference about one or more populations, and measures of association. Prereq: 3450. F

5260 Applied Regression Analysis (3) Simple linear and multiple regression, polynomial models, use of dummy variables, variable selection procedures, and nonlinear least squares estimation. Prereq: Matrix algebra, 3450, and statistical computing experience. W

5270 Design of Experiments (3) One-way ANOVA, multiple range tests, equal and unequal variances, transformations, factorial experiments, completely randomized designs, split-plots, and nested designs. Prereq: 5250. Sp

5310 Statistical Techniques in Industrial Processes (3) Control charts for attributes and variables, capability analysis, parametric and nonparametric tolerance intervals, tool wear, and problems of measurement. Prereq: 3450 W

5320 Statistical Techniques in Industrial Processes II (3) Special control chart techniques, transformations, statistical tolerancing, acceptance sampling, sequential analysis, and analysis of variability. Prereq: 5310. Sp

5610 Special Topics in Statistics (3) Prereq: Consent of instructor. May be repeated. Maximum 9 hrs. E

6060 Applied Multivariate Analysis (3) Applications of multivariate general linear model, analysis of covariance, discriminant analysis and classification, multivariate analysis of variance and covariance, multivariate approach to repeated-measure analysis. Prereq: Graduate level coursework in multiple regression and analysis of variance; experience using SAS or SPSS via interactive terminals. F, W

6070 Factor Analysis (3) Principal component analysis and principal factor analysis; estimates of communalities; methods of rotation; interpretation of factors; cluster analysis. Prereq: 6060. Sp

6250 Linear Models (3) Linear statistical models for analysis of variance with disproportionate and unequal subcell numbers using generalized inverses, concepts of estimability, and hypothesis testing. Prereq: Matrix algebra and either 4310 and Animal Science 5720, or 5720. W
College of Communications

B. Kelly Leiter, Acting Dean
Herbert H. Howard, Assistant Dean for Graduate Studies and Research
Paul G. Ashdown, Assistant Dean for Undergraduate Studies

The College of Communications offers two graduate degrees with a major in Communications, the Master of Science (M.S.) degree and the Doctor of Philosophy (Ph.D.) degree. In addition, Communications is available as a minor for students majoring in other departments. Required course work will be selected after discussion with the major adviser and an adviser from the College of Undergraduate Studies.

The M.S. program is accredited by the Accrediting Council on Education in Journalism and Mass Communication. The College is a member of the Association of Schools of Journalism and Mass Communication and the Broadcast Education Association.

The doctoral program in Communications is listed in the Academic Common Market of the Southern Regional Education Board. Students residing in Alabama, Arkansas, Georgia, South Carolina, Virginia, and West Virginia can normally qualify for in-state fee status by applying to the Academic Common Market coordinators in their state capitals.

MASTER OF SCIENCE

The Master of Science degree 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 also allowing the student to concentrate in one of four fields: advertising, broadcasting, public relations, and newswriting.

A baccalaureate degree in communications or a related field is recommended. Admission is possible with other baccalaureate degrees; however, all applicants without the appropriate background shall be required to take up to 26 quarter hours of prerequisite and co-requisite courses. The appropriate background includes the undergraduate introductory courses in advertising, broadcasting, public relations, and newswriting, and up to four additional courses, suitable to the student’s interest, as assigned by the major adviser. Students may take a proficiency test on any prerequisite course, subject to review by the Master’s Committee of the College of Communications.

Students who have had no courses in their major area of concentration may expect to spend six or more full-time quarters in the program, including a media internship.

Degree Requirements: The M.S. program emphasizes communications management in the areas of advertising, broadcasting, journalism (publications), and public relations. A minimum of 45 hours of approved graduate work is required:

- 12 hours of core courses: Communications 5100, 5121, 5140, and 5470, the first three of which must be taken during the first two quarters of the student’s program, except with written approval of the Assistant Dean for Graduate Studies for the College.
- 12 hours of Communications elective courses consisting of one graduate-level law course from the Communications, Business Administration, or Law Colleges, and one course each from Advertising, Broadcasting, and Journalism from the following list: Advertising 5310 or 5340, Broadcasting 4670 or 5610, Journalism 4420, 5210, or 5710.
- 9 hours of thesis (Communications 5000), including 3 hours of thesis seminar.

Students interested in subsequent entry into a doctoral program are advised to take additional courses in communications theory and research, subject to adviser’s approval. All students in the Master’s program without an undergraduate background or professional experience in communications will normally complete an internship that involves professional experience in the communications field. The student’s internship experience requires approval by his/her adviser. Credit will be given through Advertising 5980, Broadcasting 5980, or Journalism 5980 on the basis of 3 hours credit for the equivalent of 10 weeks of full-time professional experience. This credit is to be included in the student’s 45-hour M.S. program. Previous professional experience will be evaluated by the student’s committee.

After completion of the formal program of coursework and thesis research, the student must pass an oral examination conducted by his/her graduate committee. Communications majors in the M.S. program must demonstrate ability to use a typewriter proficiently within their first quarter in residence.

DOCTOR OF PHILOSOPHY

The Ph.D. degree with a major in Communications is intended to prepare
A student on probation will be dropped from the program unless his or her cumulative graduate grade point average is 3.0 or higher at the end of the probationary period. The probationary period is defined as the next 12 quarter hours of graduate course work attempted that is specified in the student's degree program. Exceptions to this policy may be made only with the approval of the Assistant Dean for Graduate Studies of the College of Communications upon the recommendation of the student's faculty committee.

Communications Research Center

The Communications Research Center is an adjunct to the communications graduate program. Objectives of the Center are: (a) to conduct original research in mass and public communication; (b) to disseminate research-generated information; and (c) to provide research services to faculty and students, professional communicators, and others interested in improving the quality of human communications.

Departments of Instruction

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

Communications

MAJOR DEGREES

Professors: P. G. Ashdown, Ph.D. Bowling Green; J. A. Crook, Ph.D. Iowa State; G. A. Everett, Ph.D. Iowa; J. B. Haskins, Ph.D. Minnesota; H. H. Howard, Ph.D. Ohio; R. E. Taylor, Ph.D. Illinois.

Associate Professors: M. M. Miller, Ph.D. Michigan State; M. W. Singletary, Ph.D. Southern Illinois; N. R. Swan, Ph.D. Missouri.

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

5100 Introduction to Graduate Studies (3) Scope and methods of advanced study in communications. Information sources, literature review methods, scholarly style, thesis and degree requirements and procedure, overview of traditional and behavioral research methods. F

5120 Communications Research Design (3) Nonexperimental, quasi-experimental, laboratory and field experimental designs. Universal research process from idea/problem definition to reporting results. Correlation vs. causation. F

5121 Communications Research Methods (3) Fundamentals and specific applications of most common data-gathering and measurement techniques in communications research: focus groups, mail, personal and telephone surveys; content analysis; mechanical and physiological measurement; observation; attitude measurement. Prereq: 5120 W

5140 Mass Communication Theory I (3) Critical appraisal of selected hypotheses and theoretical concepts in research literature of mass communications. Con-ceptualization of communication processes. Prereq: 5100 or 5100 F

5150 Seminar in Communications Issues (3) Contemporary topics in communications. Prereqs: 5100 and 5140, or consent of instructor. May be repeated. Maximum 6 hrs.

5200 Seminar in Communications Education (3) Principles and historical perspectives of education for journalism, broadcasting, and advertising. Su

5410 Seminar in Communications Law (3) Legal limitations, privileges, and major issues affecting mass media; law of libel and invasion of privacy, development of obscenity law, free press and fair trial, contempt of court, federal regulation of broadcasting, advertising and public relations industries, copyright and access to information. W

5420 Seminar in Communications History (3) Major trends in media history, development of major concepts and issues. Prereq: Survey courses in communications history or consent of instructor. F

5470 Seminar in Media Economics (3) Electronic and print media ownership and finance, role of new technologies and marketing techniques; corporate personnel policy, budgeting and expansion. Sp

5970 Independent Study (3) Reading, research, or projects on special topics in communication. On individual basis, under faculty direction, with consent. May be repeated.

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

6100 Introduction to Doctoral Studies (1) Doctoral degrees and dissertation requirements. Committee formation and program planning. Overview of research methods and informational sources. S/NCG only. F

6140 Mass Communication Theory II (3) Application of theory to contemporary mass communication problems. Topical approach; literature reviews and analytical papers. Prereqs: 5120, 5140, 6100. W

6141 Mass Communication Theory III (3) Continuation of 6140, detailed analysis of selected topics in theory and research. Tutorials, readings, reviews, reports, and papers in fields of interest. Prereq: 6140. Sp

6200 Seminar in Communication Topics (3) Identification, presentation and analysis of special issues and problems in communication. Organization and strategy in writing research proposals. Prereqs: 5100, 5120, 5140. Recommended prereq: 6100 or consent of instructor. Sp

6300 Survey Research Methods in Communications (3) Survey methods applied to opinion and communications media research problems. Planning, sampling, questionnaire construction, interview administration (personal, mail, and telephone), data processing and interpretation. Attitude measurement and message pretesting applications. Prereq: 5120 or consent of instructor. W

6310 Experimental Research Methods in Communications (3) Experimental methods applied to communications research problems. Causal inference from various research designs. Control, single-factor, and multifactor experimental designs. Laboratory and field experiment situations. Prereq: 5120 or consent of instructor or coreq. Basic statistics.

6320 Seminar in Historical Research Methods in Communications (3) Materials and methods in historical, descriptive, and legal research in communications theory and behavior. Prereq: 5100, 5120. Recommended prereq: 5140, 6100. Su

6330 Content Analysis (3) Content analysis as mass media, media research techniques, conceptual foundations. Research design, categorization, sampling procedures, data gathering, and analysis.

Advertising

Professors: J. B. Haskins, Ph.D. Minnesota.
4020 Radio Production (3) Study of radio productions, past and present. Familiarization with production tools and techniques. Group and individual production activities. Prereq: 2750 or consent of instructor. Cannot be taken for graduate credit by communications majors.

4030 Television Production (3) Overview of elements of television production: cameras, sound, lighting, film, videotape recording, optics, and studio control centers. Presented with the layperson and professional broadcasting point of view. Prereq: 4020 or consent of instructor. Cannot be taken for graduate credit by communications majors. F, W, Sp

4040 Advanced Television Production (3) A semi-independent course in program origination, producing, directing and performing with orientation to the professional broadcast student. Prereq: 4030 or consent of instructor. F, W, Sp

4100 Broadcast News Operation (3) Theory and practice in covering local news and public affairs events for radio and television. Gathering and production of news broadcasts, using tools of broadcast newsroom. Prereq: 3810 and 3870 or consent of instructor. 2 hrs and 1 lab. F, W, Sp

4160 Radio-Television-Management (3) Business policies and practices of networks and stations. Departmental functions, cost and income figures, sales techniques, promotion, advertising agencies, and governmental regulations. Lectures by commercial broadcasters. Prereq: 4750 or consent of instructor. F, W, Sp, Su

4600 Broadcast Sales Management (3) Problems and practices of television and radio sales, case studies in sales development, pricing, promotion, and other areas of sales management. Prereq: 2750 or consent of instructor. F, W, Sp

4970 Independent Study (3) May be repeated. Maximum 6 hrs.

5100 Creative Projects (3) For students having specialized broadcast interests or those who wish extensive directed study in creative writing or production projects. May be repeated. E

5160 Public Affairs Broadcasting (3) News and public affairs function in broadcasting stations and networks, including management, economics, personnel utilization, sources of program materials, ethical and legal aspects. Public affairs program development, special topics, conferences, interviews, and news specials. Prereq: 3610 or consent of instructor. Sp

5200 Broadcast Law and Regulations (3) Sociopolitical control of broadcasting; effect of laws, regulations, and public pressures upon station policies. Emphasis on understanding the legal nature of broadcasting in terms of regulation. Prereq: Journalism 4410 or 5210 or consent of instructor. F

5250 Radio-Television Program Development (3) Planning basic program structures for broadcasting stations. Historical trends in programming and current programming practices as related to audience requirements, governmental policy, and competitive conditions. Individual studies of program development on both local station and network levels. Prereq: 2750 or consent of instructor. W

5970 Independent Study (3) E

5980 Internship (3) E

School of Journalism

Professors: J. A. Crock (Director), Ph.D. Iowa State; P. G. Ashdown, Ph.D. Bowling Green; G. A. Everest, Ph.D. Iowa; J. B. Hargrove, Ph.D. Minnesota; B. K. Keiter, Ph.D. Southern Illinois.

Associate Professors: J. N. Adamson, M.S. Tennessee; M. M. Miller, Ph.D. Michigan; M. M. Miller, Ph.D. Toledo; M. W. Singletary, Ph.D. Southern Illinois.

Assistant Professor: M. L. Kern-Foxworth, Ph.D. Wisconsin.

Adjunct Professor: Alex Haley

3120 Writing Feature Articles (3) Selection of topics and practice in writing feature articles for magazines and newspapers. Prereq: 2220 or consent of instructor. E

3410 Communications Law (3) Statutory and judicial precedents affecting mass communications media. Legal, constitutional, administrative, invasion of privacy, copyright, broadcasting, advertising and postal regulations. E

3720 Advanced Public Relations (3) Preparation of communications materials to gain support from various public interest, news, and community relations programs. Prereq: 3710. F, W, Sp

3810 Specialized Publications (3) Editorial and design considerations for company publications and small magazines. Prereq: 2230 and 3310 or consent of instructor. F

3990 Journalism Research Methods (3) Use of social science research methods in journalism with emphasis on survey techniques, interpretation and communication of research findings to public. W, Sp

4130 Editorial Writing (3) Analysis of editorial policy, decision-making, choice of editorial pages, and relationship between editorial opinion and the layperson. Prereq: Journalism 4410 or consent of instructor. W, Sp

4150 Issues in Journalism (3) Topics vary. May be repeated. Maximum 6 hrs.

4310 Reporting Public Affairs (3) Reporting news of public affairs, local, county, state and national coverage. Prereq: 2230 and senior standing. W, Sp

4410 Mass Media and Society (3) Roles and responsibilities of mass media in society. Critique of mass media performance. Media codes and controls on the media. E

4420 Newspaper Management (3) Daily and weekly business operations. Development in newspaper management. Sp

4560 Investigative Reporting (3) Investigative and interpretive reporting of complex or specialized subjects to place news in perspective or to clarify situations. Emphasis on writing for publication. Prereq: 2220.

4710 Public Relations Cases (3) Case studies and application of public relations principles to problems in business and industry, government, institutions, trades and professions; solving problems in public relations situations. Prereq: 3720. F, W, Sp

4810 Journalism in the High School (3) Functions and methods of high school publications. Staff organization, writing and editing techniques, editorial problems, and business management. Su

4910 News and Feature Photography (3) Advanced principles and methods in black-and-white photography. Emphasis on news and feature photographs, and picture stories. Prereq: 3910 or consent of instructor.

4950 International Communications (3) Communication of news and opinion among nations and under varying types of political and economic systems; world news organizations; the press as a factor in international affairs, barriers to the flow of information; comparison of world press systems.

4970 Independent Study (3) May be repeated. Maximum 6 hrs.

5120 Government and the Press (3) Historic and current problems in the relations of executive, judicial, legislative, and regulatory segments of government and press. Prereq: 3110 or consent of instructor. Sp

5250 Public Opinion and Mass Media (3) Nature of public opinion with emphasis on role of press in its formation and how the press in turn is influenced by public opinion. Prereq. 4410 or consent of instructor. F

5310 Reporting Issues in Science (3) Reporting and writing about scientific issues: microbiology/medicine,
School of Journalism/College of Communications

5510 Writing and Editing Projects (3, 3) Specialized writing or editing interests, such as agriculture, politics, labor, finance, science, or technical as well as general publications. Prereq: 2220 or 2230.

5550 Magazine Article Writing (3) Techniques of writing in-depth articles for mass circulation magazines. Prereq: 3120 or consent of instructor.

5560 Magazine Article Writing (3) Techniques of writing in-depth articles for mass circulation magazines. Prereq: 3120 or consent of instructor.

5570 Studies in Public Relations Communications (3) Problems of communication between institutions and organizations and their publics. Prereq: 2710 or consent of instructor.

5810 Magazine Editing and Production (3) Analysis of editorial and production problems of general, regional, and specialized publications. Prereq: Consent of instructor.

5820 Communications and International Development (3) Seminar emphasizing mass media in national and international development. Communications and change in developing countries. Prereq: Consent of instructor.

5970 Independent Study (3)

5980 Internship (3)
## College of Education

Richard Wisniewski, Dean  
C. Glennon Rowell, Associate Dean for Graduate Studies  
Thomas W. George, Associate Dean for Undergraduate Studies  
Charles M. Peccolo, Director, Bureau of Educational Research and Service

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

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

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

### TEACHER CERTIFICATION

Applicants for initial teacher certification and those applicants previously certified who are seeking initial institutional recommendation for certification must gain admission to the College’s Teacher Education Program. A complete explanation of the admission process appears in the General Catalog.

### MASTER OF SCIENCE

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

#### SPECIALIST IN EDUCATION DEGREE

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

#### DOCTORAL DEGREES

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

The Ph.D. program with a major in Education provides six options for study in the departments of Curriculum and Instruction, Educational Administration and Supervision, Educational and Counseling Psychology, Special Education and Rehabilitation, Technological and Adult Education and the divisions of Health and Safety, and Physical Education. The program requirements and the concentrations and emphases are:

### The Program

#### Research Area

- Foreign or Computer Language (demonstrate proficiency) 0-9 Hours

#### General Core Requirements

- Courses in history of education, philosophy of education (two areas must be represented) 6 Hours minimum
- Courses in learning theory, curriculum theory, and administrative theory (three areas must be represented) 9 Hours minimum
- Trans-college seminar—four consecutive quarters 4 Hours minimum

#### Alternative Core Requirements

- Courses in philosophy of science 4 hours minimum
- Transcollege Seminar—four consecutive quarters 4 hours
- Seminar in area of emphasis 4 hours minimum

#### Supporting Emphasis

Courses in learning theory/group or independent study 3 hours minimum

#### Specialization

- Major Option—A minimum of 24 hours normally selected from one or two emphases within the major option 24 Hours Minimum
- Supporting Emphasis—A minimum of 12 hours selected from any one of the five options but not a combination of options. 12 Hours Minimum
- Cognate—A minimum of 9 hours selected from outside the College in addition to the designated research courses. 9 Hours Minimum
- Dissertation 36 Hours Minimum

### Concentrations and Emphases Option I*. - Emphases in Administrative Theory and Practice

Major Options and Emphases:

1. School Administration
2. Higher Education Administration
3. Organizational Leadership and Policy Studies

#### Option II*. - Emphases in Theories of Curriculum Development and Foundations of Education

2. Principles and Models for Planning, Developing, and Evaluating Educational Programs.
3. Research Design for Educational Programs.

#### Option III*. - Emphases in Instructional Theory and Practice

1. Principles and Models for Instructional Improvement.
2. Elementary and Early Childhood Instruction and Practices.
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

**Option IV**. Emphasizes in Theories and Practice of Educational and Personal Adjustment

- Major Options and Emphases:
  1. Counselor Education
  2. Counseling Psychology
  3. Educational Psychology

**Option V**. Emphasizes in Foundations of Human Movement

- 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**

**Option VI**. Emphasis in Health Education

- Public Health (up to 12 hours)
- Safety (up to 12 hours)

*S.M. in Education guidelines available in College of Education.

**Bureau of Educational Research and Service**

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

**Departments of Instruction**

**Art and Music Education**

*C. H. Ball, Head*

**Art Education**

**MAJOR**

**DEGREE**

Art Education

**Professors:**

J. W. Robertson, Ed.D., Columbia (Emeritus),

**Associate Professor:**

J. P. Watkins, M.S., Tennessee.

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

The thesis option requires 45 quarter hours as follows:

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<thead>
<tr>
<th>Quarter hours</th>
<th>1. Art Education 5310, 5320 and electives</th>
<th>18</th>
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<tbody>
<tr>
<td></td>
<td>2. Curriculum and Instruction 5710, and</td>
<td>15</td>
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<tr>
<td></td>
<td>electives</td>
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<tr>
<td></td>
<td>3. Minor (selected with committee)</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td>4. Thesis (Art Education 5000)</td>
<td>9</td>
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</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Quarter hours</th>
<th>1. Art Education 5210, 5310, 5320, and</th>
<th>21</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>electives</td>
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<tr>
<td></td>
<td>2. Curriculum and Instruction 5800, and</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td>electives</td>
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</tr>
<tr>
<td></td>
<td>3. Minor (selected with committee)</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td>4. Electives</td>
<td>6</td>
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</tbody>
</table>

The thesis option requires satisfactory completion of an oral examination prior to awarding the degree, while the non-thesis option requires satisfactory completion of a final written comprehensive examination.

Both the oral and written exams are conducted by the student's Master's degree committee.

Not all courses in art education are offered regularly each quarter, so the student should plan his or her program carefully with a faculty advisor.

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

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

5002 Non-Thesis Graduation Completion (3-15)

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

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

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

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

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

**Music Education**

**MAJOR**

**DEGREE**

Music Education

**Professors:**

C. H. Ball (Head), Ph.D., Peabody; A. W. Humphreys (Emeritus), Ed.D., Illinois; J. H. Jones (Emeritus), Ed.D., Columbia; W. J. Julian, Ph.D., Northwestern; A. W. Tips, Ph.D., Michigan.

**Associate Professors:**

H. A. McKelvie, M.S., Tennessee; J. O. mintz, Ed.D., Columbia; M. C. Moore, Ph.D., Michigan; R. J. Palmer, Ph.D., California (Los Angeles).

**Assistant Professors:**

J. R. Sparks, M.S., Tennessee.

Thesis and non-thesis programs lead to the Master of Science degree in Music Education. Pre-requisite preparation: undergraduate degree or equivalent in music education. All graduate students in music education must pass proficiency examinations in music theory and applied music.

**Thesis Option:**

- Music Education 5210, 5220, 5230 and electives 18
- Music electives 9
- Professional education courses including Curriculum and Instruction 5710 9
- Music Education 5000 9
- **Total** 45

**Non-Thesis Option:**

- Music Education 5210, 5240, 5250, 5710, one seminar, and electives numbered 5000 and above 27
- Music electives at 3000, 4000, and 5000 levels (not to include required undergraduate curricula courses) 15
- Professional education electives including Curriculum and Instruction 5610, Educational Counseling and Psychology 4760, and Educational Counseling and Psychology 5050, 5320, or other appropriate course 9
- **Total** 51

1. Evaluation (in addition to routine examinations in courses): a. Written comprehensive examination in major and minor fields.
2. The student shall elect one of the evaluation procedures below (with approval of advisor and committee):
   (1) Oral examinations in major and minor fields.
   (2) A public recital on principal instrument, piano, or voice.
   (3) The presentation in public performance of an original music composition(s) accepted by the committee as music suitable for school music performing groups.
   (4) Plan, rehearse and conduct a full public performance of music by junior or senior high school music groups. This shall be worked out as a long-term project under the supervision of the student's committee.

2. Student's Committee: A minimum of
three faculty members—the advisor from music education, one member from music, one member from education.

4414-42-43 Teaching Class Piano (1, 1, 1) For majors in music, music education, or elementary education. Prereq: Consent of instructor. F, W, Sp

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

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

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

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


5210 Psychological Foundations of Music (3) Perception; function; aesthetics; talent measurement; implications for teaching theory and practice. A review of classic and current experimental studies. Prereq: Consent of instructor. Su

5220 The Administration and Supervision of School Music (3) Improvement of teacher-learning environment in music education. Preparation for supervision, research, and in-service education, teacher preparation, and guidance. Su, A

5230 Comparative Teaching Procedures in Music Education (3) Modern teaching theories and their implications. Su, A

5240 Evaluation Procedures in Music Education (3) Tests, measurements, and evaluation systems of music development of students at all levels. Standard educational measurements and teacher-made tests applicable to music and specialized evaluative techniques for use in classroom situations. Uses of musical aptitude and achievement tests. Statistical measures applied to learning music. Prereq: General psychology, educational psychology, and elementary statistics. Su

5250 The Role of Music in Education (3) For school personnel, other than music teachers, on the role of music in public education. No previous experience in music required. Su

5260 Music for Early Childhood (3) Prereq: 3120 or 3130 or consent of instructor. Su

5270 Studies of Music for Children in the Primary Grades (3) Children’s growth processes in music for Grades 1-3, and musical experiences. For major in music education and/or elementary education. Prereq: 3120 and 3130 or consent of instructor. Su

5320 Advanced Choral Literature and Conducting (3) Reading, conducting, and interpreting vocal scores utilizing literature for church, and community groups; emphasis on contemporary and standard major choral works. Prereq: Undergraduate degree with a major in music or music education, 4450, 4510 or equivalent. Sp, A

5350-80-70 Special Problems in Music Education (3, 3, 3) Current problems in music education at all levels of instruction and in various specialized areas of music curriculum. Prereq: 5710 or equivalent and consent of instructor. E

5410 Advanced Band Literature and conducting (3) Reading, conducting, and interpreting band scores suitable for high school, college, and community bands; emphasis on contemporary and standard band literature. Prereq: Undergraduate degree with a major in music or music education, 4450 or equivalent W, A

5510-20-30 The Talent Education Program of Shinichi Suzuki (2, 2, 2) Study of the psychology, procedures and literature utilized by Shinichi Suzuki in Talent Education program in Japan. Prereq: Consent of instructor. F, W, Sp

5710 Research in Music Education (3) Prereq: Consent of instructor. Su


5820 Seminar (3) Music teaching in vocal and general music areas of junior high school curriculum. Survey of research, professional literature and development of bibliography. Laboratory activities. Projects. Prereq: Admission to M.S. program. Su, A

5830 Seminar (3) Music teaching in instrumental areas of the elementary, junior high, and senior high curricula. Survey of research, professional literature and development of bibliography. Laboratory activities. Projects. Prereq: Admission to M.S. program. Su, A

5840 Seminar (3) Music teaching in vocal, theoretical, historical, and appreciation area of the secondary school curricula. Survey of research, professional literature and development of bibliography. Laboratory activities. Projects. Prereq: Admission to M.S. program. Su, A

Curriculum and Instruction

MAJORS

DEGREES

Curricular

M.S.

Elementary Education

M.S.

English Education

M.S.

Foreign Language Education

M.S.

Instructional Media and Technology

M.S.

Mathematics Education

M.S.

Reading Education

M.S.

Science Education

M.S.

Social Science Education

M.S.

DEGREES

4450 School Library Administration (3) (Same as Library and Information Science 4150.)

4240 Classroom Instructional Organization (3) Developing understandings and skills relating to grouping, individualization, space utilization, organization, grading, integration, and achieving an effective social climate in the elementary classroom teacher. Prereq: Senior standing.

4292 History and Philosophy of Afro-American Education (4) (Same as Cultural Studies and History 4292.)

4300 Developmental Reading in Secondary School and Community College (3) Approaches and materials for teaching reading skills at the secondary school level. Prereq: Consent of instructor.

4304 Developing Reading Skills in Content Fields (3) Approaches and techniques for improving reading skills in content areas of school programs. Prereq: Consent of instructor.

4400 Problems in Improvement of Instruction (1-3) Special conferences, workshops, or in-service programs designed for improvement of instruction. May be repeated. Maximum 9 hrs. S/N only.

4410 Educational Sociology (3) (Same as Sociology 4410.)

4450 Teaching in Kindergarten: Overview (3) Emphasis on middle school and secondary school programs. Prereq: Consent of instructor.

4451 Teaching in Kindergarten: Program Development (3) Classroom planning and organization; classroom management. Prereq: Consent of instructor.

4454 Methods and Materials in Environmental and Science Education (3) Instructional methods, materials, and curricular programs and courses in environmental and science education. Prereq: Consent of instructor.

4750 Utilization of Instructional Media (3) Introduces...
the basic communications process, need for instructional problems in teaching reading (other than read- 

dings and corrective reading needs. Prereq: course in diagnos- 

ing and teaching children having developmental 

5382 Developmental Reading Practicum (3) Diagnostic- 

tion (3) Examination of alternative approaches to improve 

current practice. Prereq: 5580 or consent or instruc- 

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

5310 Education in Cultural Perspective (3) Contribution of anthropological concepts (primarily concepts of culture) to understanding of education processes, problems, and instructional principles of practice in our society and others. (Same as Anthropology 5510).

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

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

5580 Curriculum Planning and Development (3) (Same as Educational Psychology 5790).

5600 Seminar in Cooperative Curriculum Research (3) Action research procedures and the application to programs. E

5610 Introduction to Data Processing in Education (3) Analysis of current activities in field of educational data processing. Emphasis on curricular, administrative, and research opportunities in education, using modern electronic data processing methods and machines. Prereq: Consent of instructor.

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

5825 Teaching Mathematics in the Middle and Junior High School (3) Problems related to teaching mathematics in middle and junior high schools. Understanding structure of mathematics education, methods, and materials for teaching. Materials suitable for individualized instruction, mathematical laboratories, and individual projects. Opportunities for individual projects. Prereq: 3350 or 3751-52 or equivalent. Su

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

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

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

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

5843 Seminar in Early Childhood Education (3) Analysis of research in early childhood education (K-6) with emphasis on application to programs and methods of instruction. Prereq: 4450 or equivalent, or consent of instructor. May be repeated. Maximum 6 hrs. W

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

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

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

5859 Field Experience (1-9) Application of curricular and instructional principles, methods, and materials in schools. Program prerequisites must be met, and consent of instructor required. May be repeated. Maximum 12 hrs. S/NC only.

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

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

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

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

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

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

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

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

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

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

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

5911 Directing the Forensic Program (4) (Same as Speech 5511.)

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

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

5920 The Teaching of Natural Science (3) Strategies, laboratory techniques, testing and evaluation, professional guidelines for junior and senior high schools, community colleges. Prereq: Consent of instructor.

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

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

5970 The Teaching of the Social Studies (3) Su

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

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

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

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

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

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

6032 Organization and Administration of Reading Programs (3) Synthesizing instructional and learning components of reading into classroom, school, and community practice.
system programs. Prereq: 2 5000-level courses (preferably 5379 and 5304) in reading education or consent of instructor.

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

6060 Advanced Studies in Elementary Education (3) Critical analysis of research as it applies to classroom practice. Prereq: 5710 or 5860. 12 hrs at graduate level or equivalent.

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

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

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

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

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

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

6230 Programs for Curriculum Improvement (3) W

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

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

6282 Advanced Studies in Elementary School Science (3) Critical analysis of current research in elementary school science. Prereq: Undergraduate course and one graduate course in science, or equivalent.

6350 The Professional Education of Teachers (3) Principles and practices of preserve preparation of teachers for American elementary and secondary schools; current and historical trends and issues; innovations and directions for future.

6400 The Dynamics of Educational Change (3) Interpersonal and intrapersonal dynamics relating to change process in education. Prereq: Consent of instructor.

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

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

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

6710 Advanced Educational Statistics (3)

6730 Interpretation of Data (3) Types of data in published educational materials in education; principles of sound interpretation.

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

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

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

6990 Internship (1-6) Advanced level experiences in application of principles and practices of curriculum development and instructional improvement. Program prerequisites must be met and consent of instructor required. May be repeated. Maximum 12 hrs. S/NC only.

6990 Advanced Studies in Secondary Science and Environmental Education (3) Programs, materials, and recent research for middle, junior and senior high schools, community colleges. Prereq: 5860 or equivalent, consent of instructor.

Education MAJOR DEGREE

Education Ph.D.

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

Educational and Counseling Psychology MAJORS DEGREES

Educational Psychology M.S., M.S.Ed.

Educational Psychology Ph.D.

and Guidance Ed.S., Education Ph.D.

Professors:


Associate Professors:


Programs of Specialization: Educational psychology, counseling psychology, school psychology, counselor education, guidance and community agency counseling are programs of specialization offered.

THE MASTER'S DEGREE

For the Master of Science degree, thesis and non-thesis options are available in the following programs: Community Agency Counseling, Educational Psychology, and Elementary or Secondary Guidance and School Counseling. The non-thesis option requires the completion of 60 hours of course work and both options require a comprehensive examination over course work.

THE SPECIALIST DEGREE

The Educational Specialist degree is available through the following programs: Community Agency Counseling, Educational Psychology and School Psychology. Thesis and non-thesis options are available and the number of required credit hours is 90.

THE DOCTORAL DEGREE

The Department is Option IV within the college-wide Ph.D. in Education major and offers program concentrations in: Counseling Psychology (APA approved), Counselor Education, and Educational Psychology. Requirements for Ph.D. in Education are listed on page 56. The Ed.D. in Educational Psychology degree may be obtained through a program concentration in Counselor Education.

Appropriate course work taken in this department will satisfy requirements for certification in Tennessee as a school psychologist or school counselor; course work in the counseling psychology doctoral program is designed to allow the graduate to qualify for certification as a licensed psychologist.

Write the department for information concerning admission criteria and program requirements.

Application deadlines for the Ph.D. or Ed.D. are March 1; Ed.S. and M.S. deadines are March 1 and November 1.

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

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

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

4350-60-70 Special Topics and Problems (1-6, 1-6, 1-6) May be repeated. S/NC or letter grade. E

4460 Standardized Testing (3) Use and interpretation of standardized group instruments in assessment of intelligence, aptitude, achievement, vocational interests, and personality traits.

4480 The Construction of Classroom Tests (3) Concerned with teacher-made classroom tests: instructional objectives, principles of test construction, item analysis, test score validity and reliability, interpretation of test scores, relationship between testing and grading. W, Sp

4760 Advanced Child Study (3) Prereq: 3430 or 3810 or consent of instructor. F, Su

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


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

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

5540 Guidance and Pupil Personnel Services in Education (3) (Same as Vocational-Technical Education 5540) F, Su

5560 Children and Adolescents (3) Mental, social, physical, and emotional growth, development, and learning of children and adolescents; prevention, guidance and counsel of children and adolescents. E

5600 Advanced Studies in Elementary Education (3) Critical analysis of research as it applies to classroom practice. Prereq: 5710 or 5860. 12 hrs at graduate level or equivalent.
identication, and remediation of learning problems. Su

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

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

5100 Developmental Psychology (3) (Same as Psychology 5100) W

5101 Advanced Psychology of Adolescence (3) Theory and research on principles and problems of adolescence development; application to individual adolescents. Prereq: 3810 or equivalent. A

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

5111 Seminar in Current Issues in School Psychology (3) Historical, legal, ethical and technological issues in practice of school psychology. S/NC only.

5140-50-60 Psychoeducational Assessment (3, 3, 3) Naturalistic, psychometric, and sociometric assessment methods on school learning environments. Must be taken in sequence. Prereq: Admission to School Psychology program or consent of instructor.


5190-90-300 Educational Specialist Research and Thesis (3, 3, 3) FNP only. E

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

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

5310 Diagnostic and Corrective Teaching (3) Application of psychology of learning to instruction and problems in the classroom and occupational, and community information in the guidance program; sources, types of materials, and occupational filing plans. For use both in group and individual guidance programs. W, Su

5320 Advanced Classroom Behavior Modification (3) Current research in psychology and its application to educational problems. W, Su

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

5331 Current Developments in Human Learning (3) Sp, Su

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

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

5360 Parent Consultation (3) Theory and practice of parent consultation on problems of children and home. Prereq: 5310, or 5320, or consent of instructor. W

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

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

5785 Career Development: Program Development Implementation and Evaluation (3) Career development and precocial programs and projects, K-12 with emphasis on development, implementation, and evaluation. Prereq: 5780 or equivalent, or consent of instructor. Sp

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

5800 Cross-Cultural Counseling (3) Counseling individuals from various cultural backgrounds. Issues in cross-cultural counseling use of tests and client expectations. Prereq: Consent of instructor or admission to educational and counseling psychology.

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

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

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

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

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

5897 Prepracticum (3) Didactic experiences and counseling simulations in learning laboratory. Coreq: 5890, F, W, Su

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

5940 Counseling Practicum (3) Supervised practice in counseling in elementary or secondary school guidance and/or student personnel work. Prereq: 4640, 5060 or 5340, 5890, 5897 or consent of instructor. May be repeated with consent of department. Maximum 6 hrs. E

5950-60-70 Theory and Practice of Consultation (3, 3) (Same as Psychology 5950-60.)

5959-5969 Practicum in Counseling (2, 3) (Same as Psychology 5959-60.)

5970 Internship in Community Agency Counseling (1-6) Supervised training at departmentally-approved internship sites. Prereq: Consent of instructor and admission to the community agency counseling program. May be repeated. Maximum 12 hrs. S/NC only. E

5975 Vocational Assessment (3) Use and interpretation of tests in vocational assessment. Prereq: 4640 or Psychology 4640 or 5780, or consent of instructor.

5980 Organization and Administration of Pupil Personnel Programs (3) Basic principles, procedures, and policies. Prereq: 4640 or 5040 or 5210, or consent of instructor. W

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

6040 Seminar in Educational and Counseling Psychology (1-3) Seminar required in fall quarter. Maximum 4 hrs. S/NC only. F (Formerly: Seminar (1))

5919 Internship in School Psychology (1-6) Supervised training at departmentally-approved internship sites. Prereq: Consent of instructor and admission to the school psychology program. May be repeated. Maximum 12 hrs. S/NC only. E

6006 Internship in Counseling Psychology (1-6) Supervised training at departmentally-approved internship sites. Prereq: Consent of instructor and admission to the doctoral program in counseling psychology. May be repeated. Maximum 12 hrs. S/NC only. E

6007 Internship in Educational Psychology (1-6) Supervised training at departmentally-approved internship sites. Prereq: Consent of instructor and admission to the educational psychology program. May be repeated. Maximum 12 hrs. S/NC only. E

6008 Internship in Counseling Education (1-6) Supervised training at departmentally-approved internship sites. Prereq: Consent of instructor and admission to the counselor education program. May be repeated. Maximum 12 hrs. S/NC only. E

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

6120 Application of Experimental Research Design (3) Experimental designs used by researchers in educational psychology, counseling, and college student personnel. Prereq: 6110 or equivalent. W

6150 Ethical and Professional Issues in Psychology (3) Professional, ethical, and legal issues related to research, human services, teaching and public policy. Prereq: Admission to Psychology doctoral program or consent of instructor. (Same as Psychology 6510.) Sp

6160-20-30 Seminar in Dissertation Proposal Writing (1, 1, 1) Preparation and evaluation of dissertation proposals. Prereq: Two consecutive statistics courses or consent of instructor. W

6750-60-70 Special Topics and Problems (1-6, 1-6, 1-6) Not to be taken to fulfill regular 6000-level course requirements. Prereq: Consent of instructor. May be repeated. Maximum 12 hrs. May be taken for letter grade or S/NC. E

6810 Seminar in Counseling (3) Selected counseling theory, topics, issues. Prereq: 5890 or consent of instructor. May be repeated. F, W, Sp

6820 Analysis of Personality Theories (3) Comprehensive and systematic conceptual analysis of major personality theories. Implications for research in counseling and education. Prereq: Consent of instructor or admission to educational and counseling psychology.

6910 Special Topics Seminar (3) Exploration of specific research or theoretical topics with students who have necessary background. Topic will vary from quarter to quarter, depending upon instructor. Prereq: Advanced standing as doctoral student. May be repeated. S/NC only. F, W

6931-32-33 Practicum in Counseling Psychology (3, 3, 3) Supervised practice. Minimum: 90 clock hours each quarter. Prereq: Admission to counseling psychology program and consent of instructor. F, W, Sp

6940 Group Counseling Practicum (3) Supervised practice with children and/or adults. Prereq: 5340, 5890, 5897, and 5940 and consent of instructor. May be repeated. Maximum 12 hrs. S/NC only. E

6941-42-43 Practicum in Guidance, Counseling, and Personnel Services (3, 3, 3) Supervised practice in application of guidance, counseling and personnel services. Minimum: 90 clock hours each quarter. Prereq: 5890 and consent of instructor. E

6944-45-46 Teaching Practicum (3, 3, 3) Prereq: Acceptance in doctoral program and consent of instructor. May be repeated. Maximum 6 hrs for each course. E

6950 Counseling Supervision (3) May be repeated with consent of advisor. Prereq: 5890, 5940, 6810, 6941. S/NC only. E
Educational Leadership

MAJORS

College Student Personnel

Educational Administration

Education

DEGREES

M.S.

M.S., Ed.D.

Ed.D.

Ph.D.

Professors:

D. H. Stofiar (Head), Ph.D. Ohio State


M. C. Monnino, Ph.D. Florida State

C. M. Peccolo, Ph.D. Iowa, E. M. Ramer (Emeritus), Ed.D. Columbia; R. K. Roney, Ed.D. Tennessee


Associate Professors:

G. W. Harris, Jr., Ph.D. Michigan; P. M. Husen, Ed.D. Stanford; R. T. Mertz, Ed.D. Columbia

D. R. Quarles, Ed.D. Tennessee

Assistant Professors:


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

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 an emphasis 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 portion 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. A minimum of 24 credit hours beyond the baccalaureate degree, including 9 hours of 5190-20-200 is required. Twelve hours must be in a collateral area within the college and 12 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 90 credit hours beyond the baccalaureate degree including 9 hours of 5190-20-200 is required. Twelve hours must be in a collateral area within the college and 12 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 PROGRAMS

For the Ed.D. program, the minimum credit hours are determined by the student's doctoral committee. Nine to 12 hours must be in a collateral area within the college and 9-12 hours outside the college unless the student has a Master's degree in a field outside the College of Education. Three consecutive quarters of 6040 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. degree with a major in Education includes concentrations and emphases as listed on page 55.

Educational Administration and Supervision

Thesis Option: A minimum of 45 credit hours including 9 hours of Thesis 5000 is required. A major consists of a minimum of 24 hours. An internship is highly recommended but not required. A final oral examination is required. A written exam at the option of the committee.

Non-Thesis Option: A minimum of 51 credit hours with a minimum of 24 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 90 hours, which includes 9 hours of practicum experience, is required in either option.

THE EDUCATIONAL SPECIALIST PROGRAM

Thesis Option: A minimum of 90 credit hours beyond the baccalaureate degree, including 9 hours of 5190-20-200 is required. Twelve hours must be in a collateral area within the college and 12 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 90 credit hours beyond the baccalaureate degree including 9 hours of 5190-20-200 is required. Twelve hours must be in a collateral area within the college and 12 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.

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

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

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

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

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

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

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

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

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

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


5560 Research for Educational Administrators (3) Descriptive, experimental, and quasi-experimental designs to help students analyze quantitative background to read and understand technical literature. Primarily for nonthesis option students, should be taken early in M.S. or Ed.S. program. W, Su

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

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

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

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

5741 Problems in Educational Administration and Supervision: Preparation Programs (3) May be repeated. E

5751 Problems in Educational Administration and Supervision: Community Education (3) Independent study of administrative problems. May be repeated. E

5752 Problems in Educational Administration and Supervision: Finance (3) May be repeated. E
5753 Problems in Educational Administration and Supervision: Transportation (3) May be repeated. E
5754 Problems in Educational Administration and Supervision: Business Management (3) May be repeated. E
5755 Problems in Educational Administration and Supervision: Personnel (3) May be repeated. E
5756 problems in Educational Administration and Supervision: School Plant (3) May be repeated. E
5757 Problems in Educational Administration and Supervision: Organization and Structure (3) May be repeated. E
5758 Problems in Educational Administration and Supervision: School Law (3) May be repeated. E
5759 Problems in Educational Administration and Supervision: Supervision (3) May be repeated. E
5760 Maintenance of School Plants (3) Skills in operating school custodial and maintenance programs. Sp
5810 Survey Research Methods (3) Overview of descriptive studies, data collection, analysis, and interpretation for survey studies and school surveys, strategies for designing, implementing, and utilizing surveys. F, Su
5850-60 Independent Study in Educational Administration (3, 3) Prereq: Consent of instructor. E
5900 Special Topics (3) May be repeated. E
5910-20-30 Problems in Lieu of Thesis (3, 3, 3) S/NC only. E
5950 Elementary Administrators Seminar (3) For in-service training of elementary school administrators. Developments, problems, programs, and trends of elementary schools and management skills of elementary school administrators. Prereq: Presently an elementary school administrator or consent of instructor. May be repeated. S/NC only. F
5960 Middle School Administrators Seminar (3) For in-service training of middle school administrators. Developments, problems, programs, and trends of middle schools and management skills of middle school administrators. Prereq: Presently a middle school administrator or consent of instructor. May be repeated. S/NC only. F
5970 Secondary Administrators Seminar (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 a secondary school administrator or consent of instructor. May be repeated. S/NC only. F
6000 Doctoral Research and Dissertation (3-15) Pr/NC only. E
6040 Seminar in Educational Administration and Supervision (1) Required three consecutive quarters. S/ NC only. E
6100 Internship in Educational Administration (3) May be repeated at discretion of student's committee. Opportunity for doctoral students and advanced graduate students to gain experience in performance of critical tasks of educational administration under supervision of practitioner and University representative. E
6110 Administrator Update (3) Current topics of concern to practicing school administrators, selected each quarter and presented by a specialist. Prereq: Presently a school supervisor or instructor, or consent of instructor. May be repeated. S/NC only. E
6340 Current Trends in School Law (3) Logical arrangement of case and statutory material for public school administration; in-depth examination of problems concerning the law and public education. W, Su
6350 Instructional Supervision—School District (3) Definitive theories and practical applications of instructional supervision at the school district level. Supervisory operations including goal development; curriculum development; instructional support, help, and service for teachers and administrators; personnel development; program evaluation. W, Su
6420 School Board-Superintendency Relationships (3) The local unit of school administration, school district and its governing body, board of education or school board. Sp
6440 School Business Management (3) Emphasizes superintendency team concept, planning, procurement and utilization of fiscal resources. F, Su
6450 Grant and Contract Proposal Preparation (3) Grants and contracts processes in education. Basic concepts applicable to other special agencies. A
6460 School Personnel Administration (3) Personnel administration 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. F, Su
6480 Special Topics in School Personnel Administration (3) Human problems in school personnel administration; staffing plan, record systems, personnel policy development; collective bargaining in education; and staff evaluation. May be repeated. Maximum 12 hrs. W, Su
6530 Futuristic Educational Planning Methods (3) Methods for describing alternative futures. A
6540 Contemporary Economics and Educational Finance (3) Contemporary educational finance policies and their influence on educational service and program, national economy, welfare of individuals, and welfare of the nation. W, F, Su
6550 State-Federal Relations in Education (3) Purposes and functions of federal/regional/state/local educational agencies, organizational control and political variables. Major education laws, rule and regulation-making process, grants and contracts as inter-level policy instruments. F, Su
6560 Legal Foundations of Public Education (3) Legal framework and theoretical concepts that impinge on operation of public education within present legal structure of the United States. A
6580 Seminar in Managing Conflict (3) Learning about and experiencing various forms of conflict. W, Su
6750-60-70 Independent Studies in Educational Administration and Supervision (3, 3, 3) Prereq: Consent of instructor. May be repeated. E
6800 Administration of Complex Educational Organizations (3) Concepts and theoretical formulations to understand, analyze, evaluate, and change complex educational organizations. W, Su
6870 Advanced Study in School Facility Planning (3) In-depth experiences in development of educational specifications, selection and evaluation of leadership in creation of quality educational facilities. A
6900 Special Topics (3) May be repeated. E
6981 Specialized Seminar: School Operation (3) E
6983 Specialized Seminar: State School Administration (3) E
6984 Specialized Seminar: Preparation Programs (3) E
6990 Specialized Doctoral Seminar in Politics of Education (3) Political theories and practices as they affect operation of public school system. Appropriate interdisciplinary discussions based on literature and research from education, sociology, and political science. One field inquiry. Prereq: 5290, 5810 or equivalent or consent of instructor. W
6991 Specialized Seminar: Theory (3) E
6992 Specialized Seminar: Finance (3) E
6994 Specialized Seminar: Business Management (3) E
6997 Specialized Seminar in Organization and Structure (3) Organizational theories in education including systematic review of status of organizational and leadership research in education and related disciplines; implications for further research; application of existing theory and research to known educational settings. Prereq: Consent of instructor. A
6998 Specialized Seminar: School Law (3) E
6999 Specialized Seminar: Supervision (3) A
Higher Education
4554-55-56 Student Leadership Workshops (1, 1, 1) Small group and individualized experiences to develop knowledge and skills in leadership roles; for resident assistants, student government leaders, student activities, other student organizations. Prereq: Consent of instructor. S/NC only.
5000 Thesis (1-19) F/P/SP only. E
5002 Non-Thesis Graduation Completion (3-15) Required for the non-thesis student not otherwise registered during any quarter when such a student uses university facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. S/NC only. E
5110 Seminar in College Teaching (3) Effective college teaching: testing and measurement; recent research in college instruction; major problems and issues in higher education. Required of candidates for the MACT degree. S/NC only. Sp
5410 College and University Law—The Legal Envi- ronment (3) Legal precedent affecting organization, administration, and financing of public higher education. Academic freedom, faculty termination, taxation, private support, religion, tort liability, administrative law, academic due process, and affirmative action in employment. W
5420 College and University Law—Constitutional Rights and Responsibilities of Students (3) Legal precedent affecting student personnel services in public higher education. Student discipline, housing, dress, organizations, activities, fees, tuition, and related federal regulations. A
5440 American Higher Education (3) Purposes, functions, organizations, and programs. F, Sp
5450 Instruction in Higher Education (3) Problems, procedures, and techniques. W
5470 The Curriculum of Undergraduate Higher Edu- cation (3) Background, content, and organization of instructional programs, trends and evaluation procedures, including accreditation activities. A
5510 Governance of Colleges and Universities (3) Development, change, trends, process, and structure of collegiate governance. W, F
5580 Fiscal Problems in Higher Education (3) Revenue sources and fiscal management in public and private colleges and universities. Sp
5750 Student Personnel in Higher Education (3) Philosophy and scope.
5780 Case Studies in College Student Personnel (3) Prereq: 5750 or consent of instructor. E
5860 The Community-Junior College (3) History and role of the junior college, major functions, organization and administration, problems, and issues. F, Sp
5885-65-75 Practicum in Continuing and Higher Edu- cation (1-3, 1-3, 1-3) Supervised practice in selected areas of instruction or administration of continuing or higher education programs. S/NC only. E
5900-70-80 Seminar in Continuing and Higher Edu- cation (1-3, 1-3, 1-3) Review of educational and administrative problems of professionals in fields of adult or higher education. E
5990 Practicum in College Student Personnel (3) Prereq: 5750, 5770, Educational Psychology 5560, or consent of instructor. May not be repeated with consent of instructor. Maximum 9 hrs.
6190 Administration in Higher Education (3) Developing conceptual understanding of administrative theory and practice in higher education. F, Su
Special Education and Rehabilitation

MAJORS

Special Education
Vocational Rehabilitation Counseling
Education

DEGREES
M.S.
M.S.
Ph.D.

Professors:

Mississippi State

Associate Professors:

Assistant Professors:
W. M. Mulkey, Ph.D. Florida State.

Instructors:
D. H. Ashmore, M.S. Tennessee; M. Griffin, M.D. Tennessee; M. S. Wilson, M.S. Tennessee; G. D. Tyler, M.S. Tennessee; K. M. Warden, M.S. Tennessee.

Lecturers:
H. L. Byrd, Jr., M.S. Tennessee.

The Department of Special Education and Rehabilitation offers graduate programs (thesis and non-thesis options) leading to the Master of Science degree with a major in Special Education or Vocational Rehabilitation Counseling. These are competency-based programs and experiences to prepare regular, special education, and rehabilitation personnel to work with exceptional persons: children and adults. Specialized courses may be distributed over the several areas of exceptionality with emphasis in area of special interests or need. Facilities are available for continuous observation and participation in direct relationships with handicapped children and adults who are hospitalized, homebound, or in residential schools, special classes, or regular classes.

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

Programs lead to the Master of Science degree in Special Education with an emphasis on one of these areas:

The Doctor of Philosophy degree with a major in Education includes concentrations and emphases as listed on page 56.

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

For further information write the department head.

EDUCATION OF THE HEARING IMPAIRED

4230 Communication Processes for the Hearing Impaired

Impaired I (3) Various communicative skills required by hearing impaired person; speech and language development; training, speechreading, manual language and its relation to other forms of communication: Observations and practicum. Prereq: Consent of instructor.

4231 Communication Processes for Hearing Impaired II (3) Intermediate course in manual communications skills and techniques with emphasis on vocabulary development, expert receptive and expressive fluency. Prereq: 4230 or consent of instructor.

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

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

4870 Student Teaching with Hearing Impaired Children (9) Supervised practicum with preschool, day school, and residential pupils. S/NC only. F, W, Sp

4871 Practicum with Hearing Impaired Children (6) S/NC only, F, W, Sp

5190 Speech Development of Hearing Impaired (3) Theories of speech development of hearing impaired; developmental approach in training perception and production of speech in hearing impaired persons. Prereq: Audiology and Speech Pathology 3060; Audiology and Speech Pathology 3710. W

5202 Practicum in Speech Development of Hearing Impaired (3) Application of theories and techniques in training perception and production of speech in hearing impaired persons. Prereq: 5190. Sp

5210 Language Development of Hearing Impaired I (3) Basic principles of transformational grammar, case grammar, and other formal systems as used to describe language and language development of hearing impaired. F

5220 Linguistics in the Education of the Hearing Impaired (3) Recent research and developments in linguistics related to hearing impaired. F


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

5244 Orientation to Deaf-Blindness (3) Definition, types, etiology of deaf-blindness; impact of deaf-blindness on devices and community resources for deaf-blind persons. F

5245 Rehabilitation of Deaf-Blind Persons (3) Aspects of deaf-blindness pertinent to vocational rehabilitation. Prereq: 5244 or consent of instructor. Sp

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

5290 Teaching Reading to Hearing Impaired (3) Specific methods necessary to teach reading to prelingually hearing impaired student. Prereq: 5210. W

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


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

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

5821 Assessment of Hearing Impaired Learners (3) Types of diagnostic evaluations of hearing impaired children: screening, formal testing, continuous progress evaluation. Sp

EDUCATION OF THE MENTALLY RETARDED

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

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

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

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

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

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

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

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

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

MULTIPLE DISABILITIES

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

4160 Education of Children with Crippling and Special Health Conditions (3) Nature of crippled child; skills for identifying educational, physical, and emotional characteristics; appropriate educational modifications and associated services. Prereq or coreq: 3353 or consent of instructor. admission to Teacher Education. F, W

4840 Educational Problems of the Cerebral Palsied Child at Home and School (3) Physical, social, and educational needs of cerebral palsied; evaluative techniques; related services. A
4291 Student Teaching in Crippling and Special Health Conditions (3-15) Observation and supervised practicum in home, hospital, and classroom. S/NC only.
A

EDUCATION OF THE EMOTIONALLY DISTURBED

4610 Nature and Characteristics of Learning and Behavior Disorders (3) Forms of academic and social-ly disruptive behavior; variety of disorders; severity, causes, and relationships to each other. Relationships with respect to personality characteristics and development factors interpreted through behavioral and psychodynamic theory as well as practical situations in which learning and behavior disorders may occur.
F

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

4630 Practicum in Residential Settings Serving Children with Disturbing Behavior (3) Practice in scientifically identifying, observing, and recording disturbing behaviors. Initiating behavior changes regarding academic and program behavior. Teacher aide capacity within regular classrooms. Special emphasis and practic in individualizing instruction for learning and behavior problems, interpreting the regular and the regular classroom setting. Discussion and evaluation of relevant methods and materials unique to each teaching situation. Prereq: 4610 and 4620 or consent of instructor. A

4640 Practicum in Public School Systems Serving Children with Learning and Behavior Problems (6) Advanced concepts and techniques in teacher aide capacity within regular classrooms. Special emphasis and practice in individualizing instruction for learning and behavior problems, interpreting the regular and the regular classroom setting. Discussion and evaluation of relevant methods and materials unique to each teaching situation. Prereq: 4610 and 4620 or consent of instructor. A

4924 Student Teaching of the Emotionally Disturbed (3-18) Tutoring and classroom observation and teaching of the emotionally disturbed individual. Prereq or coreq: Curriculum and Instruction 4720 or 4820. S/NC only.

REHABILITATION COUNSELOR

EDUCATION

5100 Orientation to Rehabilitation (3) History, philosophy, and legal bases for rehabilitation movement; case finding, intake, diagnosis, physical restoration, counseling, training, placement, follow-up, relation to professional behavior. Techniques performed in a residential facility and work within a residential classroom; and to take part in discussion and evaluation of relevant academic curriculum and training for rehabilitation counselors. Prereq: 4610 and 4620 or consent of instructor. A

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

5210 Job Development and Placement in Rehabilitation (3) Identifying work for handicapped persons; utilization of vocational resources and materials and techniques including field experiences for analyzing situations, procedures necessary for helping a handicapped individual successfully adjust to a work environment and assessment of future trends within labor market. Su

5310 Seminar in Rehabilitation (2, 3)

5411 Diagnostic Vocational Evaluation in Rehabilitation (3) Process, principles, and techniques used to determine work behaviors and vocational potential. Includes rationale underlying selection and use of occupational evaluation programs, work samples, situational tasks, simulated work experiences, and job tryouts in vocational evaluation. Prereq: 5141 Sp

5420 Vocational Assessment in Rehabilitation (3) Process, principles, and techniques used to determine and predict work behaviors and vocational potential. Includes rationale underlying selection and use of occupational evaluation programs, work samples, situational tasks, simulated work experiences, and job tryouts in vocational evaluation. Prereq: 5141 Sp

5430 Interpretation of Vocational Evaluation Data in Rehabilitation (3) Procedures, principles, and techniques used in interpretation of vocational evaluation data to handicapped adults, to referral agency, and to facility staff. Interpretation of data through the formal staff conference, vocational counseling report writing, and follow-up. Prereq: 5141 and 5142. Su

5440 Development and Supervision of Client Evaluation Programs (3) Procedures involved in establishment and maintenance of effective vocational evaluation programs. Determining and planning amount of floor space, type of equipment, type and number of staff, and lines of communication essential to maintenance of vocational evaluation programs. Effective supervisory, referral, recording, budgeting, and staff development practices. Prereq: 5141, 5142 and 5143, or consent of instructor. Su

5455-46 Practicum in Rehabilitation (3, 3) Supervised experience in area of rehabilitation with emphasis on application of concepts, principles, and skills acquired in previous or concurrent course work. Prereq: Consent of instructor. W; Sp

5500-50 Internship in Rehabilitation (9, 9)

5710 Medical Aspects of Disability I (3) Etiology, clinical signs, symptoms and diagnostic procedures related to musculoskeletal, neurological, circulatory, and respiratory diseases/disorders. Effect on structure and function of the human body. Restorative measures including or related to handicapped individuals. Skills necessary to communicate effectively with lay persons and medical community on evaluation of impairments and administration of appropriate rehabilitation services. F

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

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

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

5750 Principles and Problems of Disability Evaluation (3) Individual identification and analysis of principles and problems of disability evaluation process or structures; emphasis on problems of disability evaluation process or structures, and innovation, exploration of alternatives, and sharing experience within group. Prereq: 5700 or consent of instructor. W

5760 Seminar: Functional Capacity Assessment (3) Criteria for residual functional capacity assessment in disability insurance claims and critical problems in achievement or acquisition of residual functional capacity assessments. Prereq: 5710-20 or consent of instructor. Su

5771 Current Problems in Disability Claims Evaluation (1-3) Current problems in process, content, or administration of disability claims evaluation; workshops in identification and proposal of alternative solutions. May be repeated with consent of instructor. S/NC only.

SCHOOL SPEECH AND HEARING THERAPY

4030 Professional Aspects of Speech/Language Hearing Programs in Schools (2) Organization and administration of school programs. Other settings, hospitals, institutions, private practice, professional certification levels, legislation, careers.

4040 Appraisal of Speech and Language Disorders (4) Prereq: 3200, 4330 or consent of instructor. (Same as Audiology & Speech Pathology 4040.)

4120 Introduction to Clinical Practice in Speech Pathology (3) (Same as Audiology and Speech Pathology 4120.) S/NC only.

4330 Clinical Practice in Speech Pathology (1-6) (Same as Audiology and Speech Pathology 4330.)

4340 Clinical Practice in Speech Pathology I (1) (Same as Audiology and Speech Pathology 4340.) Audiology and Speech Pathology is the primary department.

4341 Clinical Practice in Communication Disorders in Schools (3) Prereq: 4030, 4320-30-40 and consent of instructor. F, W, Sp

4342 Seminar in Communication Disorders in Schools (3) Prereq: 4030, 4320-30-40 and consent of instructor. F, W, Sp

4900 Voice Disorders (4) (Same as Audiology and Speech Pathology 4900.)

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

4930 Aural Rehabilitation: Speechreading and Auditory Training (3) (Same as Audiology and Speech Pathology 4930.)

4940 Introduction to the Verb-Tonal System (4) (Same as Audiology and Speech Pathology 4940.)

4950 Advanced Clinical Practice in Audiology Study and Practice (1-6) (Same as Audiology and Speech Pathology 5040.)

5380 Cerebral Palsy (3) (Same as Audiology and Speech Pathology 5380.)

5389 Clerical Palate (3) (Same as Audiology and Speech Pathology 5380.)

5540 Seminar in Language Pathology (3) (Same as Audiology and Speech Pathology 5540.)

EDUCATION OF THE VISUALLY HANDICAPPED

4160 Education of Partially Sighted Children (3) Curricular adjustments and materials; home visits for parents; cooperation in medical care and special needs.

A

4850 Eye Problems Encountered by the Teacher (3) Eye anatomy and hygiene; common diseases and defects; testing and treatment; educational adjustments for specific eye conditions; related service resources.
GENERAL COURSES

3333 Education of the Exceptional Child (3) Prerequisites: characteristics, and special needs: local and state programs for diagnosis and care; educational provisions in regular or special classes; home teaching; social and vocational guidance. E

4350-60-70 Problems in the Education of Exceptional Children (3, 3, 3) Prerequisite: Consent of instructor. E

4520 Language-Speech Handicapped Child in the Classroom (3) Recognition, understanding, observational procedures on referral procedures, agencies, legislation, incorporation of speech improvement-language development activities, and course material. For students not majoring in speech pathology or audiology. F, Sp, Su

4740 Evaluation Exceptional Students (3) Evaluation of educational; theoretical considerations and methods of evaluating exceptional students; basic statistical concepts relative to norm- and criterion-reference tested. Prerequisite: 3333 or consent of instructor, admission to Teacher Education. F, W, Sp

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

5092 Non-Thesis Graduation Completion (3-15) Required for the non-thesis student not otherwise registered during any quarter when such a student uses university facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. S/NC only. E

5200 Nature and Needs of Mildly Handicapped (3) Identification and analysis of needs, professional definitions, environmental etiologies, and learning characteristics and educational settings. Professional roles and responsibilities of teachers. Prerequisite: 3333 or consent of instructor.

5201 Education of Mildly Handicapped (3) Methods of planning, implementing, and evaluating instruction; materials evaluation and adaptation to meet needs. Prerequisite: 5290.

5260 Education of Gifted Children (3) Curricular and social adjustments. E

5261 Instructional Systems for the Gifted and Talented (3) Instructional systems and strategies in terms of effectiveness with gifted children in various educational environments. Translate theory into practice. Prerequisite: 5260 or consent of instructor.

5262 Psychosocial Development of Gifted Children (3) Phenomena of talent development in context of home, neighborhood, and school. Practices which promote development. Prerequisite: 5260 or consent of instructor.

5300 Nature and Needs of Moderately and Severely Handicapped (3) Identification of legal and professional definitions, biological and environmental etiologies, and learning characteristics and educational settings. Professional roles and responsibilities of teachers. Prerequisite: 3333 or consent of instructor.

5301 Education of Moderately and Severely Handicapped (3) Identification and analysis of methods and materials. Review of traditional techniques and strategies plus innovative approaches. Prerequisite: 5300.

5400 Assessment and Remediation of Learning Disabilities (3) Identification and remediation of learning problems of children: neurological and medical aspects; task analysis of cognitive, affective, and psychomotor skills; formal testing diagnostic material emphasizing cognitive development. Optimizing teaching instruction combined with a prescriptive teaching approach to learning disabilities. A

5401 Prescriptive Teaching for Children with Learning Disabilities (3) Diagnostic test materials to assess functional levels of ability followed by specific remedial recommendation consistent with functional ability level. Emphasis on reading and mathematical skill development, materials designed for a diverse population, high interest-low vocabulary, assessing sensory, linguistic, and motor development. A

5402 The Exceptional Child in the Regular Classroom (3) Adoption, modification, delivery, and maintenance of instructional activities for exceptional child within regular classroom. Learning and academic considerations stressed. Prerequisite: 5401 or consent of instructor. A

5403 Resource Teachers for the Handicapped (3) To help students acquire the skill to maintain mildly handicapped children in regular public education environments; development of decision-making and expectations, interpersonal relationships, assessments of abilities, modifications of curriculum content, and applied teaching methodologies. A

5410 Instructional Media for the Handicapped: Design, production, and evaluation of protocol curricular materials. (3) Materials (9) Perception, communication and learning theories; media design and advanced production techniques. Emphasis on planning and producing prototypical media materials specifically designed to meet needs of handicapped learners. Empanelment limited to persons holding major responsibilities for media in program for handicapped or similar setting. (For Summer Media Institute only.) A

5450-60-70 Experience in Teaching and Supervising of Exceptional Children (1-6, 1-6, 1-6) E

5510-20-30 Administrative Practicum on Problems in Institutional Care of Children (3, 3, 3) Physical and social development; business and personnel management. Prerequisite: Training and experience in institutions for children, or consent of instructor. A

5550-60-70 Problems in the Education of Exceptional Children (3, 3, 3) E

5555 Special Topics (1-3) May be repeated. Maximum of 15 hrs. S/NC or letter grade.

5620 Families in Special Education (3) Dynamics of "special" families. Family's interactions with social agencies and institutions in regard to judicial and legislative processes. Prerequisite: Consent of instructor. F, W


5640 Special Education Policies, Procedures and Practices (3) Review of special education procedures: referral process, multidisciplinary teams, individualized educational programs, due process, and options of service. Philosophical principles of special education. Prerequisite: 5780 Career Development: Workshop (1-6) (Same as Educational Psychology 5780.) A

5801 Neuromuscular and Health Disorders in Children (3) Neuromuscular disorders, physical ailments, and special health conditions. Neurological functioning and how impaired functioning interferes with learning process. Prerequisite: 3333 and admission to teacher education.

5802 Instructional Techniques for Physically Disabled Student (3) Investigation of instructional techniques and adaptations appropriate for physically disabled and health impaired students. Non-oral communication systems, adaptive equipment, use of computers with disabled, handling and positioning disabled. Prerequisite: 3333 and admission to teacher education.

5830 Seminar: Issues and Theories in the Education of the Exceptional Child (3) Current trends in education of exceptional child, application of philosophical approaches to education, analysis of current theories of integration as applied to exceptional child. Current research concerning education and/or rehabilitation of exceptional persons. Prerequisites: Curriculum and Instruction 5880 or Educational Psychology 5210 and consent of instructor. A

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

5970 Juvenile Delinquency and the School (3) Principles of rehabilitation of exceptional persons. Theory applications in educational settings. Prerequisite: Admission to doctoral program or consent of instructor.

6020 Seminar in Social Processes in Special Education and Rehabilitation (3) Social phenomena which influence impact of disability on person and on significant others. Impacts for habilitation. Prerequisite: Admission to doctoral program or consent of instructor.

6030 Seminar in Assessment in Special Education and Rehabilitation (3) Procedures and issues in assessment: pupil or client identification; educational or rehabilitative intervention, and program or method evaluation. Prerequisite: 4740 or equivalent; introductory statistical methods.

6040 Seminar in Research in Special Education and Rehabilitation (3) Instruction in development and implementation of research. Independent research studies. Research proposals. Prerequisite: 9 hrs of research course and consent of instructor.

6100 Internship in College Teaching and Supervision (3-9) Supervised practice in college teaching and supervision. Prerequisite: Admission to doctoral program or consent of instructor. May be repeated. Maximum 9 hrs. S/NC only.

6200 Internship in Research in Special Education and Rehabilitation (3-9) Placement with professional engaged in theoretically-researched based research; public schools, institutions, agencies or university settings. Prerequisite: 9 hrs in statistics and research methods. May be repeated. Maximum 9 hrs. S/NC only.

6300 Internship in Institutional Leadership in Special Education and Rehabilitation (3-9) Advanced level field experiences under direction of practitioner. Prerequisite: Consent of instructor. May be repeated. Maximum 9 hrs.

Technological and Adult Education

MAJORS

Adult Education

Agricultural Education

Business Education

Industrial Education

Vocational-Technical Education

EDUCATION

MS., Ed.D., Ed. D.

Professors:

G. D. Cheek (Head), Ph.D., Kansas State;
W. A. Cameron, Ph.D., Ohio State;
J. L. Matthews, Ph.D., Arizona State;
R. J. Woodin (Emeritus), Ph.D., Ohio State;
K. O. McCullough, Ph.D., Florida State;

Agricultural Education:

D. G. Craig, Ed.D., Cornell;
G. W. Wiegers, Jr., Ed.D., Missouri.

Business Education:

G. A. Wagoner (Emeritus), M.S., Indiana.

Distributive Education:

C. B. Cooley (Coordinator), Ph.D., Wisconsin.
R. W. Haskell, (Coordinator), Ph.D., Purdue;
C. P. Campbell, Ed.D., Maryland;
J. R. Reed (Emeritus), M.S., Oklahoma State.

Associate Professors:

Agricultural Education:

J. D. Todd (Coordinator), D. Ed., Colorado.
B. E. Ruckle, (Coordinator) M.S. West Virginia.
R. J. Woodin, (Emeritus), M.S., Virginia.

Industrial Education:

R. Hanson, Ph.D., Purdue;
G. K. Labinoff, Ed.D., Tennessee;
B. J. Ledford, Ed.D., Tennessee;
E. C. Mann, Ed.D., Penn State;
C. G. Petty, Ph.D., Missouri.

Assistant Professors: Technological and Adult Education/College of Education 67

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

Instructor:

C. W. Wright, M.T., Arizona State.

THE MASTER'S PROGRAM

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

Requirements: Concentration requirement is 18 hours, research requirement is 6 hours, elective requirement is 12 hours, thesis option requires 9 hours, and option requirement requires 15 hours. The total for all requirements is 45-51 hours. All course work must be approved by the student's committee.

The Master of Science degree in Adult Education is offered for teachers, administrators, counselors, and community education specialists. The degree program has two options: a thesis option requiring a minimum of 45 hours and a non-thesis option requiring a minimum of 51 hours. For each option, 9 hours must be completed in the behavioral sciences.

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

The SPECIALIST PROGRAM

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

THE DOCTORAL PROGRAM

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

The Technological and Adult Education doctoral curriculum consists of the following: professional education core, 9 hours; service area, 18 hours; vocational-technical education, 18-27 hours; research techniques, 15 hours; and dissertation, 36 hours. A minimum of 120 hours above the baccalaureate is required.

The Doctoral philosophy degree with a major in Education includes concentrations and emphases as listed on page 56.

GENERAL

4010 Development and Utilization of Advisory Committees (3) Craft advisory committees, selection, organization, implementation, and utilization.

4750 Utilization of Instructional Media (3) Same as Curriculum and Instruction 4750 and Library and Information Science 4750.

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

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

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

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


5020 Placement, Follow-up and Evaluation Procedures in Occupational Education (3) Methods and procedures in establishing placement programs, curriculum revision.

5030 Post-Secondary Education for Adults (3) Structure and functions of post-secondary, sub-university institutions, programs and clients. Prereq: 5060 or consent of instructor. F, Sp

5040 Guidance and Pupil Personnel Services in Education (3) Same as Educational Psychology 5040.

5050 Supervision of Vocational-Technical Education (3) Program planning, coordination, instruction, roles and functions of supervisors.

5055 Vocational School Administration and Management (3)

5070 Competency Based Vocational Education (3) Introductory, comparative, and practical approaches.

5080 Continuing Education in Vocational-Technical Education (3) Importance, objectives, historical development, psychological and sociological formulations, methods and techniques, research, evaluation.

5100 Occupational Program Development for Disadvantaged Persons (3) Academic, socioeconomic, cultural and/or other handicaps that prevent individuals from succeeding in regular vocational educational programs.

5110 Principles and Objectives of Vocational-Technical Education (9) Fundamental principles and contemporary objectives.


5140 Individual Study in Vocational-Educational Technology (1-3) Must be approved by supervisory instructor and service area coordinator or department head. Approval form must be filed in office of department head. May be repeated. Maximum 12 hrs.

5150 Microcomputer Operations and Educational Applications (3) Operating procedures and programming techniques. Hands-on experience in operating common microcomputers, writing, debugging, and running educational programs. Prereq: Teaching, administrative, or related experience in schools or special consent of instructor.

5155 Software Design for Microcomputers in Education (3) Advanced BASIC software design: operating System-CP/M, TRSDOS and OSI, sequential and random I/O, analysis and operation of commercial educational programs, and teacher-designed programs. Prereq: 5150.

5160 Internship in Technological and Adult Education (3) Problems in internship in the commercial educational area of emphasis outside of area of concentration. May be repeated. S/NC only. F, W, Sp

5180-90-20 Educational Specialist Research and Thesis (3, 3, 3) Selection, analysis and completion of problem necessitating original investigation, beneficial to investigator and vocational-technical field. P/NP only.

5740 Continuing Professional Education (3) Theories and concepts supporting design and management of educational programs for adults in professions. Prereq: 5060 or consent of instructor. F

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

6010 Curriculum Planning in Vocational-Technical Education (3) Prereq. Curriculum and Instruction 5410 or equivalent.

6020 Program Planning and Development in Vocational-Technical Education (3) Planning vocational-technical and work force state, local, and institutional programs; research in planning, advisory committees, planned change, administrative structures, and evaluation procedures.

6030 Evaluation of Vocational-Technical Education Programs (3)

6040 Seminar in Vocational-Technical Education (1) Required 3 consecutive quarters during residency. S/NC only.

6050 Administration of Vocational-Technical Education (3) Administrative principles and relationship to vocational and technical education.

6100 Research Development for Vocational-Technical Education (3) Advanced research methods for planning studies: proposal development, theoretical base development, research design, sampling and application of statistical techniques. Prereq: Two consecutive statistics courses, a research methods course and consent of instructor.

6111 Internship in Technological and Adult Education (3) May be repeated. Maximum 6 hrs.

6155 Advanced Programming for Educational Computing (3) Advanced programming and applications of program generating software for microcomputers in education. Transferability of software via networking and computer communication. Variety of commercial data base generating or managing software. Hands-on environment. Prereq: 5150, 5155 or equivalent.

6156 Special Topics in Technological and Adult Education (3) Emerging topics and contemporary trends in adult education. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs. Sp

ADULT EDUCATION

5060 Adult Education: A General Survey (3) Historical development, philosophies of adult education, agencies, programs, current issues, and literature of adult education. F, Sp

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

5650 Program Planning in Continuing and Higher Education (3) Theory and method for planning adult education programs. W

6450 Advanced Seminar in Program Planning (3) Concepts and theories related to program planning in continuing and higher education. Prereq: 5650 or equivalent.

6700 Seminar in Adult Education (3) Issues in adult education, theories and concepts, philosophical positions, research trends and methodologies. Prereq: Admission to doctoral program and consent of instructor. Sp

6700 Advanced Seminar in Adult Development (3) Life cycle theories, research on adult development, designing research for studies of life cycle. Prereq: 5450 or consent of instructor. W

6780 Adult Problem Solving and Learning (3) Contemporary research and theories in area of adult problem solving and learning. Prereq: 5460 and graduate level research methods course, or consent of instructor. F
AGRICULTURAL EDUCATION

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

BUSINESS EDUCATION

5305 Methods and Materials for VOE Programs (3) Development criteria, instructional aids, recent developments and research, individualized instruction, occupational clusters.
5306 Organization and Management of VOE Programs (3) Developing office occupations, guidelines in organizing, coordinating, and model office programs. Physical facilities, instructional aids, related instructional activities (clubs), enrollment, instructor and advisory committee meetings.
5307 Measurement in Business Education (3) Evaluate methods and tools for all courses in business education and related areas of study in secondary and postsecondary business education.
5309 Evaluation of Research in Business Education (3) Prereq: Curriculum and Instruction 5610 or equivalent.
5310 Graduate Seminar in Business Education (3) Review of techniques for research and preparation of proposal for thesis or project.
5311-12 Special Topics in Business Education (1, 1)
5313-14-15 Practicum in Business Education (2, 2, 2)
5320 Improvement of Instruction in Basic Business Courses (3) Issues, research findings, methods, and materials for improved instruction at both secondary and postsecondary levels.
5330 Improvement of Instruction in Typewriting and Clerical Programs (3) Research, principles of learning, issues and materials.
5340 Improvement of Instruction in Shorthand/Secretarial Subjects (3) Principles of learning, issues, research findings, and materials on secondary and postsecondary levels.
5350 Improvement of Instruction in Accounting and Data Processing Programs (3)
5360 Improvement of Instruction in Business Communications and Word Processing (3) Basics of and strategies for teaching written communications, word processing and oral communications.
5380-85 Problems and Projects in Business Education (3, 3) Required in the non-thesis option. S/N/C only.
5390 Problems in Business Education (1-9) Variable topics. May be repeated. Maximum 9 hrs.
6300-10-20 Current Issues in Business Education (3, 3, 3)
6330-40-50 Advanced Studies in Business Education (3, 3, 3)
6360 Higher Education for Business (3)

DISTRIBUTIVE EDUCATION

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

HOME ECONOMICS EDUCATION

5510 Curriculum in Home Economics (3) Development of home economics educational programs, prereq: 4240 or equivalent.
5515 Evaluation in Home Economics Education (3) Purpose of evaluation in development of home economics programs; techniques used in evaluation. Techniques for determining progress of students; individual problems of evaluation.
5530-31-32 Problems in Home Economics Education (1-3, 1-3, 1-3) May be repeated. Maximum 3 hrs per course.
5540 Teaching Family Relationships and Parent-Child Education (3) Content, materials and methods for teaching curricular objectives in family relationships and parenthood education. Prereq: Consent of instructor.
5545 Home Economics Related Occupational Programs (3) Advanced study in planning, establishing, implementing and evaluating home economics related occupational programs. Prereq: 4508 or consent of instructor.
5550 Home Economics Adult Education (3) Development and administration of community-based home economics program for adults. Prereq: Consent of instructor.
5555 Supervision of Home Economics in the Public Schools (3) For teachers with successful experience in vocational home economics preparing for supervisory positions in vocational education. Program planning, organizing, and implementation. Field contacts with urban and rural programs.
5570-75 Seminar in Home Economics Education (3, 3) Research literature and techniques. Prereq: Consent of instructor.
5580 Teaching Home Economics in College (3) Methods, organization, and evaluation.
5581 The Problem Method of Teaching Home Economics (3) Underlying philosophy, skills and techniques, Observation and discussion.
5582 Furthering Good Human Relationships in the Classroom (3) Relationships between problems in human relations, basic needs of individuals, techniques of interpersonal relations and social values in developing more effective teacher education programs.

INDUSTRIAL EDUCATION

3830 History and Philosophy of Industrial Education (3)
3840-41-42 Part-Time Programs in Cooperative Industrial Training (3, 3, 3) Principles of organization, methods, and materials.
3850 Shop Organization and Management (3)
3860-61 Materials and Methods for Teachers of Shop and Related Subjects (3, 3)
3870 School Shop Safety (3)
4620 Special Topics in Drafting (3) Industrial practices in specialized areas of drafting selected for the individual student. Prereq: 6 hrs drafting.
4670 Manufacturing Processes (3) The manufacturing processes of industry and their relationship to shop skills. Prereq: 2620, 2641, 2660, 3651, or consent of instructor.
4671 Materials and Processes (3) Organic and inorganic materials and processes used to produce finished products. Content, curriculum and techniques of laboratory operation. Prereq: Consent of instructor.
4682 Power and Energy (3) Development, control, transmission, conversion, interaction of power sources; content, curriculum, and techniques of laboratory operation. Prereq: Consent of instructor.
4820 Foremanship Training by the Conference Method (3)
4830-31 Job Analysis (3, 3) Principles, practice, instructional methods.
4850-51 Curriculum Building in Trade and Industrial Subjects (3, 3) Course work in classroom and shop, results of job analysis, checking sheets and individual job sheets in both trade and related subjects. Prereq: Consent of instructor.
4880-81-82 Seminar in Industrial Education (3, 3, 3) Educational innovations, current events, problems, and other topics associated with the field of industrial education.
4885 Organization and Development of Vocational Industrial Clubs of America (VICA) (3) To give industrial education teacher experiences and understanding of organization and operation of VICA. Prereq: Undergraduate degree and 3 yrs teaching experience when taken for graduate credit.
4890-91-95 New Developments in Industrial Education (3, 3, 3) Developments, pressing problems, and recent trends in the field of industrial education as presented by a coordinating instructor in conjunction with knowledgeable resource personnel.
Graduate programs are available to students preparing for (1) teaching and research positions in colleges, high schools and elementary schools; (2) administrative and supervisory work in athletics, health education, physical education, public health, and recreation; (3) recreation specialist positions in various public, voluntary, private and commercial agencies and institutions; (4) public health positions in community health education, health planning and administration, and environmental health, and (5) safety education and service positions.

THE MASTER'S PROGRAM
Four programs leading to the Master of Science degree are available: Physical Education, Recreation, Safety Education and Service, and School Health Education.

Programs leading to the Master of Public Health are also available in community health education, health planning/administration, and occupational environmental health and safety.

THE SPECIALIST PROGRAM
A Specialist in Education degree with a major in Safety Education and Service is available.

DOCTORAL PROGRAM
The Doctor of Education degree is offered in Health Education and in Physical Education. See further description under Health Education and Physical Education.

The Doctor of Philosophy degree with a major in Education includes concentrations and emphases as listed on page 56.

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

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

Department of Instruction

Division of Health and Safety

Majors

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<tr>
<th>MAJORS</th>
<th>DEGREES</th>
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<tr>
<td>Health Education</td>
<td>Ed.D</td>
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<tr>
<td>Safety Education and Service</td>
<td>M.S.</td>
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<tr>
<td>School Health Education</td>
<td>M.S.</td>
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<tr>
<td>Education</td>
<td>Ph.D.</td>
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Professors:

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

Associate Professors:

- M. A. McMillen (Emeritus), M.A, Yale J. J. Neutens, Ph.D.
- Illinois;
- R. J. Pursley, Ph.D. Iowa;
- A. F. Thompson, Ph.D. Michigan State.

Assistant Professors:

- J. Ellison, Ed.D. Tennessee, A. Pickett (Emeritus),

The Division of Health and Safety offers graduate programs leading to the Master of Science degree with majors in School Health Education and Safety Education and Service; the Specialist in Education degree with a major in Safety Education and Service; and the Doctor of Education degree with a major in Health Education. The Ph.D. in Education has a concentration in health education and choice of supporting emphases from public health or safety as listed on page 52. For additional information, contact the Chairperson of the Division.

THE MASTER'S PROGRAMS

Thesis Option:

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<tr>
<th>Hours</th>
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<tr>
<td>Major Research (5000-level courses in research, statistics, or computer programming)</td>
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<tr>
<td>Collateral</td>
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<tr>
<td>General electives</td>
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Non-Thesis Option:

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<th>Hours</th>
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<tr>
<td>Major Research (5000-level courses in research, statistics, or computer programming)</td>
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<td>Collateral</td>
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<tr>
<td>General electives</td>
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<td>TOTAL</td>
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THE SPECIALIST PROGRAM

The Educational Specialist degree requires 45 hours beyond the Master's degree.

Major

- Research (5330 plus minimum of 3 hours in statistics) | 6 |
- Collateral | 9 |
- Internship and Research (6010-20-30) | 9 |

TOTAL | 45 |

THE DOCTOR OF EDUCATION PROGRAM

Foundations

- Research | 9 |
- Behavioral Sciences | 9 |
- Education | 12 |
- Health Block | 24 |
- Public Health | 12 |
- Counseling | 18 |
- Dissertation | 36 |

TOTAL | 120 |

Health

- 3000 Foundation of Health Sciences (3) Personal health wellness and contemporary health problems; mood modifying products, consumer health, international health, personal health practices, reciprocal relationships involving man, disease and environment.
- 3210 First Aid and Emergency Care (4) Theory and practice, medical self-help. Leads to Red Cross Certification in Advanced First Aid and Emergency Care. (Applicant must be at least 18 years of age for certification.) E
- 3420 School Health Services (3) Development, maintenance, and protection of health of students including examinations, screening, special services, communicable disease control, emergency care, and school health records. Sp
- 3510 The School in Community Health (3) Role of teacher in community health education; school's responsibility in promoting healthful living and the place of existing media and agencies in program. Not open to health and physical education majors. E
- 3610 Methods in Elementary Health Instruction (3) Preparation and presentation of health topics. Teaching method emphasized and student participation stressed. Required for elementary teachers. Prereq: 3510 or Public Health 1110 or Nutrition 1230. E
- 3630 Sex Education as it Relates to Human Sexuality (3) Exploration of science of human sexuality. Trends, content, methodology and materials in sex education.
- 3650 Methods in Secondary Health Instruction (3) Preparation and presentation of health topics. Teaching method emphasized and student participation stressed. W
- 4120 Alcoholism and Alcohol Education (3) Emphasis on factors which make alcoholism a serious health and safety problem. Instructional and intervention programs. F, W, Sp
- 4130 Suicide and Suicide Intervention (3) Emphasis on factors which may create a suicide health problem. Instructional and intervention programs. Sp
- 4140 Death, Dying and Bereavement (3) Theories of death and dying. Education and other programs to mitigate trauma of death and dying. F, W, Sp
- 4110 Consumer Health and Safety Education (3) Major consumer health and safety problems; selecting, purchasing, and financing of safety and medical services. (Same as Public Health 4110.) F, W, Sp
- 4411 Instructor's Advanced First Aid and Emergen-
Division of Physical Education/College of Education

DEGREES

Physical Education
M.S., Ed.D.
Ph.D.

Professors:

Associate Professors:
P. A. Beitel, Ed.D. North Carolina (Greensboro); F. J. Croskey, M.F.A. Southern Methodist; R. E. Jones (Chairperson), Ph.D. Toledo; B. J. Mead, Ph.D. Purdue; W. J. Morgan, Ph.D. Minnesota.

Assistant Professors:

The Physical Education Division offers the Master of Science degree in Physical Education thesis and non-thesis programs. Both 45-hour programs require a minimum of 27 quarter hours of work in Physical Education including thesis credits.

Doctor of Education degree in Physical Education with concentrations in exercise physiology, motor behavior, adapted physical education, and philosophical and sociological foundations.

The Doctor of Philosophy degree with a major in Education includes concentrations and emphases as listed on page 56.

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

4005 Advanced Ballet Technique (5) Styles and methods of advanced classical ballet technique: multiple pirouettes, batterie, epaulement and advanced pointe work. Prereq: 4000. Available to dance majors and minors or with consent of instructor. May be repeated. Maximum 6 hrs.

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

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

4050 Rhythmic Analysis (3) Nature and principles of music, rhythm, and rhythmic notation with emphasis on correlation with dance movement and composition. Prereq: Consent of instructor. W, A

4060 Advanced Composition (4) Application of compositional, production and administrative skills culminating in the creation of two complete choreographic works. Prereq: 3062, 4020 A

4080 History of Dance (3) Survey of dance of various societies and cultures from pre-history through nineteenth century.

4090 History of Dance II (3) Survey of development of dance in theatre, recreation, and education during twentieth century.

4110 Adapted Physical Education (3) Classification of atypical students who require modified programs in physical education; activities and class organization suitable for required or special physical education classes.
disciplinary or professional areas of physical education and/or sport. May be repeated. Maximum 15 hrs.
5440 Theory of Movement Education (3) Theoretical overview of movement education with selected oppor-
unities to develop applied understandings and competencies.
5500 Advanced Kinesiology (3) Action of muscles involved in fundamental movements, calisthenics, sports, and 
gymnastics. Prereq: 5320 or equivalent. Sp
5510 Selected Topics in Anatomy (3) Intensive study of various systems of human body. Prereq: 5580 or equiv-
alent. May be repeated with consent of instructor. S/NC only. Su
5550 Advanced Adapted Physical Education (3) Laws function tests, theoretical bases for remediation or adaption, 
programming implications. Prereq: 4110 or equivalent. W
5580 Physical Activity and Health (5) Relationship of physical exercise to longevity, weight control, car-
with emphasis on notation and reading of elementary move-
ment studies. Sp, A
5000 Thesis (1-15) P/NP only. E
5022 Non-Thesis Graduation Completion (3-15) Required for the non-thesis student not otherwise 
registered during any quarter when such a student 
uses university facilities and/or faculty time before 
degree is completed. May not be used toward degree 
requirements. May be repeated. S/NC only. E
5110 Administration in Physical Education (3) Theo-
ries of administration; principles of personnel and financial development; educational, instructional, 
policies, and practices pertaining to physical educa-
tion.
5120 Curricular Issues in Physical Education (3) Theories and foundations of curriculum: planning, deci-
sions, program evaluation and modification pertaining to 
Physical Education.
5130 Methods in Physical Education (3) Character-
istics of different school age levels, and applications of 
learning procedures in physical activities at these 
levels.
5140 Advanced Philosophy of Sport (3) Critical exami-
nation of most rigorous and sophisticated essay pieces 
concerning metaphysical, epistemological, and 
aviological status of sport. Prereq: Consent of instruc-
tor. W
5150 Systematic Physiological Analyses of Sport (3) 
Critical examination of most comprehensive, system-
atric, and revealing accounts of metaphysical, epistemological, and axiological status of sport. Prereq: 5140 or consent of instructor. Sp
5220 Readings in Physical Education (3) Compre-
hensive review of topics in physical education and 
related areas. Sp
5280 Motor Behavior: A Theoretical Perspective (4) 
Motor behavior from information processing perspec-
tive and current research to support theoretical base.
Prereq: Undergraduate course in general psychology 
or consent of instructor.
5290 Motor Behavior Laboratory (2) Beginning experi-
ence in methodology and instrumentation for assessing 
factors related to or affecting motor learning/ 
performance. Prereq: 5280, 4140, and/or 5320 or consent of instructor.
5310 Analysis of Basic Motor Skills (3) Mechanical 
analysis of basic motor skills, emphasizing applica-
tion of these skills to physical education and athletics. 
W
5320 Seminar in Research Techniques in Physical 
Education (3) Evaluation of appropriate research tech-
niques in physical education. F
5330 Psychology of Sport (3) Human behavior in sport 
context. Prereq: General psychology course and con-
sent of instructor. W
5340 Motor Behavior and Skill Acquisition (3) 
Application of research on human movement behav-
ior to sport and physical education. Prereq: 4890 or 
consent of instructor. W
5410 Special Topics (1-3) Advanced study in selected 
disciplinary or professional areas of physical education 
and/or sport. May be repeated. Maximum 15 hrs.
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Prereq: Undergraduate course in general psychology 
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context. Prereq: General psychology course and con-
sent of instructor. W
5340 Motor Behavior and Skill Acquisition (3) 
Application of research on human movement behav-
ior to sport and physical education. Prereq: 4890 or 
consent of instructor. W
4220 Communications for Better Health (3) Selective study of communication techniques. Consideration in logical progression of the problems of transmitting current and new information to practitioners, communications among members of the medical teams, among health agencies, and use of mass media for transmitting health information. W.

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

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

4730 Workshop in Public Health Education (3-6) For teachers, nurses, and students in public health education. Uses university facilities and/or faculty time before voluntary and public health agency personnel; emphasizes the problem-solving approach through small group interaction, case method, and critical incident technique. May be repeated. Su.

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

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

5010-20-30 Workshop in Public Health (3-6, 3-6, 3-6) Designed to deal with specific public health problems in the community. Fall, Winter, Summer. Su.

5070-80-90 Field Practice and Seminar in Public Health (3-3, 3-3, 3-5) Internship or field experience in approved organizational setting under supervision of designated field preceptor. Prereq: MPH major, one quarter advance notice and consent of major advisor. S/NC only. E.

5110 Environmental health (3-5) Varied environmental factors with general framework of air, food, water, shelter, transportation as they affect humanity's survival, prevention of disease, performance and enjoyment. Lecture, demonstrations, laboratory, and field practice. Prereq: Consent of instructor. F, Sp.


5140 Occupational Health & Safety III (3-5) Understanding of activities in comprehensive practice of industrial hygiene control. Industrial hygiene concepts and procedures. Prereq: 5120 and 5130 or consent of instructor. Sp.

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

5170 Industrial Hygiene Instrumentation (3) Instruments and methods in evaluating industrial environment for personal exposure to chemical and physical stresses which can affect health of workers. Lecture, demonstrations and lab. Prereq: 5120 or consent of instructor. W.

5210 Special Topics (3) Instructional or research topics to be assigned. Prereq: Consent of instructor. May be repeated under different topic. Maximum 6 hrs. E.

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

5400 Biostatistics (4) Application of descriptive and inferential statistical methods to health-related problems and programs. Use and interpretation of vital statistics in health-related research. Prereq: Introductory statistics or consent of instructor. F, Sp.


5420 Administration of Public Health (3) Administrative concepts and management of health care delivery system and public health practice. Governmental involvement in health, legal responsibilities, and managerial concepts/techniques. E.

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

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

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

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

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

5705 Introduction to Health Planning (4) Health planning concepts and methodologies emphasizing systems oriented health planning process. Major elements of planning: formulation and conceptualization of problem, plan design, evaluation and implementation. F.

5710 Community Health Planning (4) Concept of community health as related to processes of community partnership, participation, cooperation and self-reliance. Weekly seminars and community experiences; various methods for identifying and assessing health problems and capabilities of selected communities. Analyze health problems of community, arrive at community diagnosis and apply selected health planning methods to develop program for addressing identified community health problems. Prereq: 5705. W.

5715 Advanced Health Planning (4) Advanced study of health planning functions affording opportunities for either simulated or actual application of planning concepts, techniques, and skills to specific situations. Exercises and projects in health planning, agency evaluation, grant preparation, health economic issues/analysis, population analysis, and program development in community agencies, community surveying, or resource inventorying. Prereq: 5705 or consent of instructor. W.

5735 Emergency Medical Services (3) Planning, organizing, and coordinating emergency medical resources as system. Coordination of medical services. EMS systems from accident or acute illness occurrence through critical care services. Applicable to local emergency facilities. Prereq: Consent of instructor. W.


5760 Organization Theory for Health Services (3) Analysis of administrative and organizational theory related to bureaucratisation, division of labor and delegation of authority; management of health agencies and organizations, Management processes of planning, operating and controlling delivery of health services. Case discussion and problem-solving exercises demonstrate managerial functions and skills. W.

5765 Health Facilities Administration (3) Role of health facilities in U.S. health care delivery system: operation and management of community hospitals. Administrative considerations related to government, management of staff, relationships, quality control, management of costs, and departmental structure. Prereq: 5760 or consent of instructor. W.

5770 Long-Term Care Administration (3) Concepts and theoretical foundations essential to leadership role for long-term care health administrators. Operation and management of nursing homes. Prereq: 5765 or consent of instructor. Sp.


5840-50-60 Directed Independent Studies (1-3, 1-3, 1-3) Individual in-depth study of selected issues. Prereq: consent of instructor. May be repeated. Maximum 9 hrs. E.

5900 Graduate Seminar in Public Health (1-2) Scope of public health as discipline and interrelatedness to other academic and professional disciplines. Speakers both internal and external to UT. Prereq: Baccalaureate degree in health-related field or consent of instructor. May be repeated. Maximum 6 hrs. (Same as Nursing 5900, Nutrition and Food Science 5910, Physical Education 5900, and Social Work 5900). S/NC only. F, Sp.

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

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

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

6320 International Health (3) (Same as Health 6230).

Division of Recreation

MAJOR

DEGREE

Recreation

M.S.

Professor:


Assistant Professor:

K. L. Knick, Re.D. Indiana.

Assistant Professor:

M. D. Blanton, Re.D. Indiana.

The Recreation Division offers the Master of Science degree in Recreation (thesis and non-thesis programs) with concentrations in general recreation, leisure and sports administration, and therapeutic recreation.

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

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

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

4500 Specialized Study in a Selected Area of Recreation (1-9) Comprehensive study in a selected specialized area within the broad field of recreation. For recreation students only. Prereq: Consent of instructor. May be repeated with consent of division. Maximum 9 hrs. E.

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

5002 Non-Thesis Graduation Completion (3-15) Required for the non-thesis student not otherwise registered during any quarter when such a student uses university facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. S/NC only. E.
5130 Interpretations of Leisure (3) Concepts of leisure including social, psychological, cultural, and philosophical; recreative uses of leisure. Prereq: 3140 or consent of instructor. F

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

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

5240 Therapeutic Recreation (3) Role of recreation in lives and treatment of persons with disabilities—mental, physical and medical. Possibilities for helping ill and disabled realize their fullest potential. Prereq: Consent or instructor. W

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

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

5300 Seminar in Recreation (1-6) Application of research methodology and computer literacy in selected areas of recreation related research. Presentations of students' research studies. May be repeated. Maximum 6 hrs. S/NC only. F, W, Sp

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

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

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

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

5450 Specialized Study in Recreation (1-9) Advanced comprehensive study in selected specialized area within leisure and recreation field. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs. E
OFF-CAMPUS GRADUATE INSTRUCTION

degrees available pages 8-9.

College of Engineering

understanding, both scientific and cultural,

colleges. Using classroom facilities at local community plants. Such courses are offered to students made available to engineers in industrial

Oklahoma). Graduate courses have also been

centers of the UT System (Chattanooga,

Knoxville campus at selected times. Occasional visits by the professor are made
class to allow full discussion and questions.

between the professor and the off-campus
phone contact is established periodically
discussions with the on-campus classes and
rooms. The tapes contain a visual and
campus class in specially-equipped class-
videotapes prepared from a regular on-
and industrial sites. This effort makes use of
available to students at off-campus centers
ized talents of engineering college faculty
remotely-taught classes make the special-
confines of Knoxville classrooms. These
techniques to reach students beyond the
has made use of electronic communication
degree. For a listing, consult majors and
degree, and the Doctor of Philosophy
Science degree, the Master of Engineering provide opportunities for

W. A. Miller, Associate Dean

W. T. Snyder, Dean

Graduate degree programs of the College of Engineering provide opportunities for advanced study leading to the Master of Science degree, the Master of Engineering degree, and the Doctor of Philosophy degree. For a listing, consult majors and degrees available pages 8-9.

OFF-CAMPUS GRADUATE INSTRUCTION BY VIDEOTAPE

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

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

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

YEAR-IN-JAPAN M.S. PROGRAM

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

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

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

Engineering Experiment Station

W. T. Snyder, Director

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

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

Departments of Instruction

Chemical Engineering

MAJORS

Chemical Engineering

DEGREES

M.S., Ph.D.

Professors:

J. J. Perona (Head), Ph.D., Northwestern, P.E.;
M. C. Bogue, Ph.D., Delaware; E. S. Clark, Ph.D.,
California (Berkeley); L. W. Crawford, Ph.D.,
Cincinnati; D. L. Culberson (Emeritus), Ph.D.,
Texas; J. F. Fellers, Ph.D., Akron; G. C. Frazier, Jr.,
D. Eng.; Johns Hopkins; J. M. Holmes, Ph.D.,
Tennessee; H. W. Hou, Ph.D., Wisconsin;
F. Johnson (Emeritus), Ph.D., Yale; C. F. Moore,
Ph.D., Louisiana State; J. W. Prados (Vice
President for Academic Affairs), Ph.D., Tennessee;
C. D. Scott, Ph.D., Tennessee; C. D. Thomas,
Ph.D., Tennessee; J. S. Watson, Ph.D., Tennessee.
Associate Professors:

P. R. Bienkowski, Ph.D., Purdue; D. D. Brun, Ph.D.,
Houston; H. Byers, Ph.D., California (Berkeley);
R. M. Counce, Ph.D., Tennessee; T. L. Donaldson,
Ph.D., Pennsylvania; A. C. Sheff, Ph.D., Tennessee.

D. W. Lane, Ph.D., Tennessee.

Assistant Professor:

F. Werner, Ph.D., Minnesota.

Lecturer:

D. W. Lane, Ph.D., Tennessee.

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

THE MASTER’S PROGRAM

Minimum departmental requirements include the satisfactory completion of:

1. A major consisting of 18 to 27 quarter hours of graduate courses in chemical engineering.

2. One or two minors or collateral work, 9 to 18 hours total in engineering, chemistry, mathematics, physics, or other related fields.
4. Active participation in graduate seminars conducted by the department. Resident students must register for 5010 every quarter offered.
5. Final examination covering thesis, related fields, and graduate course work.

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

Department requirements consist essentially of the satisfactory completion of:
1. Graduate courses in chemical engineering, amounting to approximately 36 quarter hours, at least 12 of which must be in 6000 series courses.
2. Supporting courses in related scientific and engineering fields amounting to approximately 36 quarter hours, subject to approval by the student's faculty committee. These related fields may include chemistry, mathematics, physics, and engineering.
3. The comprehensive examination, usually given in two parts, and covering such materials as chemical engineering operations and processes, engineering mathematics, technology, mathematics, physics, chemistry, and other related fields.
4. Active participation in graduate seminars conducted by the department. Resident students must register for 5010 every quarter 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: Chinese, French, German, Japanese, Korean, Russian, and Spanish. Foreign students whose native language is one of those on the approved list will not be required to take an examination.

4110 Chemical Engineering Data Analysis (3) Random and stochastic processes; statistical properties of stationary stochastic systems; elements of probability; discrete and continuous distributions; statistical characterization of products and processes; empirical models and procedures; statistical process control. Prereq: 3420, Math 3150. F.W.Su.

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


4290 Introduction to Chemical Process Economics (3) Methods of cost estimating; analysis of product pricing based upon debt and equity financing methods; use of extensively analyzed to deal with uncertainties; a detailed case study. Prereq: 4110.

4410 Design of Separation Processes (4) Design of multicomponent distillation systems, including layout of separation trains, choice of operating variables; heat and mass balances, thermodynamic and peripheral equipment, including control systems. Selected problems emphasizing other separation methods, heat economy in complex systems, low temperature processes, equipment selection and optimization. Prereq: 3050, 3440-50, 3610. W.Su.


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

4450 Hydrocarbon Processing (3) Study of specialized characterization of physical properties of fossil fuel raw materials into products needed in industrial energy, industrial raw material and consumer markets. Prereq: 3540.

4460 Coal Processing to Liquid Fuels (3) Characterization of various methods; modeling of conversion processes and estimation of maximum yields; water and oxygen requirements; pyrolysis, catalytic hydro- genation; reactor design considerations; review and critique of selected articles from both the current literature and patents. Prereq: Consent of instructor.

4530 Chemical Reactor Fundamentals (3) Brief review of homogeneous and heterogeneous reaction kinetics; idealized homogeneous reactor models, both for closed and flow systems; corrections for non-ideal residence time distribution; identification of scaling parameters; catalyst effectiveness factors and conversion in fixed bed catalytic reactors. Prereq: 3420, Chem 3430. W.Su.

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

4620 Advanced Process Dynamics, Simulation and Control (3) Development of process models, experimental data correlation, computer simulation of processes and control strategies, and analog versus digital process control. Design using advanced control concepts such as feedback, cascade, and multivariable control. Advanced control system design for difficult control processes. Laboratory experience. Prereq: 3620 or equivalent background in basic control theory and differential equations.

4730 Mass and Energy Flow in Biological Systems (3) Basic physicochemical and organizational principles of biological systems. Derivation of general equations of biomass and energy transfer. Thermodynamics of transport and equilibrium in biological systems. Discussion of population dynamics; biological clocks. Prereq: Consent of instructor.

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

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

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

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

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

5050 Engineering Analysis (3) Analytical formulation and solution of differential, integral, and polynomial engineering problems involving deformation of solids, heat transfer and motion of fluids. (Same as Metallurgical Engineering 5050 and Polymer Engineering 5050.)


5120 Heat Convection (3) Analysis of heat convection in fluids under viscous and turbulent flow conditions, emphasizing analytical and approximate solution methods. Prereq: 5050.

5130 Methods of Optimization (3) Principles and applications of various mathematical programming techniques to chemical process design and control; variational method, maximum principle, dynamic programming, and geometric programming. Prereq: 4130.

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

5250 Chemical Process Industry Economics (3) Analysis of economic components of chemical processes, internal economics of chemical enterprise, decision making for investment in capital facilities. Prereq: 4120-30, 4420.

5310 Thermodynamics of Heterogeneous Equilibrium (3) Phase rule; equilibrium between phases; condensation relationships for liquid and solid phases; ideal and nonideal solutions. Prereq: 3040.

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

5420 Applications in Fluid Mechanics (3) Navier-Stokes equations and integral theorems; applications to chemical engineering and polymer engineering: packed and fluidized beds, multi-phase flows, flow of polymer melts in simple geometries, basic principles in solid mechanics. Prereq: Undergraduate course in fluid mechanics or consent of instructor. (Same as Polymer Engineering 5420.)

5430 Rheology and Polymer Processing (3) Equilibrium stage, concepts applied to mass transfer operations, emphasizing nonisothermal and multi-component systems.

5620 Differential Mass Transfer (3) Differential mass transfer operations; falling film, packed tower, and contacting devices; heat transfer and motion of fluids. (Same as Metallurgical Engineering 5620.)

5915 Measurement Science I (3) (Same as Nuclear Engineering 5915.)

5925 Measurement Science II (3) (Same as Nuclear Engineering 5925.)

5935 Measurement Science III (3) (Same as Nuclear Engineering 5935.)

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


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

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

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


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

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

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

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

Civil Engineering

MAJORS DEGREES

Civil Engineering

Environmental Engineering

Environmental Science

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

M.S.

M.S.

Emeritus Professor:

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

Professors:


Associate Professors:


Assistant Professors:

R. M. Bennett, Ph.D. Illinois; E. C. Drumm, Ph.D. Arizona, P.E.; R. B. Robinson, Ph.D. Iowa State, P.E.

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 concentrating in environmental engineering, structural engineering, soils engineering and materials, transportation engineering; to the Master of Science in Environmental Engineering and the Master of Science in Environmental Science with concentrations in water quality, air quality, and solid waste.

MASTERS OF SCIENCE PROGRAM

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

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

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

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

Environmental Engineering: For a Master of Science in Environmental Engineering, normally a bachelor's degree in a field of engineering is required. For a student who does not have the required background the following minimum prerequisite courses will be required: 3101, 3201, 3301, 3111, Environmental Engineering 3120, 3330, 4520, and Mathematics through the equivalent of 2860. In general, these must be completed before courses for graduate credit can be taken.

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

Option I: The student must present a minimum of 45 quarter hours of approved environmental engineering course work. The student may be selected but is not necessarily required.

Option II: The student must present a minimum of 48 quarter hours of approved graduate courses. The major shall include a minimum of 9 quarter hours of thesis and 18 quarter hours credit of approved environmental engineering course work. A minor may be selected but is not necessarily required.

THE DOCTORAL PROGRAM

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

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

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

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

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

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

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

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

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

4240 Structural Design (3) Plate girders, composite steel and concrete beams, connections and details, and analysis of steel and concrete industrial buildings. Prereq: 4250 and 4410. 2-3 hr periods. W, Sp.

4260 Photogrammetry (3) Methods of plotting maps from aerial photographs; stereoscopic plotting instruments; applications. Prereq: 2260 or Forestry Summer Camp for forestry majors.

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

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


4530 Cost Comparison in Design and Construction (3) Cost of engineering and construction. Cost comparison of alternate designs with emphasis on applications to civil engineering problems. Prereq: 1430.

4540 Computer Utilization (3) Computer use, economic justification, and extent of use by industry. Utilization of computers for solution of civil engineering problems. Prereq: Basic Engineering 1410. F.

4560 Stabilization of Soils (3) Mechanical stabilization of soils by compaction, drainage, and blending; chemical stabilization of clays, and modifying soils with additives. Prereq: 4310. W.

4570 Geotechnical Aspects of Construction (3) Unbraced and braced excavations, in situ densification by vibration and deep dynamic compaction methods; applications of well point systems, sand drains, wick drains; filter design and geotelescopes. Prereq: CE 4310, coreq: CE 4220.

4620 Airport Planning and Design I (3) Emphasis on airport master planning. Includes consideration on the air side are runway configuration, capacity, geometric and lighting on the land side included terminal layout and design. Use found access systems. Prereq: 3600 and 3610. Sp.

4640 Traffic Engineering (3) Characteristics of drivers, vehicle and roadway and their interaction; traffic studies; basic considerations of traffic circulation and control, elements of urban transportation planning studies. F.

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

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

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

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

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

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

4860 Structural Wood Design (3) Application of structural design principles to structural members of various combinations of wood, glue, plywood, and other materials. Prereq: 1140. W.

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

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

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

5150 Matrix Formulation of Structural Problems (3) Review of matrix algebra, vectors, stability considera-
tions, stiffness and flexibility analysis of plane trusses, general members and structures composed of gen-
eral members. Prereq: 2510 and 4410 or consent of instructor.

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

5170 Introduction to Structural Dynamics (3) Analysis of free and forced vibrations, and transient response of structures having many degrees of freedom, elas-
toplastic behavior considered for structural systems; approximate design methods developed. Prereq: 5120. 5160, Sp.

5180 Finite Element Structural Analysis (3) Application of finite element method to structural analysis; plane stress, plane strain, axisymmetric, and three-
dimensional elements; use of typical computer pro-
grams. Prereq: 5150, or Engineering Science and Mechanics 5560. Civil Engineering is the primary department. Sp, A.

5220 Pavement Design (3) Pavement loads; pavement design, design practices; construction and main-

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

5270 Planning and Transportation (3) Preparation of transportation and elements of comprehensive devel-
ops; transportation planning and analysis of transportation modes and between transportation and other community services. (Same as Planning 5270) W.

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

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

5410 Construction Law Contract and Administration (3) General principles applicable to construction con-
tacts and construction related sales contracts. Emphasis on role of engineer in preparation, award, and administration of construction contracts. Case study method of instruction. Prereq: 4530 or consent of instructor.

5430-40-50 Construction Management II, III (3, 3) Management and organization of heavy and build-
ing construction projects. Prereq: 4430 or consent of instructor.


5520 Advanced Foundations (3) Planning subsur-
face investigations; bearing capacity and settlement of foundations; behavior and failures of pile foundations; precast pile foundations; foundation design with the pressureretter. Prereq: CE4220.

5550 Slope Stability and Retaining Structures (3) Stability of natural and cut slopes and embank-

5560 Shear Stress and Strength Strain Behavior of Soil (3) Soil shear strength of fine grain soil from per-
spective of idealized, simple day. Drained and undrained shear strength and stress strain behavior of real soils. Consolidation theory. Coreq: 4220.

5570 Soil Mechanics—Seepage (3) Saturated flow through embankments, filter design criteria, seepage forces and velocities, subsurfaces and embankment failures. Prereq: 4310 or consent of instructor. Sp.

5590 Numerical Models for Geologic Materials (3) Numerical models to represent the stress/ strain-volume relationships for soil, rock, and con-
crete, nonlinear elastic models; classical plasticity models; critical state and caved plasticity models; multimaterial surface models. Note: Uses computer resources and data from laboratory tests. Prereq: CE4310 or consent of instructor.

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

5730 Prestressed Concrete (3) Properties of pre stressing materials and anchorages systems; meth-
ods of pretensioning and posttensioning; analysis and design of members and continuous structures. F.

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

5760 Structural Reliability (3) Application of proba-
bility theory and statistics to evaluating the reliability of structures; development of safety factors and prob-
bility based design codes. Prereq: 5230, 4110, Statistics 3450.

5770 Advanced Structural Reliability (3) Monte Carlo methods; reliability of structural members and sys-
tems; load modeling and load combination. Prereq: CE3760.

5800 Urban Systems: Engineering and Management (1) Use management of various urban systems usually under city manager and/or city engineer. Organiza-
tion, finance, personnel administration, purchasing and equipment management and dealing with engi-
neering consultants as each deals with municipal public works. Prereq: Graduate standing in Civil or Environ-
mental Engineering or consent of instructor. W, A.

5805 Urban Systems: Engineering and Management II (3) Continuation of 5800. Management and engi-
neering of urban streets, including lighting, cleaning and snow removal, water supply and waste-water drainage, solid waste, air pollution and regulations. Prereq: 5800. Sp, A.

5810 Traffic Engineering—Characteristics (3) Drivervehicle-roadway system; level-of-service concept of capacity. Coreq: Statistics 3450. 2 hrs and 12-hr lab. F.

5820 Traffic Engineering—Operations (3) Fixed-
time and volume-density controllers; progressive sys-
tems, one-way operation; reversible flows; system operation, including computerized networks; legal aspects of operational controls. Prereq: 5810. 2 hrs and 12-hr lab. W.

5840 Geometric Design (3) Advanced theory and prac-

5850 Functional Design of City Streets and Urban Systems; one-way operations; reversible flows; system operation, including computerized networks; legal aspects of operational controls. Prereq: 5810. 2 hrs and 12-hr lab. W.
Freeways (3) Effect of street systems upon urban growth and development; classification and function of surface street systems, including cross section, intersections, utility considerations, parking, effect of mass transportation; channelization; marketing, light control, pavement, and the safe street system. Prereq: Consent of instructor. Su

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

5870 Public Transit Planning (3) Person movement by bus, rapid, rail and taxi as public transports. Nature of public transit; its various roles and how they fit community's need; user preferences; modal split models; total social, political, economic and technical impacts of public transit. Prereq: 4600 or graduate standing. Sp, A

5880 Highway Safety I (3) Transportation safety, highway safety. Legislation, federal-state-local relationships, current highway safety standards. Prereq: Graduate standing or consent of instructor. Su

5885 Highway Safety II (3) Effect of current tort law upon highway safety activities; roadside safety design; cross-section, barriers, guardrails and energy attenuation; identification and correction of high accident locations and system deficiencies. Prereq: 5880 and graduate standing in Engineering.

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

5900 Special Problems in Civil Engineering (1-9) To fulfill the special problem requirement in the non-thesis program, students are required to enroll in non-thesis courses. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs. S/NC only. E

5910-20-30 Special Topics (1-5, 1-6, 1-6) Topics relate to current developments in civil engineering not included in other courses. May be repeated.

5915 Measurement Science I (3) (Same as Nuclear Engineering 5915.)

5925 Measurement Science II (3) (Same as Nuclear Engineering 5925.)

5935 Measurement Science III (3) (Same as Nuclear Engineering 5935.)

6000 Doctoral Research and Dissertation (3-15) F, W

6110 Research Development (3) Development of research projects. Alternative public sector reimbursable skills to become competitive in attracting research funding. Course cannot be used to satisfy 6000-level course requirement in doctoral programs. Prereq: Graduate standing and consent of instructor.

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

6530 Soil Dynamics (3) Behavior of soils and soilstructure systems under time dependent loadings; wave behavior in soils; principles of seismic refraction techniques; effects of earthquakes and vibrating machines on soils and foundations; dynamic stress and determination of soil parameters. Prereq: CE4220, ESM4710 or ESM5170.

6610 Behavior of Steel Bridges and Buildings (3) Behavior, analysis, and design of plate girders, columns and composite member subjected to static and dynamic loading. Prereq: 5170 and 5610. Sp, A

6740 Behavior of Reinforced Concrete Beams and Frames (3) Ultimate strength and behavior of statically indeterminate reinforced concrete structures; application of force and displacement methods to structure limit analysis. Prereq: 5120 and 5740. Sp, A

6760 Behavior of Reinforced Concrete Slabs (3) Behavior, analysis and design of reinforced concrete slabs; finite element solutions. ACI Code methods; yield theory. Prereq: Engineering Science and Mechanics 6310. Sp, A

6860 Statewide Passenger Transportation Planning (3) Comprehensive multimodal transportation plan; intercity traffic models, functional classification, programing and implementation; governmental and private sector policy decisions, as they affect air and highway investments. Prereq: 5860. W, A

6880 Planning Models for Transportation System I (3) Analytical analysis of trip generation, trip distribution, and trip assignment. Mathematical, statistical, and computer science techniques: Modal split, trip distribution, and trip assignment. Statistical models evolved into a transportation planning process. State-of-the-art and new modeling techniques. Prereq: 5860 or 5820; Mathematics 3150 and Statistics 3450. W, A

6890 Planning Models for Transportation Systems II (3) Analytical analysis of modal split, trip distribution, and trip assignment. Mathematical, statistical, and computer science techniques in modeling process. Models integrated for urban transportation planning process. Prereq: 6880. Sp, A

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

Environmental Engineering

4000 Environmental Protection (3) Managing of water resources, bodily wastes and wastewaters, air environment, solid wastes, commercial insects and rodents, food, and excreta. Emphasis on prevention of health impairment, to promote efficiency and comfort, and to safeguard balances in natural ecosystems. Principles of environmental law and ethics in design and practice without detailing design of practice methods.

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

4150 Urban Water Management (3) Introduction to urban water supply; evaluation of optimum water policies; formulation of system constraints and analysis of decision-making process; management of storm water for beneficial use. Prereq: 3330. Sp

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

4220 Water Resources Engineering Development (3) Multiobjective evaluation procedures for comparing and selecting among water resources project alternatives; achieving project optimality; single- and multi-object purpose projects, environmental assessment procedures; risk assessment methods for making water resource project decisions, and selecting among water resources development alternatives; achieving project optimality; single- and multi-purpose projects; special topics in new developments in water resources engineering; prerequisite: 3330 or consent of instructor. W

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


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

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

4530 Environmental Engineering Laboratory (3) Standard analytical techniques for evaluation of specific air, water and solid waste pollutants. Prereq: 4530 or consent of instructor. W

4600 Solid and Hazardous Waste Management (3) Magnitudes and characteristics of solid and hazardous waste problems; collection systems; disposal systems including landfill, incineration, composting, fixation, resource recovery, and proposed new technologies; current and future regulations. Prereq: Junior standing. Sp

4700 Air Pollution—Air Resources Management (3) Introductory course on concepts of air pollution; analysis of relationship among emission sources, meteorology and environmental impact; abatement options; engineering approaches for air pollution control. Sp

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

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

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

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

5220 Sediment Transportation (3) Sediment properties and measurements; bed loads and suspended load movement; erosion, scour, transportation and deposition of sediments by flowing water; settling of reservoirs and related topics. Prereq: 5230. W

5234 Flood Damage Reduction (3) National, regional, local flood problems; hydrologic design criteria; traditional flood control measures; land use controls and management; major industrial wastewater treatment plants; sludge handling systems, ultimate disposal of residuals. Prereq: 5230 or equivalent.

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

5302 Stormwater Modeling II (3) Continuous streamflow network analysis of stormwater management design. Use of logical design strategies with an emphasis on application to physical processes. Use of physically based hydrologic models to develop realistic simulations of individual and total system flow response. Application of optimization algorithms to hydrologic systems. Prereq: Consent of instructor.

5310 Groundwater Transport Processes (3) Dynamics of flow in porous media with emphasis on physical processes. Use of physical, chemical, and biological model solutions for various flow-regime conditions. Use of analytical solutions for flow-regime conditions. Use of Dupuit approximations and numerical methods, Hele-Shaw, and graphical solutions. Prereq: Principles of Engineering Science and Mechanics 3110 or consent of instructor.

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

5400 Introduction to Environmental Systems (3) Models of air and water quality, water resources, solid waste disposal, and location of central facilities; exposure to current literature on environmental management problems; optimization of these systems. Prereq: Graduate standing. Prereq: Civil Engineering 4800 or consent of instructor. Sp

5501 Water and Wastewater Treatment Theory I (3) Theory of unit operations employed in sanitary engineering. Prereq: 4520. F

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

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

5530 Environmental Engineering and Natural Systems Behavior (3) Seminar in selected issue of environmental engineering science research relating to natural system behavior. Eutrophic systems, trace metals and trace organics. Prereq: Graduate standing or consent of instructor.

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

5582 Microbiology for Sanitary Engineers (3) Microorganisms and the biological processes they inhabit. Emphasis on basic microbiology, detection and identification, enzymes, metabolic reactions, energy transfer, synthesis and growth; excrete and anaerobic biological treatment processes. Prereq: Graduate standing. Sp

5593 Advanced Environmental Engineering Laboratory (3) Application of modern and typical methods, principally instrumental, to study of environmental pollutants. Prereq: 4520. 5 hr and 1 lab.

5615 Solid Waste Resource Recovery (3) Analysis and design of resource recovery processes and operations that apply to municipal and industrial waste. Prereq: 4600. W


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

5715 Ambient Air Monitoring (3) Physical and chemical characteristics of ambient air and environmental monitoring. Survey network design. Quality control of air monitoring data. Use of air monitoring data in air quality management programs. Prereq: Consent of instructor.

5720 Air Pollution Particle Collection Theory (3) Mechanisms of particles suspended in gaseous medium including particle migration, aggregation, and aerodynamic capture of particles. Prereq: Engineering Science and Mechanics 3110. W

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

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

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

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

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

9000 Special Problems in Environmental Engineering (1-9) To fulfill the special problem requirement in the non-thesis program. Enrolment limited to environmental engineering students in the non-thesis program. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs. S/NC only. E

9010-20-30 Special Topics (1-3, 1-6, 1-6) Topics related to current developments in field of environmental engineering not included in other courses. May be repeated. E

9590 Environmental Engineering Seminar (1) Ph.D. students are required to complete a seminar in selected issues related to current developments in the field of environmental engineering. Prereq: Graduate standing in environmental engineering. Prereq: Consent of instructor. May be repeated. S/NC only. F, W, Sp

6100 Industrial Waste Unit Operations and Processes (3) Laboratory and pilot plant development of physical, chemical and biological variables for treatment of industrial wastes and residuals, utilization of industrial by-products and process residues. Prereq: 5501, 5502, 5503, 5593. 1 hr and 4 labs.

6520 Industrial Waste Management (3) Sources and characteristics of industrial wastes; recycling, waste reduction, energy recovery, resource recovery, and treatment options. Process residuals including thermal processes, land application, recovery, and encapsulation; design oriented. Field trips. Prereq: 5501, 5502, 5503.

6530 Rate Processes in Environmental Pollution (3) Application of scientific principles concerning movement and fate of chemicals at interfaces of three geospheres of environment (air, water and earthen solids). Development of intuitive sense to enhance problem solving. Prereq: 5501, 5503 or consent of instructor.

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

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

Electrical Engineering

MAJOR DEGREES

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

Professors:
knowledge of foreign language is crucial to the student's research efforts.
5. Satisfactory performance on both a qualifying and comprehensive examination. The qualifying examination is prepared by the electrical engineering faculty and consists of a 3-hour written examination in each of four areas. Areas (1) mathematics and transform methods, and (2) basic passive and active networks are required of all Ph.D. students. Areas (3) and (4) are usually chosen from the doctoral 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 36 hours of graduate course work or immediately after completion of a Master's degree. A minimum of 27 hours of graduate course work must be completed after the student has taken the qualifying examination the first time.

The comprehensive examination is prepared by the doctoral committee and consists of a 3-hour written examination in the student's major, a 2-hour written examination in a related area, and an oral examination. The comprehensive examination is normally taken at least six months after passing the qualifying examination. Part of the comprehensive oral examination will be a defense of a formal written dissertation proposal. The comprehensive examination and the dissertation proposal accepted by the student's doctoral committee before the student is reported as ready for admission to candidacy for the Ph.D. degree.

6. Participation in departmental seminars.

Many of the electrical engineering courses are offered in the evening. Engineers working in industry are encouraged to participate in research and work in areas pertinent to atmospheric and space flight are also available at the Space Institute, Tullahoma.

3170 Transient Analysis (3) Analysis of transient response of closed-loop feedback systems; Laplace transform method and classical differential equation methods for system analysis; complex frequency concept and pole-zero Nyquist applications to engineering problems. Prereq: 3050.

3170.3 hrs including project laboratory.

3050 Basic Field Theory (3) Forces between charges, electric and magnetic fields. Gauss's law and divergence, potential and line integrals, material bodies, polarization, magnetic circuits, Maxwell's equations, dynamic potentials. Prereq: 3050. 3 hrs including biweekly lab.

3060 Propagation I (3) Propagation of waves in transmission lines and in other guided systems. Impedance and reflectance analysis of waves, standoff wave and traveling wave measurements. Introductions to impedance matching, transmission line filtering, microstrip circuit construction, graphical and computer aided design methods. Prereq: 3040. 3 hrs including biweekly lab.

3080 AC Power (3) Magnetic circuits, iron cored coils; transformers, construction, calculation of performance from equivalent circuit, parameters for equivalent circuit, 1-phase and 3-phase connections, "per unit" notation; induction motors, constructional features, analysis of performance using equivalent circuits, 1-phase and 3-phase applications. Prereq: 3050, Physics 2310.


3110 Basic Electrical Engineering—Circuits and Fields (3) For non-electrical engineering majors. Prereq: Mathematics 2850, Physics 2510-30. 3 hrs including biweekly lab.

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

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

3180 Logic Design of Digital Systems (3) Introduction to boolean algebra and design of combinational circuits. Presents gate and flipflop characteristics. Design of clocked sequential circuits and other systems containing memory. Introduction to minicomputer architecture and system components to include basic structure and function of microprocessors, memory output, and control systems. Instruction set capabilities and machine language programming. Prereq: 3030 or Computer Science 2710. 3 hrs including biweekly lab.

3190 Plasma I (3) Engineering applications of physical electronics, plasma effects and devices. Topics include electrostatic precipitators and plasma light sources, laser operation and applications (electro-optics), and MH, controlled thermonuclear and other techniques of advanced power production. Prereq: Physics 2310-20-30. 3 hrs including biweekly lab.

3270 Linear Systems Analysis (3) Steady-state and transient response; log-frequency, gain-phase, and pole zeros; block diagram transformation; signal flow graphs, analog systems, properties of second order systems; introduction to feedback theory; stability criteria. Prereq: 3010 and Mathematics 3150. Coreq: 3180. 3 hrs including occasional labs.

3810 Basic Electronics I (3) Band theory fundamentals, theory and applications of semiconductor power supplies; theory of operation of field-effect transistors and applications in simple circuits. Prereq: 3030. 3 hrs including project laboratory.

3820 Basic Electronics II (3) Physical operation of bipolar transistors and vacuum tubes with applications in basic amplifiers. Integrated circuit fundamentals. Prereq: 3810. 3 hrs including project laboratory.

3830 Basic Electronics III (3) Frequency and transient response of open-loop transistor amplifiers. Fundamentals of integrated-circuit operational amplifiers and applications in basic feedback configurations. Basic digital switching circuits. Prereq: 3820. 3 hrs including project laboratory.

4020 Direct Energy Conversion (3) Background physics; conversion devices including photovoltaic power sources, thermoelectric generations and heat pumps, magneto-hydrodynamics, fuel cells, related aspects of d.c.-a.c. inversion and energy storage. Prereq: 3810, 3030.

4080 Microwave Circuits and Electronics (3) Scattered wave description, circuits, to include isolators and amplifiers, couplers and power dividers, circulators, phase shifters, loading and interconnection of systems. Power generation and amplification by vacuum devices and by solid state (bulk and junction) devices. Microwave switching, filtering and multiplexing. Prereq: 3080. 3 hrs including biweekly lab.

4090 Propagation II (3) Metal tube, dielectric rod, and


4410 Power System Components and Control (3) Modeling of transmission lines and cables, R-L-C calculations and power flow limitations. Control of real and reactive power flows in interconnected power systems; the PF and QV control problems. Prereq: 3090.


4430 Transmission, Distribution, and Protection (3) Studies in underground and d.c. transmission, consideration of over-voltages and insulation requirements; system protection against faults. Prereq: 3063, 3080.

4445 Introduction to High Temperature Plasma Physics (3) Basic concepts of plasma physics to fusion plasmas. Electrodynamic, kinetic theory, plasma transport, plasma waves, equilibrium and stability, plasma heating, and radiation processes. Prereq: Consent of instructor. (Same as Nuclear Engineering 4445.)

4455 Principles of Fusion Reactors (3) Energy balance of magnetic fusion reactors. Fundamental limits on the performance of fusion reactors. Lawson's Criterion, and principles of mainline and alternate magnetic confinement concepts. Prereq: 4445 or consent of instructor. (Same as Nuclear Engineering 4455.)

4460 Lasers and Masers (3) Introduction of principles of laser and maser operation based on classical concepts and electrical engineering analogies. Consideration of practical devices and applications.

4465 Introduction to Fusion Technology (3) Aspects of fusion technology characteristic of fusion (as opposed to fission) reactors and powerplants. Plasma heating, reactor ignition, control, and power balance. Superconducting magnet technology, divertors, limiters, direct conversion, and first wall and blankets. Major powerplant and reactor design studies, and public acceptance based by fusion power. Prereq: 4455 or consent of instructor. (Same as Nuclear Engineering 4465.)

5230 Advanced Electrical Machinery Applications (3) Linear motors; pole angle modulation and other special control techniques; variable frequency operation. Prereq: 5210.

5240-50 Control Systems Design I, II, III (3, 3, 3) Analysis and design of continuous and digital control systems, with emphasis on modern techniques. Feedback theory; system modeling; stability analysis; system response analysis; design of estimator and observer; system identification and design of engineering aspects of control systems. Coreq: 5070 or equivalent.

5271 Modern Systems Theory I (3) Introduction to linear systems theory. State-space model, linear dynamical system, state transition map, matrix exponential, controllability, observability, realization theory, pole placement, observers, stability theory for linear systems. Prereq: Consent of instructor.

5281 Modern Systems Theory II (3) Optimal estimation theory. Probability theory and stochastic processes, uncertain dynamical systems, estimation and filtering theory. Wiener filtering, the Kalman filter and its extensions. Prereq: 5271 or consent of instructor.


5315 Plasma Diagnostics I (3) Classical plasma diagnostic techniques for low temperature plasmas. Active and passive diagnostic methods including Langmuir probe, capacitive, magnetic and calorimetric probes, and perturbing spectroscopic techniques. Prereq: 4445 or consent of instructor. (Same as Nuclear Engineering 5315.)

5320 Plasma Diagnostics I (3) Classical plasma diagnostic techniques for low temperature plasmas. Active and passive diagnostic methods including Langmuir probe, capacitive, magnetic and calorimetric probes, and perturbing spectroscopic techniques. Prereq: 4445 or consent of instructor. (Same as Nuclear Engineering 5320.)

5325 Plasma Diagnostics II (3) Active and passive non-perturbing diagnostic techniques for fusion-related plasmas. Laboratory safety, electrostatic energy analyzers, particle probes, RF emission measurement, photon diagnostics, inter-ferometry and Thomson scattering, neutron and reaction product diagnostics. Prereq: Consent of instructor. (Same as Nuclear Engineering 5325.)

5335 Plasma Diagnostics Laboratory (3) Data from at least four diagnostic instruments in the UTK Plasma Science Laboratory. Langmuir probes, capacitive probes, RF emission detection, retarding potential energy analyzers, charge-exchange neutral detectors, spectroscopic measurements, microwave interferometry, and other methods. Prereq: 5315 and 5325. (Same as Nuclear Engineering 5335.)


5500 Properties of Quantum Devices (3) Optical resonant cavity theory and design; steady-state and Q-switched operation. Stable modes of oscillation, modulation and stabilization techniques. Laser output power spectral line shape and noise considerations. Operation of ring laser and slab, pulsed and semiconductor diode lasers. Prereq: 5340 and Mathematics 4710 or equivalent.

5501 Application of Quantum Electronic Devices (3) Coherence properties of laser radiation and "beating" frequency experiments. Lasers in communication and instrumentation systems. Specific application example:

5530 Digital System Architecture (3) System organization, hardware, software, memory hierarchy, input/output considerations, microprogram control, pipeline processing, interface standards. Prereq: 4810-20.

5580 Microwave Electronics (3) Vacuum electronic and semi-conductor electronic oscillators and amplifiers.
Frequency swept oscillators. Energetic electron beams, mode coupling in loaded beams, modern traveling wave tubes, matching and interstage matching, and distortion, beam modes, computation of radar cross-section. Coreq: 5820 or equivalent. W

5860 Electromagnetic Wave Propagation (3) Waves, rays, and beams in generalized propagation media; power, energy, and momentum interrelations of fields and waves in generalized media, equivalence relations. Introduction to canonical problems and applications of modern electromagnetic theory (MET). Selected topics suitable for electromagnetic waves: geometric optics approximation, accounting of far fields and near fields due to edge and surface diffractants, beam modes, computation of radar cross-section. Coreq: 5820 or equivalent. W

5870 Introductory Microwave Networks (3) Scattering and transfer representations for multiports, unilateral and bilateral microwave and millimeter wave devices, component and system parameter measurement by modern network analyzers. Design of multiports, integration of high frequency multiport designs with analyzer measurements. F

5910 Special Topics and Special Course Topics in Electrical Engineering (3-9) Open to students with graduate standing, Special projects and special course topics taught by members of the graduate faculty. 5915 Measurement Science I (3) (Same as Nuclear Engineering 5915).

5925 Measurement Science II (3) (Same as Nuclear Engineering 5925).

5930 Digital Image Processing (3) Theory and technical aspects of digital two dimensional fields and interporation, image representation and transforms, image enhancement, restoration, reconstruction, image coding and quantization, image description, scene analysis and scene matching. Prereq: 4830 or consent of instructor.

5935 Measurement Science III (3) (Same as Nuclear Engineering 5935).

5940-50 Advanced Small Computer Systems (3, 3) Real-time applications, memory and CPU organization, interface softare, and peripheral devices of minicomputer and microprocessor system are studied. Project-oriented: supported by hardware and software interface design. Prereq: 5175 or 4850. (Same as Computer Science 5940-50.)

5990 Graduate Seminar in Electrical Engineering (1-3) Topics of particular seminar sequences may include those of interest or research in department. Open to students with graduate standing. Cannot be included in 36 hrs of course work required for Master's. May be repeated with consent of department. SNC only.

8000 Doctoral Research and Dissertation (3-15) P/ NP grading. E 6000 Doctoral Research and Dissertation (3-15) P/ NP grading. May be repeated. Maximum 3 hrs credit to be applied toward degree. Must register for 5900 to be of particular interest to prospective candidates only. May be repeated. Maximum 3 hrs credit to be applied toward degree. Must register for 5900 until project is complete. S/NC only. E

Engineering Science and Mechanics

MAJOR DEGREES

Engineering Science

M.S., Ph.D.


Research Professor: T. F. Monari, Ph.D. Illinois, P.E.

Associate Professors: J. E. Caruthers, Ph.D. Polytechnic Institute of New York, P.E.; C. G. Engels, Ph.D. Virginia Polytechnic Institute, A. Matthews, Ph.D. Illinois, P.E.; S. J. Myers, Ph.D. Indiana University; W. E. Scott, Ph.D. Johns Hopkins; M. D. Soliman, Ph.D. Tennessee, P.E.; S. J. Steifer, Ph.D. University of Chicago; J. Wasserman, Ph.D. Cincinnati, P.E.

Assistant Professor: J. A. M. Boulet, Ph.D. Stanford; W. J. Jones, Ph.D. Clemson.

*U.T.S.I. faculty members.

Graduate programs leading to the degrees of Master of Science and Doctor of Philosophy are offered in the basic sciences, engineering and the physical or biological sciences. Program concentrations include solid mechanics, fluid mechanics, knowledge engineering, and biomedical engineering. In the biomedical and engineering science concentration, interdisciplinary programs are arranged to meet individual needs of the student. Each applicant will be advised as to any prerequisite courses before entering a program; the student's program of study must be approved by his/her advisory committee, and must comply with the requirements of The Graduate School. The student's major professor may be selected from a department other than the Department of Engineering Science and Mechanics.

The knowledge engineering program, which is offered only at UTSI, uses computer systems in collaboration with human experts to assimilate and efficiently manage an ever-increasing body of knowledge. The thrust of the program is to educate engineers and scientists in the development and application of knowledge-based expert computer systems to engineering problems.

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

3. 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.

1. A minimum of 12 quarter hours in the thesis is required. The second plan is offered to meet the needs of engineers employed in industry, or those who plan to teach in community colleges and technical institutes. It will be available, however, to any student who, in the opinion of his/her advisory committee, can benefit from additional course work more than from work on a thesis.

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

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<tr>
<th>Hours</th>
<th>Credit</th>
<th>Option I</th>
<th>Option II</th>
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<tbody>
<tr>
<td>Mathematics</td>
<td>9</td>
<td>9</td>
<td>9</td>
</tr>
<tr>
<td>Engineering courses</td>
<td>18</td>
<td>27*</td>
<td>12</td>
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(Major concentration; may include but is not restricted to courses offered by the Engineering Science and Mechanics Department.)

Related courses (May include additional courses in mathematics, computer science, or the physical and life sciences as well as engineering courses.)

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

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.

2. A minimum of 9 quarter hours of course work numbered 5000 and above, offered in departments other than mathematics, computer science, and the student's major department and which are not included in the areas of concentration under item 2.

5. Active participation in graduate seminars and colloquia.

6. Two doctoral examinations must be passed to be admitted to candidacy for the Ph.D. in Engineering Science.

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 36 quarter hours of graduate credit. The purposes of qualifying examination are:

(a) To determine the qualifications of the student to continue the Ph.D. program.
(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 Study Committee. The examination will be written and cover at least four graduate level subject areas. One of the subject areas will be mathematics, and the others will be designated by the student subject to the approval of the department's Graduate Study 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.

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

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

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

8. A final examination on the student's dissertation and related fields will be taken by the student after completion of the Ph.D. dissertation and course requirements.

3311 Mechanics of Materials (4) Concepts of stress and strain; stress-strain relations and Mohr’s circle; static analysis of membranes; analysis of rigid frame members; stress and displacement analysis of axially-loaded members; torsion; bending. Not for departmental graduate credit. Prereq: Basic Engineering 1301. Coreq: Mathematics 2850.

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

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

3700 Dynamics (4) Kinematics of rigid bodies; mass moments of inertia; impulse and momentum; impulse and momentum. Not for departmental graduate credit. Prereq: 2070 or Basic Engineering 1320. Mathematics 2840.

3710 Intermediate Dynamics (3) Three-dimensional dynamics of particles and rigid bodies: dynamics of bodies with varying mass; central force motion; Lagrange's equations. Prereq: 3700, Mathematics 2850.

4020 Computer-Aided Design (3) Use of computer graphics and analysis programs for design of selected systems, structures, and components. Evaluation of design alternatives. Prereq: 3700, Mathematics 2850.

4520 Biomedical Fluid Mechanics (3) Discusses objective, review foundations and present developments in biomedical and fluid mechanics. Properties of human blood and blood vessels of circulatory performance, analysis and measurement of flow and pressure in arteries, nontraumatic study of circulatory system, mechanisms of pulsations. Applications to areas of hemostasis, thrombosis, and fluid dynamics of heart assist devices. Prereq: 4500 or a course in fluid mechanics or consent of instructor.

4530 Biomechanics (3) Discusses objectives, review foundations and present developments in areas of mechanical properties of living tissues, biomechanics of injury and prosthesis, material compatibility of prosthetic devices and biomechanical problems related to impact. Prereq: 3311 or 4500 or consent of instructor.

4540 Fracture-Safe Design (3) A critical review of mechanical properties of materials that are indicative of fracture resistance, including temperature, strain energy factors, and $J$-integral; the use of such information in fracture design. Prereq: 3310 and Metallurgical Engineering 2110. (Same as Metallurgical Engineering 4540.) 3 hrs or 2 hrs and 1 lab.

4580 Principles of Nondestructive Testing (3) (Same as Physics 4580.) Physics is the primary department.

4590 Magnetic Induction Phenomena (3) (Same as Physics 4590.) Physics is the primary department.

4610 Experimental Stress Analysis (3) Basic concepts; theory, techniques, and instrumentation of resistance strain gages; theory and techniques of brattice coating method; introduction to other stress analysis methods. Prereq: 3310, Electrical Engineering 2020 or 3110. 2 hrs and a 3-hr lab.

4620 Dynamic Data Acquisition (4) Instrumentation of measuring systems for dynamic events and responses; signal conditioning; oscillographs, oscilloscopes, and magnetic tape recording; telemetry and data transmission; data processing. Prereq: 3311, 4710, Electrical Engineering 3120. 3 hrs and a 3.5-hr lab.

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

4670 Fundamentals of Vibrations (3) Free and forced vibrations of damped and undamped lumped parameter systems; energy methods. Prereq: 2720, Mathematics 2840.


4820-30 Engineering Analysis (4, 3) Integration of fundamental physical laws and mathematical methods of analysis on emphasis on application to realistic engineering problems. Prereq: 3110, 3311, and Mathematics 3150.

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

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

5000 Thesis (115) P/NP only. E.

5002 Non-Thesis Graduation Completion (3-15) Required for the non-thesis student not otherwise registered during any quarter when such a student uses university facilities. A student's candidacy for degree is completed. May not be used toward degree requirements. May be repeated. S/N only. E.
5110-20 Fluid Dynamics (3, 3) Kinematic, transport and constitutive equations for fluids. Development of rate deformation laws; mass, momentum and energy conservation relationships; non-dimensional numbers. The Navier-Stokes equations: exact solutions, potential flow and boundary layer approximations, coupled heat transfer models; disturbance-like solution methods. Must be taken in sequence. Prereq: 5800.


5225 Computational Thermal Analysis (3) Construction of numerical solution algorithms for energy systems; finite element theoretical framework, extensions to non-linearity, fluid convection and radiation. Concepts of completeness, accuracy and convergence; convection boundary condition. Unsteady problems with fluid convection; accuracy and accuracy of time- dimensional algorithms, modifications to reproduce finite difference and finite volume constructions. Computer project. Prereq: 5225.


5250 Introduction to Finite Element Structural Analysis (3) Finite element analysis techniques for structural mechanics and elasticity. Two and three-dimensional elastic problems, including elements and numerical quadrature. Equation solving, substructuring, skyline solvers, matrix iteration techniques. Applications to plates and shells, including use of representative computer programs. Prereq: ESM 5200.

5310-20-30 Advanced Mechanics of Materials (3, 3, 3) Advanced topics in mechanics of materials: three-dimensional transformations for stress and strain, asymmetry and eigentensors, thick wall pressure vessels, beams on elastic foundation, beam columns, introduction to elementary theory of elasticity. Must be taken in sequence. Prereq: 5320.


5410-20 Theory of Elasticity (3, 3) Equations of equilibrium; strain-displacement relations, compatibility. Constitutive equations; ideal and real materials, thick wall pressure vessels, beams on elastic foundation, beam columns, introduction to elementary theory of elasticity. Must be taken in sequence. Prereq: 5340.


5510 Special Topics in Engineering Mechanics (3) Mechanics problems related to recent developments. Prereq: Consent of instructor. May be repeated with consent of department.

5515 Measurement Science I (3) (Same as Nuclear Engineering 5915.)

5525 Measurement Science II (3) (Same as Nuclear Engineering 5925.)

5535 Measurement Science III (3) (Same as Nuclear Engineering 5935.)
**Industrial Engineering**

**MAJOR DEGREES**

**Industrial Engineering** M.S., M.E.

**Professors:**
- J. N. Snider (Head), Ph.D. Ohio State, P.E.
- W. W. Claycomb, Ph.D. Virginia Polytechnic Institute, P.E., Ph.D. Virginia Polytechnic Institute; D. C. Doult, M.S.
- Tennessee P.E.; H. P. Emerson (Emeritus), S. B. Massachusetts Institute of Technology, P.E.
- G. Garrison, Ph.D. North Carolina State, P.E.
- R. W. Groves, (Emeritus), Georgia Institute of Technology, P.E.
- H. L. Lovess, M.S., North Carolina State, P.E.; W. G. Sullivan, Ph.D. Georgia Institute of Technology, P.E.; J. D. Westbrook, Ph.D. Virginia Polytechnic Institute, P.E.

**Associate Professors:**
- D. H. Hutchinson, Ph.D. Georgia Institute of Technology, K. E. Kirby, Ph.D. Tennessee.

**Assistant Professors:**
- C. H. Allen, Ph.D. Tennessee, P.E.;
- M. K. Goodman, M.S., Tennessee, P.E.;
- J. C. Hungerford, Ph.D. Ohio.

**Instructor:**
- D. D. Ford, M.S. Tennessee.

**Lecturers:**

**THE MASTER OF SCIENCE PROGRAM**

A graduate program leading to the degree of Master of Science is open to graduates of A.B.E.T.-accredited undergraduate curricula in industrial engineering or to graduates of other technical curricula who take an approved list of prerequisite course work. A non-thesis option with 45 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 and production systems, human factors engineering, information systems, reliability and quality control, and traditional industrial engineering. Either one of two minors can be elected in Engineering, Mathematics, Psychology, Business, Computer Science, Statistics or Economics.

**MASTER OF ENGINEERING PROGRAM**

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

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


4060 Production Systems Planning and Control I (3) Theory and applications of forecasting, capacity, and materials planning, production systems design and inventory control. Not available for graduate credit for industrial engineering students.

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

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

4150 Project Control with CPM and PERT (3) A study of project planning and control based primarily on "critical path" techniques, including resource allocation, time-phasing, impact analysis and multi-project control, and computer programs. Prereq: 3430.

4160 Materials Handling (3) Analysis and planning for the overall problem of moving, packaging, and storing of materials; equipment comparison and selection; cost analysis. Prereq: 4520 and Engineering Science and Mechanics 3310. Not available for graduate credit for industrial engineering students.

4200 Production Facilities Design (4) Materials handling, plant layout, service areas, inventory control applications, and operating procedures design. Prereq: 3630, 3510-20, 4500, 4520.

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

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

4250 Engineering Economy (3) Methods and problems in selection or replacement of equipment. Decisions among engineering alternatives, including capital recovery, economic life of equipment, and rate of return on investment. Not available for graduate credit for industrial engineering students.

4320 Simulation Systems (3) Advanced equipment evaluation of design features, reliability and operating results. Software development under a team format. Prereq: 4310.

4450 Production Systems Planning and Control (3) Theories and practices of industrial engineering programs and systems. Information objectives and design criteria. Information systems design and development. Systems engineering principles. Qualitative and quantitative models: queuing, dynamic system models. Simulation of closed systems. Not available for graduate credit for industrial engineering students.

4520 Forecasting Methods in Industrial Engineering (3) Application of learning curves, queuing theory, standard data methods and incentive systems to the design of industrial work situations.

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

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


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

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

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

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

4910-20-30 Special Industrial Engineering Topics (3, 3, 3) Prereq: Consent of instructor. May be repeated.

4950 Industrial Safety (3) Development of organization and programs for prevention and control of accidents with emphasis on OSHA Rules and Regulations.

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

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

5100 Advanced Work Design Applications (3) Advanced work methods analysis, design and improvement of work systems, human factors, use of learning curves, queuing theory and wage incentive systems. Prereq: 3630, Statistics 3450.

5110 Industrial Engineering Methods and Control Techniques (3) Management control systems through IE techniques. Qualitative and quantitative systems: management analysis, optimization, interactive systems, wage and salary development, and production and inventory control. Systems development and application. Not for credit toward a fourth undergraduate degree in Industrial Engineering.


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


5260 Information Systems Design (3) Systems engineering approach to information systems design. System model, analysis, and evaluation of information systems. Information objectives and design criteria. Optimization and simulation in system design.

5280 Production and Inventory Systems (3) Application of computer techniques and inventory systems. Closed form solutions, search techniques, and use of available computer codes. Prereq: 5700, Coreq: 5710.

5301 Accounting for Engineering Managers (3) The underlying principles and structural framework of accounting is reviewed from the perspective of cost control and economic analysis. Emphasis is placed on the accounting structure and the implications of the financial statements. The course provides an understanding of traditional financial statements and their limitations. May be repeated. S/NC only.

5302 Structure, Organization, and Control of the Enterprise (3) Explores the relationship between organizational structure, behavior and productivity. The impact of organizational size, technology, external environment, and age on structure and productivity are included. Characteristics of a bureaucracy, their appropriateness, and their implications for organizations that are subjected to industries of varying technologies. Current organizational structures such as matrix, team management, and latice are studied.

5303 Analysis and Control of Product Distribution (3) Theories, principles, and techniques of marketing and distributing technical products and services. The impact of rapidly changing technology on traditional
product demand is discussed. The relationship between engineering design and the marketing function is explored. Includes topics such as forecasting, life cycle theory, marketing research and development services, the development of marketing strategy and operational planning.

5304 Motivation and Supervision for Engineering Management (3) Explores the relationship between motivational forces and productivity in high technology environments. Includes motivational theories and managerial theories applied to technical organizations developed by Maslow, Herzberg, Likert, Blau, etc. Uses case development and analysis, and current research.

5305 Productivity and Quality Engineering (3) Productivity and quality measures are defined and used to analyze the current competitive position of important factors of American industry with respect to both internal and international competition. Management systems which promote or inhibit productivity or quality improvements are examined.

5306 Theory and Practice of Engineering Management I (3) A comparison of classical management principles and theory with the environment, needs, and practices of research and development and other scietific organizations. Cases are used to illustrate contemporary problems and environments. Emphasis is placed on developing a management style which meets organizational and technical demands through highly trained subordinates.

5307 Theory and Practice of Engineering Management II (3) Systems approach to engineering management is presented. Technical organizations and their interaction with the task of engineering management is covered. Emphasis is placed on integrating theory with practice.

5308 Organizational Behavior & Managerial Decisions (3) Theories of individual and group behavior and their applications to managerial decision making processes. Special emphasis on the roles of various "people" categories and the managerial decision making processes in the normal mode are established. Case studies of off-the-job activities and their impact on personal decision, policies, and organizational behavior and to suggest corrective action.

5309 Project Management (3) The management and control of multifaceted engineering and technological projects. Includes coordination and interactions between client and various service organizations. Topics covered include the selection of project managers and management teams, planning, organizing, and scheduling the project, evaluating project progress and management; typical problems associated with various phases of the life cycle of the project. Case studies will be utilized to illustrate theories and concepts.

5340 Applied Decision Theory (3) Application of theory of decision making to problems in industrial engineering. Decision making under conditions of incomplete information. Bayesian and Neyman-Pearson statistical, decision models, utility functions, value of information, linear and quadratic loss analysis and parallel and sequential decision processes. Prerequisite: Statistics 3450.


5420 Reliability Engineering (3) Reliability concepts, failure distribution, equipment reliability, time dependant failure. All matrix dependence problems. Maintenance data analysis and replacement problem. Prerequisite: Statistics 3450.


5540 Industrial Development (3) Factors other than mechanical or chemical which enter into successful establishment of manufacturing enterprise. Cost and location studies and market analysis to determine the correct location of projects or plants.

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

5610 Human Factors Engineering (3) Human operator, performance characteristics, and environmental requirements. Formal description of human operators, transfer characteristics through quasilinear models and describing operator as information processor. Prerequisite: 5600.

5700 Optimization Methods in Industrial Engineering (3) Operations research. Analytical techniques required in 5710, 5720, and 5730. Classical optimization theory, N-dimension geometry and calculus of variations, selected areas of operations research. Prerequisite: Computer Science 3150 and matrix algebra.

5701 Operations Research Applications (3) Survey of operations research techniques with emphasis on application to industrial engineering problems. Prerequisite: Mathematics 2860 (or equivalent), Statistics 3450, computer programming. Available for credit only to students without a B.S. degree in industrial engineering.

5710 Linear, Quadratic and Separable Programming (3) Mathematical systems approach to engineering management, quadratic programming, and separable programming. Computer solutions to programming problems. Prerequisite: Computer Science 3150 and matrix algebra.

5720 Queuing Models and Simulation (3) Theory and applications to both individual and simulation models employed to evaluate complete queuing systems. Data analysis and hypothesis testing related to pertinent waiting line probability density functions. Prerequisite: 5700, 5360.

5730 Game Theory and Random Processes (3) Operations research including game theory with applications to decision making in competitive environment, and random processes in queuing systems. Prerequisite: 5700, 5360.

5800 Health Systems Engineering II (3) Health systems for analysis, control, and improvement of function and total health system. Prerequisite: 4830.

5840 Air Traffic Control System (3) Current systems of air traffic control. Stochastic systems and air traffic control design. Control and use of applicable systems models. Prerequisite: Statistics 3450, Computer Science 3150.

5850 Dynamic System Simulation (3) Development and use of models for computer simulation of dynamic systems. Simulation in design systems. Prerequisite: 4590 and Computer Science 3150.

5900 Design Project (1-3) Individual engineering project to fulfill design project requirement in nonthesis program. Enrollment limited to industrial engineering students in non-thesis program. May be repeated. Maximum 9 hrs. S/NC only.

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


6520 Operations Research Applications (3) Traditional capital planning and budgeting techniques; operations research approaches to capital budgeting problems. Mathematical programming and computer simulation of alternative projects. Uncertain cash flows, and choice of appropriate evaluation criteria. Prerequisite: 5520, 5710.

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

6730 Dynamic Programming (3) Solving multistage optimization problems as sequence of single-stage optimization problems. Computational and theoretical aspects of dynamic programming. Decision making under certainty and risk. Prerequisite: 5700.

6740 Advanced Topics in Optimization of Dynamic Systems (3) Multi-stage optimization theory. State and input dynamic systems. Genetic and taboo optimization theory, and other selected topics. Prerequisite: 6730.

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

Materials Science and Engineering

MAJOR

DEGREES

Metallurgical Engineering

M.S., Ph.D.

Polymer Engineering

M.S., Ph.D.

Professors:

J. E. Spruell (Head), Ph.D. Tennessee;
D. C. Bogue, Ph.D. Delaware; B. S. Bore, Ph.D. Delaware; A. C. R. Brooks, Ph.D. Tennessee; R. A. Buchanan, Ph.D. Vanderbilt; E. S. Clark, Ph.D. California (Berkeley); D. A. Canonic, Ph.D. Lehigh;
J. F. Fellers, Ph.D. Akron; J. S. Lin, Ph.D. Kansas;
D. D. Lucas, Ph.D. Pennsylvania Polytechnic Institute;
C. J. McLaughie, Ph.D. Kentucky;
K. J. Mackenzie, Ph.D. Cornell; B. F. Oliver, Ph.D. Pennsylvania State; P. J. Phillips, Ph.D. Liverpool (England); E. E. Stansbury, (Emeritus), Ph.D.

Cincinnati.

Associate Professors:

K. T. Becker, Ph.D. Illinois; J. Bentley, Ph.D. University of Salford (England); C. L. Brown, Ph.D. Virginia; D. M. Kroger, Ph.D. Vanderbilt; W. J. Lackey, Ph.D. North Carolina State; C. T. Liu, Ph.D. Brown University; A. J. Pedraza, Ph.D. National University (Argentina); C. L. White, Ph.D. Michigan Tech. University.

Lecturer: George D. Wignall, Ph.D. Sheffield (England).

Graduate programs are offered leading to the degrees of Master of Science and Doctor of Philosophy in Metallurgical Engineering or Polymer Engineering.

THE MASTER'S PROGRAM

Minimum departmental requirements include the satisfactory completion of:

1. A major consisting of 18 semester hours total in engineering, chemistry, mathematics, physics, or other related fields. All course work offered for the Master of Science degree is subject to the approval of the student's faculty committee.

2. One or two minors or collateral work, 9 to 18 hours total in engineering, chemistry, mathematics, physics, or other related fields. All course work offered for the Master of Science degree subject to the approval of the student's faculty committee.


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

5. Final examination covering thesis, related topics, and general principles of Polymer Engineering.

THE DOCTORAL PROGRAM

Students applying for entrance into the doctoral program must display concrete evidence of ability to perform and report
Chemical Engineering Department requires, chemistry emphasis, with the Chemistry Department and has a Department. The second program is joint two joint programs. One program has a degrees with specialization in polymer science and engineering, and complete an additional academic program to be specified by the student's committee. M.S. and Ph.D. degrees in the joint specialization program with the chemistry department require a thesis or dissertation in the field. Materials science and engineering departmental requirements include completion of Polymer Engineering 4910 and 4920, Chemistry 5531 and 5140, plus active participation in the Polymer Seminar. The Ph.D. candidate must meet the above requirements, pass a special written examination in polymer science and engineering, and complete an additional academic program to be specified by the student's committee. M.S. and Ph.D. degrees in the joint specialization program with the chemistry department require a thesis or dissertation in the field. Materials science and engineering departmental requirements include completion of Polymer Engineering 4910 and 4920, Chemistry 5531 and 5140, plus active participation in the Polymer Seminar. Ph.D. students must also pass a special written examination as well as complete the above requirements.

UK-T-JAPAN COOPERATIVE PROGRAM IN POLYMER ENGINEERING

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

**Materials Science and Engineering**

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

3120 Engineering Materials II (3) Extension of 2110 with emphasis on control of mechanical properties of materials by specification of composition, thermal, and mechanical treatment; correlation of resultant properties with service performance. Suggested for mechanical, civil, and industrial engineering students.

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

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

3150 Engineering Materials V (3) Extension of 2110 with emphasis on mechanisms and control of reactions of engineering materials with aqueous, nonaqueous, and gaseous environments. Prereq 2110 or 2030. W, S, SU.

3160 Engineering Materials VI (3) Extension of 2110 or 2030 with emphasis on materials of significance in nuclear engineering, nuclear reactor construction materials, nuclear fuel materials, and interaction of radiation with solids to produce changes in engineering properties. Suggested for nuclear and mechanical engineering.

3170 Engineering Materials VII (3) Extension of 2110 to biomedical applications of materials. Engineering materials in biomedical applications; metals, polymers, and ceramics; prosthetic devices; dental applications; corrosion problems; failure analysis; fabrication. Prereq: 2110 or equivalent.

4510 X-Ray Diffraction and Its Applications (4) Lectures and laboratory work in the basic principles and applications of x-ray crystallography. Diffraction theory, powder technique, precision lattice constants, chemical analysis and phase identification, preferred orientation. 3 hrs. and 1 lab.

4520 Fatigue and Fracture (3) Fatigue and fracture of metals, fatigue and fracture of composites, fatigue, fracture mechanics. Prereq: 3110 or equivalent.

4720 Production Metallurgy (3) Roasting, smelting, and refining. Gas-liquid equilibria, slag-metal processes and solution behavior, correlation with phase constitutions, kinetics of reactions, rate laws, activated complex theory, adsorption and catalysis and applications. Prereq: 3400, Chemical Engineering 3410 and 3420 or equivalent, 2 hrs. and 1 lab.

3110 Biomedical Applications of Materials for Life Scientists (3) Principles of engineering materials; metals, polymers, and ceramics; methods of fabrication of components; corrosion; applications of prosthetic devices and dental materials. Prereq: Chemistry 1110-20-30 or equivalent.

3520 Materials Behavior and Chemical Process Equipment Design (3) Mechanical, metallurgical, and chemical considerations in design of chemical processing equipment. Prereq: Materials Engineering 3311 or equivalent; 3150 and Chemical Engineering 3420.

3710 Metallurgical Applications in Manufacturing Technology (3) Fabrication methods and principles of mechanical/thermal processing for finished and semifinished articles: casting, powder metallurgy, plastic forming, joining, heat treatment. Prereq: 2110 or equivalent.

4240 Engineering Materials Design (3) Property control through composition; design and engineering of materials; design and process selection of kiss alloys. Carbon steels, alloy steels, and tool steel processing for property selection and service requirements. Prereq: 3230 or consent of instructor.

4250 Design and Analysis (3) Design and laboratory sessions on analysis of materials, requirements and performance in engineering structures and components. Prereq: Suggested for engineering science students.

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

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

4740 Mechanical Metallurgy II (4) Brittle fracture due to metallurgical and environmental factors; fatigue, residual stresses; creep and stress rupture; effect of microstructure; finite plastic strain and stress-strain relations; fabrication by forging, rolling, deep drawing, forging, extrusion, 4730 or Mechanical Engineering 3850 and first course in Materials Science, or consent of instructor. Suggested for engineering science and mechanical engineering students.

4760 Casting and Welding (3) Principles and processes of casting and welding; heat transfer, solidification, segregation, gas-metal and slag-metal interactions; thermal treatments, associated stresses. Prereq: 3410 or 3520. 2 hrs. and 1 lab.

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

5010 Graduate Seminar (1) Prereq: Admission to graduate program. May be repeated. 5 hrs. and 1 lab.

5050 Engineering analysis (3) (Same as Chemical Engineering 5050)

5110 Dislocations (3) Theoretical and experimental analysis of line defects and their interactions in solids. Prereq: 4730 or consent of instructor.

5120 Plastic Deformation (3) Geometry and mecha-
nisms of plastic deformation of single crystals; slip and twinning; working hardening; effects of temperature and strain on flow stress. Prereq: 5110.

5130 Plastomechanical Deformation (3) Plastic deformation of polycrystalline materials; theoretical and experimental analysis of texture formation resulting from deformation and annealing. Prereq: 5120.


5150 Phase Transformations I (3) Thermodynamic considerations of driving force and interface formation. Electrical, magnetic and mechanical properties of phases. Prereq: 5110.

5151 Advanced Thermal Analysis (1) Special topics in phase analysis. Application to structure determination; photometry; x-ray diffraction; polarization microscopy; metallography. Prereq: 5150.

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

5310 Solidification and Crystal Growth I (3) Solute redistribution, thermodynamic considerations, kinet-ic, athermal, and athermal solidification on the solid to liquid transition. Prereq: Mathematics 4550.

5540 Electron Microscopy I and II (3) Kinematical and dynamical diffraction theories are developed and their application to electron diffraction pattern and contrast effect in electron microscopy are discussed. Special attention is given to metallurgical applications such as plastic deformation, fracture, precipitation, and phase transformation. Prereq: 4510.

5650 X-Ray Metrology (3) Application of x-ray diffraction theory and techniques to metallic sys-tems. Powder and single crystal techniques; reciprocal lattice; analysis of scattered intensity; line profiles; orientation of single crystals; preference of orientation; phase analysis; order-disorder transformations.

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

5840-50 Metallurgy of Deformation and Fracture (3, 3) Theoretical and engineering analysis of effects of stress, strain rate, temperature, and initial condition on the deformation and fracture of metals and alloys. Emphasis on mechanical behavior in service, testing, and fabrication.

5900 Special Topics in Metallurgical Engineering (3) Recent advances in metallurgical engineering and relat-ed fields: fiber composites, ordered alloys, grain boundaries and radiation effects. May be repeated. Maximum 9 hrs.

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

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

6110-20-30 Theoretical Metallurgy (3, 3, 3) Phases of solid state physics applicable to metallurgy, elastic-ity, introductory quantum theory, specific heats, electron theory, electrical and thermal conductivity, magnetic phenomena, theory of superfluid helium. Prereq: 4610 or Physics 3720; Mathematics 4550 and con-sent of instructor.


6510-20 Advanced X-ray Diffraction (3, 3) General-ized theory; crystal structure determination; thermal motion, lattice faults, diffuse scattering. Prereq: 5560.

6900 Special Topics in Metallurgical Engineering (3) Developments in the science and technology of metals and alloys. May be repeated. Maximum 9 hrs.

Polymer Engineering

4910 Applied Polymer Science (3) First course in the physical properties of polymers. Polymer structure, crystalline and glassy phases, physical properties of amorphous and crystalline polymers, crystalliza-tion kinetics and mechanical properties are discussed. Not for credit for Polymer Engineering majors.

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

4930 Principles of Fiber and Textile Engineering (3) Chemical and crystalline structure of important fibers; melt, wet and dry spinning of manmade fibers; draw-ing and texturing of fibers; weaving, knitting, weaving and knitting. Emphasis on quantitative aspects.

4940 Plastics Fabrication Operations (3) Lecture and laboratory course treating operations of the plastic industry. Types and mechanisms of operation of machin-ery used and the structure and properties of fabricated parts. Operations to include extrusion, coextrusion, injection molding including structural foam, thermform-ing, blow molding, rotational molding.

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

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

5050 Engineering Analysis (3) (Same as Chemical Engineering 5560)

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


5310 Polymer Solution Properties and Characterization (3) Molecular weight determination, chromatography, solution thermodynamics, phase separ-ation: application to synthetic and naturally occurring macromolecules. Prereq: Undergraduate physical chem-istry.

5420 Applications in Fluid Mechanics (3) (Same as Chemical Engineering 5420).

5430 Rheology and Polymer Processing (3) Basic concepts of rheology; experimental measurements; non-Newtonian fluid mechanics: introduction to vis-coelastic theory; applications in polymer processing; screw extrusion, fiber spinning, tubular film blowing, injection molding.

5460 Principles of Injection and Blow Molding Opera-tions (3) TECHNOLOGY: theoretical analysis of injection mold filling, structure of molded parts, principles of structural foam and sandwich molding; principles of sheet theory, application to blow molding, structure and properties of blow molded containers. Prereq: 5410 or equivalent.

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

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

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

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

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

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

5810 Physical Properties of Polymer Structures (3) Molecular weight and composition distributions in copolymers plus structures of two phase block poly-mers and polymer mixtures as related to glassy and crystalline transitions, phase incompatibility, thermomechan-ical, and optical properties.

5910-20-30 Special Topics in Polymer Science and Engineering (3, 3, 3) Advanced problems in modern polymer research and current interests to engineers. Prereq: 4910, 4920 or equivalent.

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

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

6150 Advanced X-Ray Diffraction Methods for Characterization of Macromolecules (3) Advancements in the field of crystal structure determination; Patterson and Fou-rier functions; helical nets and Bessel function techniques; levels of model development; order-disorder phenomena, order-disorder transitions and paracrystallinity. Prereq: Winterberg and Weissenberg photograph, single crystal and powder diffraction with applications to syn-thetic and biological macromolecules.

6210 Nonlinear Viscoelasticity (3) Tensor formulation of constitutive equations of viscoelastic materials sub-jected to large deformations. Integral, differential, and acceleration tension formulation. Applications to poly-mer flow problems. Prereq: 5210 or equivalent. (Same as Engineering Science and Mechanics 6440.)

6220 Advanced Methods of Polymer Processing (3) Applied on experimental and theoretical methods and structures formation to analysis of polymer process operations. Prereq: 5210.

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

6240 Polymer Engineering Applications of Statistical Mecha-nics (3) Formalisms, postulates and basic statistical mechanics concepts. Statistical function, relative population in equilibrium systems. Lattices, the Ising Model and phase behavior applied to rubber elasticity, solution theories of random coils and idealized chains of rubberlike state mechan-ical properties. Prereq: 5310.
6650 Large Deformation Elasticity (3) Curvilinear tensor analysis of finite strains; Mooney-Finger-Rivlin formulation of isotropic non-linear elasticity, solution of large homogeneous and nonhomogeneous vibration problems, application to vulcanized rubber, reinforcement with inextensible cords. Prereq: 5230 or equivalent.


6610 Advanced Industrial Polymer Chemistry (3) Chemistry and properties of new polymeric engineering materials; highly integrated engineering and chemical approach. Prereq: Consent of instructor.

9910-20-30 Recent Advances in Polymer Science and Engineering (3, 3, 3) Treatment of latest developments in the science and technology of polymers. May include topics of morphology, structure, characterization. Prereq: Consent of instructor.

Mechanical and Aerospace Engineering

MAJORS

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

Professors:

Associate Professors:

Assistant Professor:
P. E. George II*, Ph.D. Purdue; M. Keyhani, Ph.D. Ohio State.

*Space Institute, Tullahoma.

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

MASTER OF ENGINEERING PROGRAMS

Entrance into the Master of Engineering program is restricted to qualified graduates of A.B.E.T.-accredited undergraduate curricula in mechanical or aerospace engineering. At least one-third of the program of study must be classified as engineering design. The student's advisor will assist in planning the program of study to ensure that it includes the necessary design content.

MASTER OF SCIENCE PROGRAMS

Entrance into the Master of Science programs is available to qualified graduates of recognized undergraduate curricula in mechanical or aerospace engineering and to qualified graduates who satisfy the necessary prerequisites.

MASTER'S PROGRAM OPTIONS

Three program options are available:

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

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

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

3. Participation in the departmental seminar program.

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

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

Problems Option: This option is restricted to those students who have had the equivalent of a thesis experience. The evaluation of the work experience and the final selection of the student's program of study are left to the student's committee. The requirements of this option are that the student must satisfactorily complete a program of study that includes:

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

2. Participation in the departmental seminar program.

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

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

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

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

3. Participation in the departmental seminar program.

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

THE DOCTORAL PROGRAM

Admission into the doctoral program will be granted to those applicants who have demonstrated superior achievement in their engineering backgrounds.

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

1. A minimum of 72 quarter hours credit beyond the Bachelor's degree, exclusive of credit for the M.S. thesis or problems.

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

3. A minimum of 18 quarter hours in mathematics in courses numbered 4000 or above.

4. A minimum of 36 quarter hours in mechanical and/or aerospace engineering courses numbered 5000 and above, with at least 12 quarter hours of 6000-level courses. These are exclusive of thesis, problems or dissertation credit.

5. Participation in the departmental seminar program.

GRADUATE CREDIT FOR UNDERGRADUATE COURSES

Junior (3000-level) and senior (4000-level) mechanical and aerospace engineering courses may be taken for graduate credit by non-mechanical or non-aerospace engineering majors, if approved by the student's major department. Mechanical or aerospace engineering majors may not normally use more than one 4000-level engineering course to meet their advanced degree requirements. Non-mechanical or non-aerospace engineering graduate students should consult with instructors regarding prerequisites for undergraduate courses.

Mechanical Engineering

3110 Applied Engineering Thermodynamics (3) Energy and laws governing energy transformations; thermodynamic properties; applications to engineering problems.

3311 Engineering Thermodynamics (3) Energy and laws governing energy transformations; thermodynamic properties; applications to engineering problems.

3330 Engineering Thermodynamics (3) Properties of gases and mixtures; chemical reactions; equilibrium; applications to mechanical engineering problems.

3410 Fluid Flow (3) Development of continuity, momentum and energy principles for fluid systems; applications of mechanical and aerospace engineering problems.

3440 Heat Transfer (3) Heat transfer processes, heat conduction, thermal radiation.
and structures.

3610 Mechanics of Machinery—Kinematics (3) Machine motions, graphical and analytical methods; instantaneous centers; velocities; accelerations.

3620 Mechanics of Machinery—Dynamics (3) Applications of Newton's laws, work, energy, and impact to machinery. Force analysis of mechanisms, balancing, gyroscopic effects, flywheels. Prereq: 3610.


3550 Introduction to Machine Design (3) Ductile-brittle behavior of materials under static and cyclic loading; Stress concentration, design factors and theories of failure. Changes in material behavior in processing and fabrication. 2 hrs and one 2-hr lab.

3910 Engineering Analysis (3) Advanced analysis techniques for problems of aerospace and mechanical engineering. Emphasis on approximate methods.

4140 Energy Conversion Systems (3) Operating and technical aspects. Participation in team design effort including formal presentations and design report.

4170 Turbo-Machinery (3) Basic principles of turbo-machinery; systematic methods of analysis, design, performance evaluation.

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

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

4420 Heat Transfer (3) Heat transfer by free and forced convection, heat transfer with phase changes, heat transfer applications.

4450 Lubrication (3) Hydrodynamic theory of lubrication of sliding bearings; application of Navier-Stokes equations to infinite and finite bearings; analytic and numerical solutions; applications to design.

4471-91 Experimental Mechanical Engineering (3, 3) Experimental methods and measurements of force, length, time, temperature, pressure, transport rates, and physical properties. Planning, conducting, analyzing, and reporting experimental tests run according to test standards and other specifications.

4821 Manufacturing Processes (3) Comparison of machining methods; plastic production; metrology.

4822 Tool Design (3) Principles underlying tool and die design; development of high-volume production tools and molds, work holding fixtures.


4824 Manufacturing Engineering Systems Design (3) Design of complete manufacturing system for a particular product; manufacturing planning, tool and fixture design, design of manufacturing operations, redesign of product to reduce cost.

4825 Manufacturing Process Engineering (1) Product specification; dimensional analysis of size and form; true position tolerance theory; tolerance analysis; and workplace control for production to tolerance.

4831 Energy Methods in Mechanical Design (3) Applications to heat engine principles in complex beams and structures.
Aerospace Engineering

4510 Airplane Performance (3) Introduction to airplane and wing characteristics, drag, propellers, static performance and maneuverability; theory and design of control surfaces; stability.

4920 Selected Topics in Aerospace Science (1-4) Current problems in aerospace science; topics in science and engineering required for an understanding of the several areas of aerospace science. Prereq: Consent of instructor.

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

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

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

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

5150-60-70 Air Vehicle Aerodynamics and Performance (3, 3) Application of aerodynamics to air vehicles to provide estimates of performance, stability, and control. Equations for subsonic to supersonic speeds and for supersonic and subsonic, transonic flow. Relations among thrust, drag, lift, and altitude; propulsion systems, vehicle performance characteristics, and trajectory optimization. Prereq: 4220.

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

5240 Dynamics of Viscous Fluids (3) Equations of viscous fluid flow: laminar and turbulent flow; transition; separation; boundary layer theories; exact and approximate solutions. Prereq: Mechanical Engineering 5316 or equivalent.

5250 Introduction to Hypersonic Flow (3) Boundary layer flow; similarity; Newtonian theory; blunt body flow; viscous interactions; free molecule and rarefied gas flow. Prereq: 5240.

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


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

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

5440-50 Transonic Flow (3, 3) Theoretical and experimental aspects. S440—Nature of flow at transonic speeds and delineation of specific problems—nonlinear nature of flows, viscous interaction, development of small disturbance equations and similarity parameters, shock-wave in transonic flow and assumption of inviscid, flat-plate solution techniques. S450—Shock-wave boundary layer interaction and consequences, design of shock-free flows, wind tunnel testing at transonic speeds, interference problems. Prereq: 5220 or equivalent.


5590 Application of Acoustics (3) Energy flow in acoustics, general equations of sound propagation in nonhomogeneous moving media, sound waves due to turbulence, vortical sound, pseudosound, propagation and absorption of sound, beam theory, instrumentation, and measuring techniques. Prereq: Consent of instructor.

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

5680-90 Aircraft Design (3, 3) General design of aircraft, including systems, present and future, emphasis on systems approach. Socioeconomic base, aerospace and propulsion technology, meterology, aircraft control system, community interface, and technological trends and developments pertinent to present status and future development of air transportation. Prereq: 4210.

5680-90 Aircraft Design (3, 3) General design of aircraft, including systems, present and future, emphasis on systems approach. Socioeconomic base, aerospace and propulsion technology, meterology, aircraft control system, community interface, and technological trends and developments pertinent to present status and future development of air transportation. Prereq: 4210.

5690 Selected Engineering Problems (3-9) Selected problems of aerospace and non-mechanical engineering majors only. Prereq: 5810.

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

5950 Seminars (1) All phases of aerospace engineering, including reports of research projects. The University of Tennessee, Knoxville, and at The University of Tennessee Space Institute, Tullahoma. May be repeated. S/NC only.

5990 Special Topics in Aerospace Science (1-4)

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

6310 Magnetohydrodynamics I (3) Electromagnetic field theory, chemical kinetics, thermodynamic and thermophysical properties of gas plasmas; governing equations and applications. Prereq: 4220 and Mathematics 4710.

6320 Magnetohydrodynamics II (3) Continuum magnetohydrodynamics, solution techniques, and exact solutions for magnetohydrodynamic flow channel flows, one-dimensional model of channel flow, magneto-hydrodynamic boundary layer. Prereq: 0340, Mathematics 5620.
quarter hour master's thesis must be submitted which demonstrates research or design capability. The student must pass a final examination covering the thesis and graduate course work.

An alternate program is available for the Master of Science degree which involves engineering practice rather than a thesis. The student must complete a program of study which includes the following:

1. Thirty-six quarter hours of course work similar to the requirements for the regular Master of Science program (see above).
2. Twenty-four quarter hours of Nuclear Engineering 5980. A student usually registers for 6 hours of Nuclear Engineering 5980 each quarter and investigates problems assigned by a member of the faculty. At the end of each quarter the student submits a written report and makes an oral presentation of the work.
3. Final examination covering graduate course work and practice school problems.

MAJOR PROGRAM

A graduate program in Nuclear Engineering leading to the degree of Master of Science is available to graduates leading to the degree of Master of Science program (see above).

1. A minimum of 72 quarter hours credit beyond the Bachelor's degree, exclusive of credit for the M.S. thesis or Nuclear Engineering Practice.
2. A minimum of 36 quarter hours of credit in nuclear engineering.

These are exclusive of thesis or dissertation credit.

4. A minimum of 18 quarter hours in mathematics, computer science, or statistics in courses beyond the Bachelor's degree.
5. A minimum of 9 quarter hours in courses numbered 5000 or above from a department other than nuclear engineering. The choice depends on the student's overall program and should expand his/her knowledge in a given field.
6. A reading knowledge of one foreign language will be determined by the student's doctoral committee.

4110-20-30 Introduction to Nuclear Reactor Theory (3, 3, 3) Nuclear structure; radioactive decay laws, neutron interaction, fission process, chain-reacting systems; diffusion equations, including multigroup diffusion theory, neutron moderation; reactivity coefficients; perturbation theory.

5. A reading knowledge of one foreign language will be determined by the student's doctoral committee.

4110-20-30 Introduction to Nuclear Reactor Theory (3, 3, 3) Nuclear structure; radioactive decay laws, neutron interaction, fission process, chain-reacting systems; diffusion equations, including multigroup diffusion theory, neutron moderation; reactivity coefficients; perturbation theory.
College of Human Ecology

Nancy Belck, Dean
Jay Stauss, Associate Dean
Jane Savage, Associate Dean
Karl Weddle, Assistant Dean

Graduate studies in Human Ecology prepare the student for teaching, research and public service in colleges and universities or managerial positions in government, business and industry. Within the College of Human Ecology, the Master of Science degree is offered in Child and Family Studies, Home Economics, Interior Design, Food Science, Food Systems Administration, Nutrition (including Public Health Nutrition), and Textiles and Apparel (see departmental sections for further information); the Doctor of Philosophy is offered with concentrations in Child Development, Family Studies, Food Science, Nutrition Science, and Textiles and Apparel. For additional information, contact Jay Stauss, Associate Dean, College of Human Ecology, The University of Tennessee, Knoxville, TN 37996-1900, Phone: (615) 974-6276.

Admission Requirements: A completed file for review includes a College of Human Ecology application, Graduate Record Examination (GRE) scores for the verbal and quantitative sections and completion of three Graduate School Rating forms by individuals who can attest to your potential for graduate education. Forms may be obtained from the Dean's office. Interior Design students are required to submit a portfolio of their undergraduate or graduate work consisting of 15-20 slides which represent their best creative accomplishments from a studio experience. The M.S. in Home Economics requires an undergraduate degree in Home Economics.

Academic Common Market: The ACM is an interstate agreement among some states for sharing academic programs. If you are a resident of one of the participating states and qualify for admission, you may enroll in certain programs on an in-state tuition basis. Potential students for the doctoral program in Human Ecology who are residents of Alabama, Arkansas, Kentucky, Louisiana, Mississippi, South Carolina, Virginia, or West Virginia are eligible. Students planning to enter the Master's program in Food Systems Administration who are residents of Arkansas, Kentucky, South Carolina, and Kentucky, and students planning to enter Nutrition who are residents of Alabama, Arkansas, Georgia, Kentucky, South Carolina, and Virginia are also eligible for in-state tuition.

THE MASTER'S PROGRAM
The M.S. in Home Economics is a college-wide multidisciplinary program. Thesis (45 hours) and non-thesis (51 hours) options are offered.

The program includes 6 hours in research methodology, 9-12 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 18 (thesis) to 30-33 (non-thesis) hours in home economics subject matter. At least one course is to be from each department in the College. A written and oral comprehensive examination is required in the non-thesis option. Other M.S. programs available: Child and Family Studies; Food Science; Food Systems Administration; Nutrition; (including Public Health Nutrition) Textiles and Apparel; and Interior Design (see Department of Instruction for details).

THE DOCTORAL PROGRAM
Graduate study leading to the Doctor of Philosophy Degree is available in the College of Human Ecology (4). The doctorate is a research degree granted only to individuals who demonstrate proficiency in conducting original research. Course requirements for the degree are determined by the student's faculty committee, based upon College and departmental requirements and student needs and interests. The Graduate School sets minimum requirements for the doctoral degree (see pages 23-24) and the College has the following minimal requirements:

1. Selection of a concentration and fulfillment of the requirements as directed by the major professor and approved committee.
2. Minimum 117 quarter hours in courses beyond the baccalaureate degree (exclusive of Master's thesis credits).
3. HES110 Professional Seminar in Human Ecology
4. Minimum 15 quarter hours of 6000 level coursework (not including dissertation).
5. Successful completion of written comprehensive examinations as provided by each department's procedures and the student's doctoral committee.
6. Original research project, which culminates in a dissertation; maximum 42 quarter hours of dissertation credit may be applied to the degree.
7. Final oral examination in defense of the dissertation. The doctoral committee shall determine whether a reading knowledge of a foreign language is required.

THE PH.D. CONCENTRATIONS
Child Development or Family Studies: The doctoral program in Child and Family Studies prepares scholars in the fields of child development and family studies. The strength of this doctoral program is based on three major components: the integration of child development and family studies within the context of human ecology and related areas, specialization in child development or family studies, and an emphasis on factors that affect the child's acceptance of different foods. Within the College of Human Ecology, research from one discipline is enhanced by encompassing and utilizing the findings of research from other disciplines. The doctorate is a research degree granted to individuals who demonstrate proficiency in conducting original research. Course requirements for the degree are determined by the student's faculty committee, based upon College and departmental requirements and student needs and interests. The Graduate School sets minimum requirements for the doctoral degree (see pages 23-24) and the College has the following minimal requirements:

1. Selection of a concentration and fulfillment of the requirements as directed by the major professor and approved committee.
2. Minimum 117 quarter hours in courses beyond the baccalaureate degree (exclusive of Master's thesis credits).
3. HES110 Professional Seminar in Human Ecology
4. Minimum 15 quarter hours of 6000 level coursework (not including dissertation).
5. Successful completion of written comprehensive examinations as provided by each department's procedures and the student's doctoral committee.
6. Original research project, which culminates in a dissertation; maximum 42 quarter hours of dissertation credit may be applied to the degree.
7. Final oral examination in defense of the dissertation. The doctoral committee shall determine whether a reading knowledge of a foreign language is required.
Textiles and Apparel: Students take one comprehensive examination to provide foundation for the integration of textiles and apparel, around the context of the near environment. A department research seminar is required which exposes students to research being conducted in the department. Textiles and Apparel concentration requirements are:

1. Thirty-six hours in textiles and apparel, including 9 hours at the 6000-level, exclusive of dissertation.
2. T&A 5120 or 5250; 5170; 5180; 6110; 6520.
3. Minimum of 3 hours of T&A 6500 Research Seminar. Attendance at seminar is required for all full-time students.
4. Minimum 12 hours chosen from statistics, computer science and research methods.
5. Minimum 12 hours in a cognate area.

Departments of Instruction

Child and Family Studies

MAJORS

Child and Family Studies  M.S.  Human Ecology  Ph.D.

Professors:  G. L. Fox (Head); Ph.D. Michigan; N. Belch (Dean); Ph.D. Michigan State; J. L. Givens; Ph.D. Michigan State; V. M. Nordquist; Ph.D. Tennessee; P. White, Ed.D. Tennessee.

Associate Professors:  J. H. McInnis, Ph.D. Florida State; G. Peterson, Ph.D. Brigham Young; J. Laus (Associate Dean); Ph.D. Washington State; S. Twardosz, Ph.D. Kansas.

Assistant Professors:  J. Allen, Ph.D. Purdue; L. Brill, Ph.D. Ohio State; C. Buelher, Ph.D. Minnesota; C. Catron, Ed.D. Vanderbilt; R. Hailstorks, Ph.D. Ohio State; J. Kidwell, Ph.D. Purdue; G. Pettit, Ph.D. Indiana University; D. Tagano, Ph.D. Virginia Tech; J. G. Weddle, (Assistant to the Dean); Ph.D. Tennessee.

The Department of Child and Family Studies encompasses two primary concentrations: child development and family studies. Integration of these areas creates a unique perspective for the study of individuals and families. Each graduate student's program of study is carefully planned in conjunction with a faculty committee to establish a program consistent with the individual goals of the student. All programs are characterized by a broad array of coursework, varied research experiences, and opportunities for experiences in applied settings. Students at the doctoral level receive substantial participation in statistics and research methodology. Interested students should contact the Department Head.

Admission Requirements: Admission to the program is contingent upon faculty evaluation of the student's background, graduate GPA, rating forms, and work experience.

THE MASTER'S PROGRAM

An individual program of study may be designed by the student in collaboration with his or her major professor and committee. The program may have a concentration in one or both of the following areas:

child/human development

Departmental requirements.

All students, regardless of individual emphasis should follow these guidelines:

1. One theories course in the major concentration of child, or family (i.e., 5210 or 5410).
2. At least one graduate course in each of the two concentrations in child/human development, family development/relationships.
3. At least one-hour of credit from the research seminar, CFS 5910.

Non-theory courses have these requirements in addition to 1-3 above:

4. At least one course in interpretation of statistics and methodology such as Education Psych 5210 or 5220. 5. A comprehensive written examination. 6. At the 45 credit hours required for the M.S.; 24 hours must be in the major field with 18 of these at the 5000 and 6000 level, a minimum of 30 hours must be at the 5000 and 6000 level. 7. At least 9 hours in one minor area or at least 9 hours in a collateral area.

Thesis students have these requirements in addition to 1-3 above:

4. At least one course in statistics such as Stat. 5211, or 5050. 5. At least one course in Methodology such as CFS 5530. 6. Completion of an acceptable thesis and oral examination. 7. At the 45 credit hours required for the M.S.; 9 hours are required for the thesis, a minimum of 30 hours must be at the 5000 and 6000 levels; 18 hours must be in the major concentration with 9 of these hours at the 5000 and 6000 level. 8. At least 9 hours in one minor area or at least 9 hours in a collateral area.

Students seeking the M.S. degree 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 completed.

4290 Adult Development and Aging (3)

Adult life in our society. Adjustment to internal and environmental changes through middle and aged years. Prereq: 2110 or Home Economics 1510 or equivalent background in adult development or consent of instructor.

4360 Advanced Child Development (3)

Survey of selected theories important to child development with emphasis on research literature and research methodology. Prereq: 4 hrs psychology and 6 hrs child development or equivalent back- ground.

4430 Learning Experiences with Parents (3)

Dynamic of parent-child interaction. Emphasis on a variety of techniques for developing communication and working relationships between parents and teachers through experiences in a variety of settings. Prereq: 2210 or Home Economics 1510 or consent of instructor. W

4430 Family Interaction (3)

Dynamic of family interaction at different points in the life cycle. Includes dynamics of parent-child relationships and marital dyad, with family and as family interacts within community; formal and informal support systems within community. Prereq: 3515.

4610 Child in the Community (3)

Needs of children; community agencies meeting these needs; visits to agencies contributing to the welfare of children. Prereq: 2110 or Home Economics 1510 or equivalent.

4620 Administration of Programs for Young Children (3)

Organization, staffing, housing, feeding, scheduling, and financing for day care of infants and young children, nursery school programs, and special programs for deprived preschool children. Prereq: 3350 or 4110.

4710 Contemporary Developments (1-3)

Student or staff-initiated course for study of special topic(s) pertinent to the student or graduate program. Courses to be determined by students and instructor with departmental approval. Elective credit only. Prereq: Consent of instructor.
May be repeated with departmental approval. Maximum 9 hrs.

4810 Afro-American Families (3) Historical background, contemporary family structure and relationships; emerging needs and programs. Prereq: 4 hrs in social sciences.

4820 The Changing American Family (3) Introduction to demographic analysis of family change. Topics covered include the decline in family size, dual-working/dual-career families; separation, divorce and remarriage; gay families; and the elderly. Prereq: 3515 or equivalent, or consent of instructor.

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

5002 Non-Thesis Graduation Completion (3-15) Required for the non-thesis student not otherwise registered during any quarter when such a student 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

5060 Practicum (1-12) Field experience in selected agencies and organizations that focus on problems in family studies. Prereq: Consent of instructor. S/NC only. E

5110 Field Work in Family Life (3) School and community programs concerned with education for family living. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs. S/NC only.

5160 Assessment of Family Behavior (3) Methods of measurement related to study of family. Current methodological issues. Prereq: 5410 or 5530 or consent of Instructor.

5210 Theories of Human Development (3) Prereq: 4350 or equivalent. W

5220 Family Life Programs (3) School and community programs in family life; survey and evaluation; students concentrate on type best suited to their experience and future professional orientation. Prereq: 3 hrs child development; 3 hrs family relationships; 3 hrs sociology. 2 hrs and 1 lab.

5310 Theory and Research on Human Sexuality (3) Cultural, social, and psychological dimensions of human sexuality; historical, sociological, and personal theory and research. W

5320 Individual and Family Development: Cognition (3) Processes through which humans learn to recognize their world. Cognitive processes involved in development across life span. Prereq: 5510 or equivalent or consent of instructor.

5330 Individual and Family Development: Socialization (3) Processes of socialization throughout the life span. Family as primary socializing agent. Prereq: 5510 or equivalent or consent of instructor.

5410 Survey of Research in Family Studies (3) Problems in modern family life: individual adjustments, group relationships. Prereq: 3515, 4430, or consent of instructor.

5420 Naturalistic interventions for Parents and Teachers of Young Children (3) Common problems of young children faced by parents and teachers; emphasis on methods available to modify problem behavior. Prereq: 5760 or equivalent or consent of instructor.

5430 Families in Crisis (3) Interpersonal transactions in disordered family behavior. Prereq: 5410 or equivalent. W

5440 Parent-Child Relationships (3) Major theoretical and research issues of parent-child socialization; influence of the child on the parent; reciprocal influence of children on parents, reciprocal interaction between parents and children, applications of systems models, child abuse, and child neglect. Prereq: 5410 or equivalent or consent of instructor.

5450 Conceptual Frameworks for the Family (3) Theoretical perspectives for understanding families. Exploration and applications of frameworks on theoretical and research levels. Historical to contemporary development of family studies. Prereq: 5410 or consent of instructor. Sp

5480 Marital Dyad (3) Theory and research related to quality of marital relationships: communication, power, marital satisfaction. Prereq: 5410 or equivalent or consent of instructor.

5510 Survey of Research in Human Development (3) Research literature; locating, abstracting, reporting research studies. Prereq: 3515 or 4430 or consent of instructor. W

5530 Research Methods in Child and Family Studies (4) Research procedures in child and family behavior; basic methodology of behavioral sciences. Recomm. prerequisite as advanced experience in beginning thesis work in this area. 9 hrs child and family studies. 3 hrs. lectures and 1 hr. discussion.

5540 Program Models in Early Childhood Education (3) Description, analysis, and evaluation of various preschool program models. Prereq: 5520 or equivalent or consent of instructor.

5550 Supervision in Preschool Programs (3) Guidance of students working in nursery school and day care centers. Guiding students through seminar discussion, individual conferences, and various evaluation techniques. Prereq: 5540. 3 hrs and 1 2-hr lab.

5560 Assessment of Development and Learning in Young Children (3) Procedures for formal and informal assessment of development and learning; psychology of the young, non-handicapped and handicapped children. Critical issues in assessment and evaluation of appropriateness of procedures, and interpretation of results for curriculum improvement. Summative and diagnostic assessment. Prereq: 5510 or equivalent or consent of instructor.

5610 Theories of Management in the Family Environment (3) Fundamental management concepts, development and application to current family situations.

5640 Teaching Child and Family Studies (5) Seminar and practicum in techniques for teaching child development and family relationships. Prereq: Consent of instructor. S/NC only.

5650 Organizational Principles for Caregiving/Teaching Environments (3) Selection of appropriate problem-solving strategies, scheduling of daily routines, assignment of staff responsibilities, staff evaluation and feedback, arrangement of physical environment and selection of play materials. Day care centers, classrooms, residential facilities for retarded, and homes for elderly. Organization to prepare for remediation and support group problems and facilitate program implementation. Prereq: Consent of instructor. Sp

5700 Special Topics in Child Development (3) Research and analysis of current issues in child development. Prereq: 4 grad hrs in child and family studies or consent of instructor. May be repeated. Maximum 9 hrs.

5710 Independent Study in Child Development (1-3) Individual study related to child development, childhood education. Prereq: 3 graduate hrs in child and family studies or consent of instructor. Maximum 9 hrs.

5730 Advanced Study in Infant Development (3) Theory and research concerning normative and nonnormative development during the first two years of life; cognitive, emotional, social and physical aspects. Prereq: 5510 or equivalent or consent of instructor.

5740 Advanced Study in Early Childhood Development (3) Theory and research concerning normative and nonnormative development before preschool years of life; cognitive, emotional, social and physical aspects. Prereq: 5510 or equivalent or consent of instructor.

5750 Advanced Study in Adolescent Development (3) Theory and research concerning normative and nonnormative adolescent development; physical, cognitive, moral, social, familial, sexual, and personality. Prereq: 4350 or equivalent or consent of instructor.

5800 Special Topics in Family Studies (3) Research and theory related to current issues in family studies. Variable topics. Prereq: 12 graduate hrs in child and family studies or consent of instructor. May be repeated. Maximum 6 hrs.

6100 Advanced Study in Family Development (3) Advanced study of research and theory related to current issues in family development. Variable topics. Prereq: 12 graduate hrs in child and family studies or consent of instructor. May be repeated. Maximum 6 hrs.

6120 Advanced Special Topics in Family Studies (3) Advanced study of research and theory related to current issues in family studies. Variable topics. Prereq: 12 graduate hrs in child and family studies or consent of instructor. May be repeated. Maximum 6 hrs.

6250 Advanced Independent Study in Family Development (1-3) Individual study of research and theory in specific area of child development. Prereq: 12 graduate hrs in child and family studies or consent of instructor. May be repeated. Maximum 6 hrs.

6260 Advanced Independent Study in Family Studies (1-3) Individual study of research and theory in specific area of family studies. Prereq: 12 graduate hrs in child and family studies or consent of instructor. May be repeated. Maximum 6 hrs.

6410 Theory Construction in Family Studies (3) Process and application of theory construction in contemporary research areas and family studies. Emphasis on understanding, criticizing and constructing theoretical models based on research findings. Prereq: 5410 or consent of instructor.

6540 Seminar in Programs for Infants and Young Children (3) Research related to programs for infants and young children. Various program models for education of infants and young children, methods of working with parents, and student training programs. Prereq: 5210, 5540 or equivalent.

Human Ecology MAJOR DEGREE

Human Ecology Ph.D.

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

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

5010 Microcomputer Research Applications in Human Ecology (3) Advanced microcomputer procedures and applications for research and data processing. Overview of statistical analysis software, computer graphics, computer assisted design, and national database searches. Project using integrated software to develop research proposal. Prereq: Consent of Instructor.

5210 History and Philosophy of Home Economics (3) Historical development of home economics; survey of concepts and philosophy of component disciplines. Prereq: 6 graduate hrs in child and family studies or consent of instructor. May be repeated. Maximum 6 hrs.

5250 Theoretical Issues in Human Resource Development (3) Interdisciplinary approach to development and use of human resources in solution of family and consumer problems. Prereq: 6 graduate hrs of 5000 level courses representing 2 areas of home economics. F, W
6310 Advanced Topics (3) Comprehensive individual or group discussion of individual and family behavior, physiological development and well being, environmental factors, and economic and social well being. Prereq: 6115. May be repeated.

6900 Seminar (1-3) May be repeated. S/N only.

Home Economics Education

The graduate program in Home Economics Education is administered by the College of Education with home economics education being one of the five service areas within the Department of Technological and Adult Education. The department offers the M.S., Ed.S., and Ed.D., degree programs with a concentration in home economics education. Inquiries may be addressed to Home Economics Education, Jessie Harris Building. (See pages 67-69 for staff, program descriptions, and course offerings).

Nutrition and Food Sciences

MAJORS DEGREES
Food Science M.S.
Nutrition M.S.
Food Systems Administration M.S.
Human Ecology Ph.D.

Professors:
R. E. Beauchaine, Ph.D. Kansas State;
B. R. Carruth (Head), Ph.D. Missouri;
M. P. Penfield, Ph.D. Tennessee; J. R. Savage (Associate Dean), Ph.D. Wisconsin; J. T. Smith, Ph.D. Missouri; M. A. Smith (Memphis), Ph.D. Tennessee.

Associate Professors:
F. E. Andrews, Ph.D. Ohio State; G. W. Disney, Ph.D. Tennessee; N. L. Marable, Ph.D. Massachusetts; D. S. Sachan, Ph.D. Illinois;
M. N. Traylor, M.P.H. California (Berkeley).

Assistant Professors:
J. B. Britts (Memphis), Ph.D. Tennessee;
M. D. Brooks (Memphis), M.S. Alabama;

In the Department of Nutrition and Food Sciences, Master of Science programs are available in Nutrition, Food Science, and Food Systems Administration. Within the Nutrition program, a student may choose to study nutrition science or public health nutrition.

Admission Requirements: Admission to the Nutrition and Food Sciences programs is dependent on completion of undergraduate course work in nutrition, food science, mathematics, economics, human physiology, microbiology, chemistry, biochemistry, and analytical chemistry. For Food Systems Administration, undergraduate coursework in quantity food production and food service system administration is required.

THE MASTER'S PROGRAM

In Nutrition students studying nutrition science may choose a thesis or a non-thesis option. Students emphasizing public health nutrition must choose the non-thesis option. Students in the Food Science or Food Systems Administration programs may select either the thesis or non-thesis option.

Thesis Option: The program will consist of a minimum of 45 hours with at least 24 hours of coursework in the department. Nine hours of thesis are required and may be applied toward the 45 hours. Nine hours outside the department are recommended. A minimum 30 hours at the 5000 and 6000 level is required.

An oral examination over the thesis and coursework is given at the time of the examination.

Non-Thesis Option: The program will consist of a minimum of 45 hours with at least 30 hours of coursework in the department. Nine hours in one area outside the department are required. A minimum of 30 at the 5000 and 6000 level is required.

A written comprehensive examination is given at the end of the program.

Students studying public health nutrition are required to complete one quarter of supervised field experience in a health agency.

4020 Introduction to Sensory Evaluation of Foods (3) Sensory evaluation methods. Prereq: 4010 or 9 hrs of food technology and science. Plant and Soil Science 3610 or equivalent. 2 hrs and 1 lab.

4040 Food in Contemporary Society (3) Consumers' options, responsibilities, and potential influence with respect to food supply.

4050 Food Preservation (3) Application of basic principles and research findings to food preservation in home. Prereq: 3015 and 4 hrs microbiology. 2 hrs and 1 lab.


4140 Nutrition in Disease II (3) Interdisciplinary lectures and discussions on the metabolic processes of normal and diseased organs and/or tissues and the dietary or behavior modifications required. Prereq: 4130. Designed for senior students in the coordinated undergraduate program in dietetics.

4150 Community Nutrition (3) Nutrition problems and services in the community; supervised field experiences. Prereq: 3120 or 3160.

4180 Environmental Effects on Nutrition (3) Effect of natural and synthetic food toxins, drugs both social and therapeutic, and extreme environmental conditions upon nutrient availability, utilization, and requirements of humans. Prereq: 6 hrs natural science.

4190 Diet and Drug Therapy (3) Effect of drug therapy on absorption and utilization of nutrients, and effect of diet on absorption, utilization, and toxicity of drugs. Prereq: 3160 or consent of instructor.


4220 Food and Lodging Information Systems (3) Design of information systems for decision making in home-motel complex; computer application in hospitality industry. Prereq: 3220, Accounting 2130; Computer Science 1410; Marketing 3120, a statistics course, Sp, Su.

4340 Food Systems Personnel Development (3) Development of training programs and personnel management policies for food service personnel. Prereq: 3120. W.

4250 Food Systems Managerial Cost Control (3) Cost analysis for food and beverage operations; use of financial statements for decision making in food service systems. Prereq: 3220, a statistics course, Accounting 2110, Economics 2520. W.

4260 Food and Lodging Physical Plant Planning and Maintenance (4) Fundamentals of mechanical systems and building components of food and lodging physical plant; organization and principles of properties management. Prereq: 3220, 4210, Accounting 2130, Computer Science 1410, Marketing 3120, a statistics course. 3 hrs and 1 lab. W

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

5022 Non-Thesis Graduation Completion (3-15) Required for non-thesis student not otherwise registered during any quarter when such a student uses university facilities and/or faculty time before degree is completed. May be repeated. S/N only.

5100 Food Texture (3) Classification of foods according to textural parameters; instrumentation in evaluation of texture. Prereq: 4010 or Food Technology 4920; Plant and Soil Science 3610 or equivalent; or consent of instructor.

5200 Food Sensory Testing Methods (3) Principles and methodology of sensory evaluation of food; application of methods, analysis of sensory data. Prereq: 4020 or equivalent.

5300 Advanced Experimental Food Science (3) Application of research methods to individual problems. Prereq: 5010-20 or consent of instructor.

5400 Food Behavior of the Individual (3) Development of and changes in choices of food and food habits of individual. Prereq: 4000, 3 hrs of nutrition, or consent of instructor. Sp or Su.

5500 Foodways in the United States (3) Current foodways of selected subcultures in United States and historical basis for their development. Prereq: 4000, 3 hrs of nutrition, or consent of instructor. W, Sp.

5605 Hydrocolloids, Pigments, and Structural Polysaccharides in Relation to Food Science (3) Physical and chemical characteristics; behavior in food. Prereq: 4010, 3140-50 or equivalent.

5700 Sugars, Starches, and Lignins in Relation to Food Science (3) Physical and chemical characteristics; behavior in food. Prereq: 4010, 3140-50 or equivalent.

5750 Proteins in Relation to Food Science (3) Physical and chemical characteristics of proteins. Prereq: 3140 or equivalent.

5100 Advanced Physiological Chemistry (4) Bioenergetics and related metabolism of nutrients. Prereq: 3140 or equivalent.

5105 Advanced Physiological Chemistry (3) Nutritional factors in relation to body fluids, gas transport, and endocrine function. Prereq: 3140.

5110 Community Nutrition (3) Nutrition problems and practices in community; supervised field work. Prereq: 3160 and consent of instructor. 3 labs.

5115 Community Nutrition (2) Observations and participation in nutrition in hospitals, federal and state agencies. Prereq: 5110 and consent of instructor. 3 labs. W.

5120 Community Nutrition (3) Nutrition programs of state and federal agencies; preparation of material for nutrition education; supervised field work. Prereq: Consent of instructor. 3 labs. Su.

5125 Field Study in Community Nutrition (1-12) Personal participation in and analysis of state or regional community nutrition program. Location of independent study to be selected in consultation with instructor. Prereq: 5115 and consent of instructor. S/N only. Sp.

5130 Mental Retardation or Other Developmental Disabilities of Children (3) Core course required of all full-time students in training at Child Development Center, UT Center for the Health Sciences, Memphis. Prereq: Consent of department head. F, W, Sp.

5135 Nutrition in Mental Retardation and Developmental Disabilities (1-12) Interdisciplinary diagnosis and treatment of developmentally-handicapped child. Role of nutritionists; clinical experience and lectures at Child Development Center, Center for the Health Sciences, Memphis. Prereq: Consent of department head.

5140 Experimental Methods in Nutrition (3) Use of small animals in experimental nutrition. Prereq: 3140-50-60, 3410. 2 hrs and 1 lab.

5145 Human Metabolic Research (3) Basic principles of planning, conducting, and interpreting human
metabolic studies. Prereq: 3150 and 6 hrs 5000-level nutrition courses. 2 hrs and 1 lab.
5150-55 Human Nutrition (3, 3) Functions of carbohydrates, proteins, fats, minerals and vitamins. Nutritional requirements of humans throughout life spans and practical applications in meeting requirements. Prereq: 3150 and 5100. W; Su
5160 Physiological Bases for Diets in Disease (3) Developments in dietary treatment of disease in which nutrition plays a major role. Prereq: 4130 or equivalent. Su
5170 Survey Methods in Human Nutrition (3) Food consumption, food practices and nutritional status of population groups. Prereq: 5150-55. 2 hrs and 1 lab. Su
5175 World Food Supply and Human Nutrition (3) Food supplies and food practices as related to human nutrition throughout world. Regional, national and international agencies concerned with food and nutrition problems. Prereq: 5150 or consent of instructor. Sp
5180 Nutrition and Aging (3) Nutritional problems of aging individual, nutritional requirements, dietary intakes, and effect of nutrition on rate of biological aging. Prereq: Consent of instructor. W
5185 Adolescent Nutrition (3) Application of nutrition principles and accelerations effects of diseases on growth and health maintenance; nutrition assessment and counseling. Prereq: 4130 or consent of instructor. F
5210-20 Experimental Quantity Food Study (2, 3) Analysis of food production, holding environment, and service problems related to quality of food prepared in volume. Management resources. Prereq: 3210, 3220, or consent of instructor. F, Su
5220 Methods of Food Systems Research (3) Research methods applicable to food systems administration. Prereq: 3210 or equivalent. W, A
5240 Experimental Design of Food System Facilities (3) Environment in which food is prepared, held, and served in volume. Prereq: 4210.
5250 Food Systems Evaluation (3) Management resources in food systems. Standards for control. Prereq: Consent of instructor. Sp
5270 Administration of Food Service Delivery Systems (3) Introduction to administrative aspects of food systems. Planning and management of food service delivery systems. Prereq: 3250 or consent of instructor. W, A
5280 Human Resource Planning and Development for Food Service Industry (3) Identification of human resource needs; program planning and evaluation for personnel in food service industry. Prereq: 4240, 5230, or consent of instructor. Sp
5310 Clinical Training in Health Care Agencies (3) Instructional and supervisory techniques in clinical settings by nurses and dietitians for training of entry-level health care providers. Prereq: Nursing 4760 or consent of instructor. Sp
5340 Foods and Nutrition: Physicochemical Principles (3) Thermodynamics; physicochemical properties of proteins, carbohydrates and lipids; chemistry of cellular state and practical kinetics; specialized kinetics of enzymatic processes. Prereq: 3140 or equivalent. Sp, A
5360 Instrumental Methods in Research (3) Theory and application of instrumentation for analysis of food and biological materials. Prereq: 3150, 2 hrs and 1 lab. F
5380 Field Experience (3-9) Experience in food-related industry or agency under supervision of faculty member. Prereq: Consent of instructor.

Textiles, Merchandising and Design

MAJORS

Textiles and Apparel

Interior Design

Human Ecology

Ph.D.

Professors:
J. O. DeJonge (Head), Ph.D., Iowa State; R. D. Blakeney, Ph.D., Florida State; A. J. DeLong, Ph.D., Pennsylvania State; M. F. Drake, Ph.D., Pennsylvania State; K. E. Ducket, Ph.D., Tennessee.

Associate Professors:

Assistant Professors:
J. L. Crouse, Ph.D., North Carolina State; J. B. Havasy, Ph.D., Ohio State; B. A. Oliver, Ph.D., Florida State; J. H. Rabun, Ph.D., Tennessee.

Interior Design

The department of Textiles, Merchandising and Design offers a Masters Degree in Interior Design. Students are expected to have a good foundation in this area to enter the program. The program of study will prepare students for careers with interior design or architectural firms, public and private agencies, and educational institutions. Interested students should contact the Department Head for more information.

THE MASTER'S PROGRAM

Thesis Option:
(Major (minimum of 9 hours of 5000 level courses) 18 hrs

Thesis

Minor (minimum of 12 hours of 5000 level courses) 18 hrs

TOTAL

45 hrs

A minor is chosen in an area other than Human Ecology with the approval of the major professor.

ACQUISITIONS AND EXHIBITIONS

Graduate students pursuing a degree in advanced interior design should submit a portfolio of their ungraduate studio work to the department. This portfolio may include slides or original work.

4320 Family Housing Problems (3) Housing requirements of families. Reading and judging house plans, efficient use of space, maintenance problems, housing regulations and restrictions; sites selection and neighborhood development; financing procedures. Prereq: 6 hrs from Economics 2110-25-30. Sp

4450-50 Advanced Interior Design (6, 6) Intensive interior design experiences: complex design problems utilizing systematic design methodology. Project types: multi-family housing, commercial and institutional environments, or complex working environments. Assistance and critiques from area professionals. Prereq: 3452 for 4450. Courses taken in sequence or consent of instructor.

4460 The Consumer and the Market (3) Analysis of consumer decision-making and problems in the marketplace. Consumer issues and policies with emphasis on consumer choice information, consumer protection and current issues. Prereq: Econ 2510 and 2520.

4791 History of Contemporary Interior Architecture (4) Furniture; design and design philosophies of Europe and America in relation to forces that shaped them; movements in visual arts, technological advances, and cultural milieu.


4940 Proxemics (4) Definition of proxemic variables. Recording and analysis of proxemic behavior using unobtrusive methods of observation, still photographs, scale-model environments and interview techniques. Observe, bias and methods of bias reduction. Members of seminar required to design, conduct and present original proxemic research. Prereq: 2000 or consent of instructor. (Same as Architecture 4940.)

4950 Environment as Code (4) Theoretical issues involving consideration of environment as a medium of human communication. Codes and nature of coding behavior in animals and humans. Relationships between coding behavior and the organization of the central nervous system. Coding and social behavior. Communication process as a generic model of human-environmental relations and aspects of environmental communications. Prereq: 2000 or consent of instructor. (Same as Architecture 4950.)

5000 Thesis (1-15) FINP only: E

5022 Non-Thesis Graduation Completion (3-15) Required for the non-thesis student not otherwise required during any quarter when such a student uses university facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. S/NC only. E

5050 Advanced Interior Design (4) Integrative focus on interior design problems applying variety of research and design methods. Prereq: Consent of instructor.

5060 Practicum (1-12) Field experience in selected agencies, organizations or firms that focus on solutions to problems in interior design. Prereq: 12 hrs graduate level interior design or consent of instructor.

5120 Historic Interior Design (3) Research studies of historic interior design developments; interior design, decorative arts of selected geographic areas of Europe or Orient. Variable topics. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs.