ing. Prereq: Senior standing or consent of instructor.

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

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 permission 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.

4990 Problems in Research (3) Independent work course for seniors. Intensive study of some phase of the major field, investigative procedures, report writing.

GRADUATE

5210 Government and the Press (3)
5250 Public Opinion and Mass Media (3)
5510-20-30 Writing and Editing Projects (3, 3, 3)
5560 Magazine Article Writing (3)
5710 Studies in Public Relations Communications (3)
5810 Magazine Editing and Production (3)
5950 Communications and International Development (3)
5970 Independent Study (3)
Joseph P. Goddard, Dean  
William D. Barton, Associate Dean

The Division of Continuing Education at Knoxville extends the academic programs and services for all colleges and schools on campus to the people in the area served by The University of Tennessee, Knoxville. In addition, the division cooperates with all other campuses of The University of Tennessee in extending academic programs and services to all citizens of the state.

Conferences and Institutes

Director:  

Assistant Director:  

Coordinators:  
J.H. Gillespie, M.S. Tennessee; S.R. Martin,  
B.A. Tennessee; G.C. Tranham, B.S.  
Tennessee.

The purpose of the continuing education conference program is to bring together under University auspices groups of participants and qualified resource people to share new information and ideas, to develop new insights, to cope with current problems, or to impart new work performance skills. Types of persons served are practically unlimited. This includes all disciplines: the professional, technical, managerial, and service individuals from the professions, industry, government, education, and commerce.

Conferences, institutes, short courses and workshops from one day to two weeks or more in length are planned and administered by this department and the related academic departments in cooperation with business, industrial, and professional organizations.

Each program is specifically designed for the needs of the group being served and may be held on the University campus or at any other location where adequate facilities and sufficient interest exist.

ELDERLY AND DISABLED PERSONS

Recent statewide legislation gives Tennessee citizens who are 60 years of age or older, or those who are totally disabled, the opportunity to attend courses at The University of Tennessee, Knoxville at no charge on an audit, space available basis. Legal verification of either of these conditions is required for enrollment. Additional information may be obtained at the Department of Conferences and Institutes, 432 University Extension Building.

Workshops and Off-Campus Programs

Director:  

Assistant Directors:  
J.R. Rosamond, M.S. Tennessee; R.B. Tucker,  
M.S. Mississippi State.

This department conducts undergraduate and graduate courses in many locations away from the Knoxville campus. The courses are scheduled in response to requests and identifiable needs of adult part-time students who live some distance from the UTK campus and who take part or all their courses at off-campus locations.

All course offerings and instructors are approved by the appropriate academic department heads and the credit awarded is resident credit. The majority of the colleges and their academic departments cooperate in the off-campus program.

Credit workshops are another phase of continuing education designed to meet the student's changing needs. They are coordinated through the various academic units of the University and provide students the opportunity to participate in short periods of intensive study. As a result, students may earn college credit within a shorter time frame than the traditional quarter system.

Workshops also offer flexibility of timing, location and content. Summer workshops are particularly popular with teachers and school administrators. Although most workshops are held on the UTK campus, geography is not a limiting factor. In the past, workshops have been held throughout the state and in the United Kingdom.

Provisions for a program of student services are provided. These services encompass areas of registration, records and procedures for admission. The student adviser/counselor is available upon request for meeting with students at on-campus locations. Beginning fall 1978, all UTK course offerings in Oak Ridge will be under the administration of this department. Inquiries and/or course requests may be directed here.

University Evening School (Knoxville and Oak Ridge)

Director:  

Associate Director:  
J.C. Sekula, Ph.D. Tennessee.

Assistant Directors:  
T.R. Ayres, M.S. Tennessee; L.U. Jurand-Salter,  
M.S. Tennessee.

Assistant Professors:  
G.M. Fisher, M.S. Tennessee; C.B. Mamantov,  
Ed.D. Tennessee.

Instructor:  
A.J. MacCabe, M.S. SUNY at Albany.

The University Evening School with the cooperation of academic colleges and departments administers credit classes and supports activities for those students attending in the late afternoon and evening. Programs and services are offered enabling working adults to pursue their educational interests and goals.
Undergraduate Degree Programs
The following degrees are available for evening students:
College of Business Administration
Bachelor of Science in Business Administration with a major in Accounting, General Business, Economics, Management, or Office Administration.
College of Engineering
Bachelor of Science in Engineering Science;
College of Liberal Arts
Bachelor of Arts with a major in Anthropology, Economics, History, Political Science, Psychology, or Sociology.

Graduate Degree Programs
Some departments within the Colleges of Business Administration, Education, and Engineering offer all courses required for an advanced degree during the evening. For a specific major, consult the appropriate department. In the College of Business Administration, all courses required for the MBA degree with a concentration in management are offered during the evening.

Nursing Education Program
The Nursing Education Program is conducted through contractual agreement with three area Knoxville hospitals. The diploma program is run through each hospital's independent School of Nursing. Academic courses are provided by the University Evening School in support of this program.

Student Services
A comprehensive program of services is provided by the Evening School for the adult part-time student.
REGISTRATION
Quarterly registration by mail or on campus is offered as a convenience for former Evening School students.
ADVISING
An advising-counseling program is available for the benefit of all evening students who need assistance with academic and/or personal matters. This program can accommodate students during regular daytime hours (8:30-5:30) and in the evenings by appointment. In addition, advisers from the various colleges are on hand for academic consultation during evening preregistration days. A full-time veteran adviser assists evening students, who receive educational benefits under the G.I. Bill, with their academic planning.
FINANCIAL AID
Evening School students who encounter difficulty in pursuing academic goals because of financial restrictions may be eligible for assistance through the Evening School Scholarship Fund. In addition, interested students may obtain applications for the Basic Educational Opportunity Grant Program in the Evening School Office.

Elderly and Disabled Persons
Recent statewide legislation gives Tennessee citizens who are 60 years of age or older, or those who are totally disabled, the opportunity to attend courses at the University at no charge on an audit, space available basis. Legal verification of either of these conditions is required for enrollment. Students who are 65 or over, or are totally disabled and who desire to receive UT credit for their courses, may pay a reduced charge of $5 per credit hour to a maximum of $50 for a full-time load. Registration for day and evening classes is handled by the Evening School.
For additional information concerning any of these programs or services please contact the University Evening School, 451 Communications & University Extension Building.

Non-Credit Programs
Director:
Assistant Director:
Coordinator:
K.J. Reagan, M.S. Tennessee.
The department conducts and coordinates various non-credit courses offered on campus and off campus. It administers non-credit programs offered by the department and other courses offered in cooperation with other academic departments and service departments of the University. These non-credit courses provide opportunities for college remedial training, in-service training, upgrading of physical and some technical skills, recurrency training, and leisure type educational courses for the Knoxville and surrounding community.
Certain non-credit courses are approved for Veterans' training. For specific information, contact the Department of Non-Credit Programs.
Continuing Education Units (CEU's) are awarded to students satisfactorily completing courses described in the non-credit quarterly class schedule. A Continuing Education Unit is defined by the Southern Association of Colleges and Schools as "ten contact hours of participation in an organized continuing education experience under responsible sponsorship, capable direction and qualified instruction." A permanent record of CEU's is maintained by the Division of Continuing Education, Department of Non-Credit Programs. A transcript of all CEU's earned at The University of Tennessee may be obtained upon written request.
ELDERLY AND DISABLED PERSONS
Recent statewide legislation gives Tennessee citizens who are 60 years of age or older, or those who are totally disabled, the opportunity to attend courses at UTK at no charge on an audit, space available basis. Legal verification of either of these conditions is required for enrollment. Additional information may be obtained at 2016 Lake Avenue.
College of Education

William H. Coffield, Dean
E. Dale Doak, Associate Dean for Undergraduate Programs
Helen B. Watson, Associate Dean for Graduate Studies

Teacher education is historically a major function of The University of Tennessee. Beginning in 1903, when the first courses for teachers were offered, the University has increasingly fulfilled its responsibility to provide schools with competent teachers and service personnel and to improve the teaching profession by continually upgrading its membership. The College of Education was established in 1926, and all teacher preparation programs at the University of Tennessee are now coordinated within its seven departments and its School of Health, Physical Education, and Recreation. 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 faculty of the College of Education is committed to performing three major functions: (1) to provide professional preparation for teachers, administrators, and school service personnel at 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 experimental and research studies in education.

The teacher preparation programs represent utilization of University-wide resources and cooperation of all appropriate units. Certain requirements are of basic importance: a broad cultural background in the arts and sciences (general education), mastery of professional knowledge and skills, and thorough preparation in specific teaching fields. Through a carefully planned program of combined academic and direct experiences, the prospective teacher acquires a depth and breadth of knowledge and understanding superior to that of the typical college graduate—superior in cultural and citizenship appreciation as well as in professional and scholarly accomplishment.

The Claxton Education Building contains many modern and functional facilities for the professional training of teachers. Classrooms, laboratories, seminar rooms, faculty and administrative offices, the instructional materials center, the Bureau of Educational Research and Service, the School Planning Laboratory, and facilities for special activities such as observation and experimentation are located in this air-conditioned building.

Special Services

Bureau of Educational Research and Service. Four major types of activities—research, development, educational services, and publications—are channeled through the Bureau of Educational Research and Service (BERS), located in Claxton Education Building. The research activities involve developing research proposals, conducting research, and assisting others in development of research proposals in the College of Education. Developmental activities relate to change efforts in curricular content and instructional methodology. Educational services include a wide list of activities such as inservice educational programs, consultant services, educational services and administrative training programs. Official publications of the College of Education are developed through the bureau. A limited number of graduate student assistantships are available. The Educational Opportunities Planning Center, the Research Coordinating Unit, and the School Planning Laboratory are integral parts of the Bureau of Educational Research and Service.

EDUCATIONAL OPPORTUNITIES PLANNING CENTER

The Educational Opportunities Planning Center (EOPC) works with school districts in the Tennessee-Kentucky area to help meet their desegregation-related needs by assisting with needs assessment and by helping develop plans to meet the needs. A new component was added during the 1975-76 year to deal with sex discrimination in the school systems of Tennessee and Kentucky. Staff follow through with inservice training of local district personnel, with such training directed toward solutions of curricular, human relations, and other types of problems created or compounded by school desegregation and sex discrimination. On-site evaluation of locally installed practices and continuing cooperative evaluation of the progress of local programs are additional major efforts. This program is funded by the U.S. Office of Education.

SCHOOL PLANNING LABORATORY

The School Planning Laboratory (SPL), located in Claxton Education Building, assists school systems and colleges in the state and in the southeastern region with problems arising from renovation of existing facilities and planning of new facilities. Course work peculiar to the field of school planning is offered through the Department of Educational Administration and Supervision. Graduate student assistantships are available each year through the Laboratory.

The Reading Center. A commitment to the concept of teaching, research, and service as the role of the University involves the Reading Center in a variety of activities. An extensive program of diagnostic and remedial reading services to children is closely tied to graduate course work and practicums in reading.
methodology. Effective reading and study classes are offered for the benefit of the University student body. Service functions of the Center include extensive inservice and consultative services for public school reading program improvement. The Center also maintains a remedial reading materials center and assists in the coordination of an ERIC/CRIER Regional Information Center in reading. For further information write the Director, Reading Center, 1912 Terrace Avenue, Knoxville, Tennessee 37916.

**Teacher Placement Service.** The College of Education, cooperating with the University Placement Service, assists qualified students and alumni in securing positions. School and college administrators are cordially invited to make full use of these services in their efforts to employ competent personnel.

**General Information**

**Admission to the College**

For transfer into the College of Education after completion of the freshman year, a minimum grade average of 2.0 (C) is required.

**Load**:

- Permission for more than 19 hours in a quarter must be obtained from the Associate Dean for Undergraduate Programs. A normal course load in the college is 16-18 hours.

**Admission to Teacher Education**

All students are required to apply for Admission to Teacher Education after earning a minimum of 60 quarter hours or in their first quarter if a transfer student with more than 60 quarter hours. Admission to Teacher Education will be a prerequisite for enrollment in any sub-division College of Education course that is required for a professional curriculum.

The criteria include:

1. **Speech and Hearing.** Completion of a speech and hearing exam.
2. **G.P.A. Students** must have a 2.2 cumulative grade point average and a 2.2 UTK average in order to be admitted to Teacher Education. In addition, students must have a 2.0 cumulative G.P.A. and a 2.2 UTK average at the end of the quarter immediately preceding the student teaching quarter.
3. **Social-Emotional Evaluation.**

   Students will be required to undergo social-emotional evaluation. Students whose scores on selected instruments are extreme variations from established norms for these instruments will be required to undergo further evaluation. Data resulting from the social evaluation will be reviewed by the Admissions and Retention Committee as one factor to be used in reaching a decision regarding the continuance of the student in the Teacher Education Program.

4. **Student Conduct.** At the point of a student's application for admission to Teacher Education, any record established by the student in the Office of Student Conduct will be reviewed by the Admissions and Retention Committee. Additional information may be sought when deemed appropriate. In addition, this review will be repeated the quarter prior to student teaching. Primary consideration will be given to the implications of misconduct for persons who will be working as teachers of youngsters.

5. **Field Experience.** Students will be required to have a field experience prior to being admitted to Teacher Education. Applications should be filed in 212 Claxton Education Building.

**State Board of Education**

Effective November 1978, the Tennessee State Board of Education requires that all students preparing for a teaching career in Tennessee must pass a standardized test of basic skills (mathematics, reading, and language) prior to admission to teacher education programs. The University of Tennessee will administer such tests each quarter to allow students planning to enter teacher education programs to fulfill this certification requirement of the State Board of Education.

**Admission to Student Teaching**

Application for student teaching must be filed no later than January 1 of the academic year preceding the actual experience. For example, if a student plans to student teach during the 1980-81 academic year application must be made by January 1, 1980. Applications for student teaching may be completed at approximately five times during each quarter. A schedule of the application meetings is available in the Office of the Director of Student Teaching, 212 Claxton Education Building.

- Students majoring in special education—speech and hearing, and in special education—hearing impaired, are required to make application for clinical practice or student teaching in the Department of Special Education and Rehabilitation in the Office of the Director of Student Teaching.

Before admission to the student teaching quarter, the student must have fulfilled the following requirements:

1. Full admission to the Teacher Education Program no later than the quarter preceding student teaching (i.e., all conditions relative to admission satisfied).
2. Completion of the professional core courses (Education 3010, 3020, 3030 and Educational Psychology 2430 or 3810).
3. Completion of at least 90 percent of course work in the endorsement area(s).
4. Completion of the special methods courses at The University of Tennessee.
5. Completion of the Student Teaching Seminar and the September experience (nondescribed credit).
6. Senior standing and a minimum grade point average of 2.2 on work completed at The University of Tennessee.

- The 15-hour student teaching experience is evaluated on a satisfactory-no credit basis and the hours are included in the University policy requiring a 2.0 in the last 45 hours work.

- The most important criterion in placing student teachers in the public schools is the value of the experience for preparing for teaching. The University cannot guarantee the geographic locale desired by the student though effort will be made to follow the student's wishes. Student teaching centers are maintained in East Tennessee communities, some of which are at a considerable distance from Knoxville. Married students will be placed as near their homes as possible in order to preserve family life.

**Substitutions**

It is sometimes necessary and advisable for students to substitute other courses for those required in a particular curriculum. This is particularly true of students who transfer to The University of Tennessee College of Education from another college or university. The general test of whether a substitution would be appropriate is "does the course you wish to substitute meet the spirit of the course requirement?" That is "is the content similar or perhaps more appropriate to your needs?"

To initiate a substitution request the student should visit with the adviser first. If they agree that the substitution is an appropriate one, the substitution request form should be forwarded to the Office of the Associate Dean for Undergraduate Programs, 212 Claxton Education Building. Approved petitions are forwarded to the Dean of Admissions for further approval, and for filing with the Undergraduate Council.

**Recommendation for Certification**

The application for a professional teacher's certificate should be completed early in the final quarter before graduation. Application forms may be obtained in the Registrar's Office, 215 Student Services Building, and 212 Claxton Education Building. Tennessee state regulations stipulate that the applicant for a professional certificate must be recommended by the teacher-training institution. The dean of the College of Education is the official designated to recommend Tennessee graduates for teacher certification. To receive this recommendation, the applicant must have fulfilled the following requirements:

1. A minimum cumulative grade point average of 2.0.
2. Satisfactory performance of the student teaching experience.
3. A minimum grade point average of 2.0 in the teaching field(s).
4. Completion of a methods course in each area of endorsement.
5. Fulfillment of all special recommendations of the Committee on Standards and Admissions.

**Graduate Programs**

The College of Education, through the Graduate School, offers programs leading to the Master of Science degree, the Master of Education degree, the Master of Arts in College Teaching degree, the Master of Public Health degree, the Specialist in Education (advanced) degree, the Doctor of Education, and the Doctor of Philosophy degrees. For
I. Curricula for Elementary Teachers

A. Kindergarten through Grade 8

GENERAL EDUCATION ........................................ 89 hours

Communications (12 hours)

English 1010-20 and 1031 or 1032 or 1033 (English 1015 may be required of some students); Speech 2021 or 2311 or any speech elective.

Health and Physical Education (18 hours)

P.E. 3450 (3), School Health 3610 (3), Psychology 2500 (4), P.E. and health electives (6 hours) must include minimum of 3 hours in each area.

Humanities (12 hours)

Literature 8 hours; the remaining four hours must be chosen from foreign language (above introductory level), philosophy, religious studies, Art 1815 or 1825, or Music 1210 or 1220.

Mathematics (9 hours)

Mathematics 2101, 2120, 2130.

Natural Science (20 hours)

At least 12 hours in biological science. Recommended series are Biology 1210, 1220 (1230 or Botany 1110, 1120), 8 or 12 hours in physical science. Recommended series are Physics 1410, 1420, (1430) or Geology 1510-20 or Astronomy 2110, 2120, 2130, or Chemistry 1110, 1120, 2130.

Social Studies (16 hours)

History 4 hours—It is recommended that the history course be at the sophomore level. Electives (14-16 hours) from anthropology, economics, geography, political science, and sociology. Minimum of 3 areas are required.

CORE PROFESSIONAL COURSES .................................. 9 hours

Educ. C & I (1301)*, 3260, 3305*

ELEMENTARY EDUCATION COURSES .......................... 36 hours


SPECIALIZED COURSES .................................................................................................................. 21 hours

Educational Psychology 2430; Art Education 2108, 2110, Music Education 2100, 3110; Educ. C & I 3510; Special Education 3333.

AREAS OF CONCENTRATION .................................... 15-16 hours

One or more areas of specialization are to be chosen from the following:

Art Requirements plus 15-16 hours from art, CIDD, art education.

Black Studies Courses from at least 3 different fields must be included. See Black Studies for specific course possibilities.

Child Studies Requirements plus 15-16 hours from child development, psychology, educational psychology.

*Requires admission to Teaching Education Program.

B. Nursery School through Grade 3

GENERAL EDUCATION ........................................ 83 hours

Communications (12 hours)

English 1010-20 and 1031 or 1032 or 1033; Speech 2021 or 2311.

Humanities (12 hours)

Literature 4 hours; Music 1210 or 1220 or Art 1815 or 1825; philosophy or religious studies 4.

Social Sciences (16 hours)

Biological science (in series or combination) 8; physical science (in series or combination) 8.

Mathematics (9 hours)

Mathematics 2110-20-30.

Social Sciences (18 hours)

History 4 hours; Family and Consumer Science 6130; Economics 2110; Anthropology 2530 or 3410 or Human Services or Sociology 3420 or 4510; Elective (from anthropology, economics, geography, human services, political science, sociology).

Interdisciplinary Studies in Home Economics (16 hours)

H.E. 1510, 1520, 2510, 3510.

SPECIALIZED COURSES .................................................................................................................. 34 hours

P.E. 3450, 3660; Pub. Health 3210; health elective; Art Ed 2110, 2110; Music Ed 2100, 3110; Educ. C & I 3430; CFS 3120; LIS 3510.

FOUNDATIONS COURSES ........................................ 15 hours

CFS 1500, 3210; Select one: CFS 2320, 4230 or 4350; Select two: Educ. C & I 3010, 3020, 3030.

TEACHING AND THEORY COURSES ................................. 54 hours


ELECTIVES ........................................................................... 5 hours

TOTAL MINIMUM REQUIRED: 191 hours

*Total three hours required.
II. Joint Elementary-Mathematics Education Certification
(Mathematics + B.S. Degree)

GENERAL EDUCATION ............ 90 hours
Communications (12 hours) 
English 1010-20 or 1023-30 or 1030-33
(English 1019 may be required of some students)
Sistems 201 or 211.
Humanities (12 hours)
Eight hours literature and four hours electives.
Health and Physical Education (19 hours)
Psychology 2500; Educ. Psychology 2420;
Physical Education 3450; physical education electives
(3 hours); School Health 3610. Select one of the
doing as a prerequisite to School Health
3610: Public Health 1110, School Health 3000,
3210, 3410, 3510.
Natural Sciences (20 hours)
Recommended series or combinations:
A. Biological science (8-12 hours) 
Biology 1210-20 or Botany 1110-20
B. Physical Science (8-12 hours) 
Physics 1410-20 or Geography 1510-20 or
Astronomy 2110-20 or Chemistry 1110-20
Mathematics (9 hours) 
Math 2110-20-30, taken in sequence.
Social Sciences (18 hours)
Four hours in history; 14 hours electives from a
minimum of three areas of social science other than
history.

CORE PROFESSIONAL EDUCATION ....... 50 hours
A. Educational Curriculum & Instruction (9 hours)*
Educ. C&I 3010*, 3020*, 3030*
B. Educational Methods (26 hours)*
3751*, 3752*, 3753*, 3754*, 4100*, 4110*, 4140*,
C. Educ. C&I Student Teaching (15 hours)*
Educ. C&I 4810, 4720.

SPECIALIZED COURSES .......... 12 hours

AREA OF CONCENTRATION ........... 36 hours
2. At least 12 hours in courses numbered 3500 or
above with at least one course selected from each of
the following categories:
   c. Geometry: Math 3130, 3220, 3330.

ELECTIVES ....................... 10 hours
TOTAL MINIMUM REQUIRED .......... 198 hours

*Requires admission to Teacher Education Program.
*Required for Student Teaching.

III. Curricula for Secondary Education (7-12)

GENERAL EDUCATION ............ 70 hours
Communications (13 hours) 
English 1010-20 and 1031 or 1032 or 1033
(English 1019 may be required of some students);
and Speech 2311.
Health and Physical Education (9 hours)
Including at least 3 hours of school health or
public health or nutrition (P.E. must be repre-
sented).
Humanities (16 hours)
Any 4 hours from English 2510-20-30-40-60-70-
80-100, plus 2 hours from electives from anthro-
polgy, art, English literature, Library and Information
Science 3510-30, foreign language (beyond introdutory level),
history 3110, music, philosophy, or religious studies. (NOTE: At least
three fields must be represented.)
Mathematics (12 hours)
Natural Science (12 hours)
A biological science, or a physical science, or an
combination of the two.
Psychology (4 hours)
Psychology 2500.

Social Studies (12 hours)
Teaching Content Area and Electives (71 hours)
See outline of the programs below.

TOTAL MINIMUM REQUIRED .......... 186 hours

PROGRAMS AVAILABLE
Program majors leading to graduation and
certification for high school teaching range from the
broad fields, comprehensive major to the
subject major and minor combination programs.

A. English Education
1. English with a Minor
   a. 45 quarter hours in English, including five
   classes in English language (3330, 3340, 4430, 4440,
   4450). Nine of the 45 may be in speech, provided the
   student is not minoring in speech.
   b. 27 hours in some other subject which con-
   stitutes a minor. (If a student who elects to
   minor in a foreign language does not have two
   entrance credits in a foreign language from
   high school, he must take 36 hours in a foreign
   language.)
   c. Students enrolled in this program must take
   two English methods courses: Education C&I
   3670 and 3680.

B. Foreign Language Education
1. Foreign Language Area
   a. 36 quarter hours in one language with no less
   than 16 quarter hours of upper-division
   courses.
   b. 27 quarter hours in another language with
   no less than 18 quarter hours of upper-division
   courses.
   c. 9 hours of general and applied linguistics.
   d. 2 Foreign Language Major and Minor
   a. 45 quarter hours (9 less quarter hours if
   based upon 2 entrance credits from high school)
   and one Language 1319.
   b. At least 27 quarter hours of upper-division
   courses.
   c. 27 quarter hours in another subject.

C. Mathematics Education
1. Area Majors in Mathematics
   Mathematics and Related Sciences (75 hours)
   (1) Mathematics (27 hours) must include at least a
   one-year sequence in calculus or analytic
   geometry and calculus and at least 12 quarter
   hours in courses numbered 3050 or above with at
   least one course in algebra and one in
   geometry.
   (2) Physical Sciences—12 hours in each of the
   following: chemistry, geology, physics.
   (3) Electives—12 additional hours in physical
   sciences and/or mathematics.
Endorsements: Mathematics and Physical Science, General Science

D. Psychology Education
1. A concentration and endorsement in psychology
shall require a minimum of 30 quarter
12 hours upper division
distributed as follows:
Core 16 hours
Psychology 2500 4
Psychology 3120 4
Psychology 3150 4
Psychology 3210 4
Elections—14 hours selected from:
Psychology 3230, 3240, 3250, 3290, 3319, 3219,
3220, 3319, 3430, 3550, 4230, 4530, 4550,
4610, 4900; Psychology or Ed. Psych.
4640; Ed. Psych. 3110, 4110, 4130, 4800,
4890, 4900.
Two minors (18-27 hours for a total of 45
quarter hours each with a minimum of 6 hours
upper division.
At least one of the two minor areas must meet
Tennessee minimum endorsement requirements
for the subject area.

E. Science Education
1. Area Majors in Science
   a. Biological science (72 hours minimum)
   *Biology 1210-20 or Botany 1110-20 (12)
   Biology 3110-20-30 (12 hours), Microbiology
610 (10 hours), Chemistry (excluding 1410 series) (12 hours).
   Science electives—32 hours minimum,
   approximately selected one from or
   more of the following: biology sciences,
   biochemistry, botany, microbiology, zoology,
   physical science chemistry. Minimum
   requirement in biological science consists of
   56 hours (12 hours chemistry required, excluding
   1410 series).
   Endorsements: Biology (Life Science) and
   General Science.

   b. Earth and Environmental Sciences (72 hours minimum)
   Includes 12 hours biological science required,
   and 14 hours science electives selected from
   astronomy, chemistry (excluding 1410 series),
   geography, geology, and physics.
   *Geology (16 hours)
   Chemistry (8 hours)
   Physics (excluding 1410 series) (4 hours).
   Endorsements: Earth Science, General Science, and
   Physical Science.
c. Natural Science (72 hours minimum)
Basic requirement of 12 hours in each of four of the following subjects:
  Biology (1510-20 or Botany 1100-20)
  Chemistry series (excluding 1410 series)
  Geology series (excluding Geology 1000)
  Physics (excluding 1410 series)
Mathematics (excluding 1020, 2020 and 2110-20)
  Credit for only 12 hours math accepted in this program.
  Approved science electives—24 hours minimum, including a total of six quarters of course work in one subject area other than biology. Mathematics is considered as one subject for high school endorsement.
Endorsements: General Science* (Possible endor-"sments: Biology, Chemistry, and/or Physics)
2. Subject Majors in the Sciences
   a. The only single major subject in science teaching to lead certification are chemistry and physics. Majors 45 quarter hours; minors 27 quarter hours.
   b. Specialization in one subject major (45 hours plus 27 hours for a minor).
    Minor: minor is defined as 27 quarter hours in a single subject area. I.e., biology, history, French, psychology, speech, etc. A minor does not meet certification requirements in all cases.

IV. Art and Music Education
A. Art Education
GERENAL EDUCATION
32 hours
Concentration Electives (12-13 hours)
English 1010-20 and 1031 or 1032 or 1033; and
3-4 hours in speech.
Health and Physical Education (9 hours)
Activities courses in physical education plus School Health 3510.
Humanities (15-16 hours)
Art History 1815 and 1825, one literature course, and one elective from anthropology, philology, foreign language above 1000 level, upper-division history, library service, religion or music.
Mathematics (4 hours)
Natural Science (12 hours)
Any twelve hours from the biological and/or physical sciences.
Psychology (4 hours)
Psychology 2500.
Social Studies (12 hours)
Any twelve hours from at least two areas.
CORE PROFESSIONAL EDUCATION
9 hours
Ed. C & I 1301*, 3020, 3030*
SPECIALIZED PROFESSIONAL EDUCATION
21 hours
Student teaching: Ed. C & I 4710*, 4720*; Ed. Psych. 2430 or 3810; and an elective in the College of Education.
TEACHING AREAS AND ELECTIVES 84 hours
A. Major (60 hours)
  Art Educ. 2100, 2120, 3290, 3210, 4120, 4130, 4150, 4160.

B. Minor (24 hours)
May be taken in any order offering a minor.
TOTAL MINIMUM REQUIRED 182 hours

*Requires admission to Teacher Education Program.

B. Music Education
GENERAL EDUCATION
66-68 hours
Communications (12-13 hours)
English 1010-20 and 1031 or 1032 or 1033; and
4 hours in speech.
Health and Physical Education (9 hours)
Activities courses in physical education plus School Health 3510.
Humanities (14 hours)
Music 2320, literature course, and one elective from art, anthropology, literature, foreign language beyond introductory level, upper-division history, philosophy, or religious studies.
Mathematics (4 hours)
Natural Science (11-12 hours)
Three courses from the biological and/or physical sciences, to include Physics 1810.
Psychology (4 hours)
Psychology 2000.
Social Studies (12 hours)
Any 12 hours, to include at least two areas.
CORE PROFESSIONAL EDUCATION 9 Ed. C & I 3010*, 3020, 3030*
SPECIALIZED PROFESSIONAL EDUCATION 21 hours
Student teaching: Ed. Psych. 4710, 4720*; Educ. Psych. 2430 or 3810; and a senior elective in the College of Education.
TEACHING AREAS AND ELECTIVES 85-110 hours
Concentration in Vocal Music (Voice Principal)
25 quarter hours in Music Education: 1010-20, 2110, 2411, 2421, 2423, 2433, 3130, 3150, 4420, 4510.
60 hours in music: 1111-21-31, 1113-23-33, 2111-21-31-23-33, 2340; voice 22 hours; required ensemble 11 hours plus piano proficiency.
Concentration in Vocal Music (Piano or Organ Principal)
25 quarter hours in Music Education: 1010-20, 2110, 2411, 2421, 2423, 2433, 3130, 3150, 4420, 4510.
60 hours in music: 1111-21-31, 1113-23-33, 2111-21-31-23-33, 2340; piano or organ 22 hours; voice 6 hours, required ensemble 11 hours.
Concentration in Elementary Music Education (Voice Principal)
31 quarter hours in Music Education: 1010-20, 2110, 2411, 2421, 2423, 3141-42, 3150, 4420, 4441-42-43, 4450.
60 hours in music: 1111-21-31, 1113-23-33, 2111-21-31-23-33, 2340; piano proficiency; required ensemble 11 hours.
Concentration in Elementary Music Education (Piano or Organ Principal)
31 quarter hours of Music Education: 1010-20, 2110, 2411, 2421, 2423, 3141-42, 3150, 4420, 4441-42-43, 4450.
60 hours in music: 1111-21-31, 1113-23-33, 2111-21-31-23-33, 2340; piano or organ 22 hours; voice 6 hours; required ensemble 11 hours.
Concentration in Instrumental Music Education
35 quarter hours in Music Education: 1010-20, 2110, 2411, 2421, 2423, 3130, 3150, 3410, 4420, 4430.
72 hours in music: 1111-21-31, 1113-23-33, 2111-21-31-23-33, 2340; principal instrument 22 hours; secondary instrument 6 hours; piano proficiency; required ensemble 11 hours.
C. Music Education 440 is required for all students whose principal instrument is wind or percussion.

TOTAL MINIMUM REQUIRED 181-208 hours

V. Health, Physical Education, Recreation, and Safety
A. Concentration in Elementary Physical Education (1-9)
GENERAL EDUCATION
90 hours
Communications (12 hours)
English 1010-20 and 1031 or 1032 or 1033; Speech 2311 or 2311.
Humanities (15-16 hours)
English 2510 or 2520 plus 12 hours of electives.
Social Studies (16 hours)
Sociology 1510 plus 12 hours of electives.
Natural Science (24 hours)
Chemistry 1510-20, Physics 1450, and Zoology 2520-30 and 4940.
Mathematics (4 hours)
Psychology (4 hours)
Psychology 2500.
Health and Physical Education (14 hours)
School Health 3000 and 3420; physical education activities (8 hours) including P.E. 2012, 2022, 1022, 3180.
CORE PROFESSIONAL EDUCATION
9 Ed. C & I 3010*, 3020, 3030*
SPECIALIZED PROFESSIONAL EDUCATION
27 hours
TEACHING AREAS AND ELECTIVES
70 hours
Elementary Physical Education (46 hours)
3000, 3310, 3510, 3560, 3560, 3670, 3660, 3670, 3680, 3320, 3330, 4440, 4420, 4450, and 4 hours of P.E. activity electives.
Cognate Course and Electives (24 hours)
CFS 3210 and 21 hours to be used for endorsement, minor, or free electives.
TOTAL MINIMUM REQUIRED
196 hours

*Requires admission to Teacher Education Program.
music; philosophy; religion; dance appreciation; crafts, interior design and housing. Social studies electives (20 hours) selected from: history; anthropology; sociology; geography; political science; sociology; geology; psychology. Psychology 2500. Physical education activities (12 hours); P.E. 1020, 1012, 1002, 2012, 2022, 2032.

**PROFESSIONAL EDUCATION** .......................... 32 hours Education C & I 3101-20* .......................... 32 hours Education C & I 4710-20*; education elective (3 hours); Physical Education 2560 (practicum, field experience—2 hours).

**SPECIALIZED PROFESSIONAL EDUCATION** ........ 48 hours P.E. 1000; 3210; 4140; 3320; 4110; 4120; 4230; 3220 or 3170; 4130; 4440 or 4450; 3330; 4410 or 4430; 3160; 3240; and 13 hours electives from any upper-division P.E. course.

**ELECTIVES** .................................................. 20 hours Hours to be used for minor, endorsement, or electives (None of the 20 hours may be taken in lower-division physical education.)

**TOTAL MINIMUM REQUIRED** ......................... 196 hours

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* Requires admission to Teacher Education Program.

**D. Minor in Secondary Physical Education (27 hours)** (Open only to students with a concentration in elementary physical education.) 4 hours selected from: Biology 1002, 1012, 1002, 2012, 2022, 2032. At least 6 hours must be selected from: Biology or Botany, Zoology, the areas of anatomy or physiology. At least 6 hours of electives selected from any or a combination of the above.

**Mathematics (4-hours)**

**Electives** .................................................. 15 hours from: Mathematics 1540-50-60, 1840-

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* Requires admission to Teacher Education Program.

**G. Concentration in Recreation**

**GENERAL EDUCATION** .................................. 98 hours

**Natural Sciences** (16 hours minimum)

**Electives** .................................................. 18 hours from: Biology, Chemistry, Geology, Physics, and Zoology. At least 6 hours must be selected from: Biology or Botany, Zoology, the areas of anatomy or physiology. At least 6 hours must be selected from any area of study.

**Mathematics (4-hours)**

**Electives** .................................................. 12 hours from: Mathematics 1540-50-60, 1840-

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* Requires admission to Teacher Education Program.

**H. Major in Public Health Education**

**GENERAL EDUCATION** .................................. 87 hours

**Communications (13 hours)**

**Health and Physical Education (11 hours)**

**Humanities (16 hours)**

**Mathematics (4-hours)**

**Natural Science (20 hours)**

**Psychology (4-hours)**

**Social Studies (19 hours)**

**Evaluations (17)**

**Total Minimum Required** .............................. 192 hours

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* Requires admission to Teacher Education Program.

**I. Major in School Health Education**

**GENERAL EDUCATION** .................................. 87 hours

**Communications (13 hours)**

**Health and Physical Education (11 hours)**

**Humanities (16 hours)**

**Mathematics (4-hours)**

**Natural Science (20 hours)**

**Psychology (4-hours)**

**Social Studies (19 hours)**

**Core Professional Education** .......................... 90 hours

**Evaluations (17)**

**Total Minimum Required** .............................. 190 hours

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* Requires admission to Teacher Education Program.

**J. Minor in Driver and Traffic Safety Education** (28 hours)

**Required Courses** ........................................ 17 hours

**Electives** .................................................. 11 hours

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**K. Minor in School Health Education**

**School Health Education (30 hours)**

**School Health 3300, 3210, 3410, 3650, 3420, Safety 3520; Public Health 3310, 3410, 4410, Nutrition 1230 or Public Health 4420 or School Health 3620.
VI. Special Education

A. Concentration in General Special Education

GENERAL EDUCATION ........................................ 77 hours

Communications (12 hours)
- English 1010-20 and 1031 or 1032 or 1033;
- Speech 1211 or 2021 or 2111 or any speech elective.
(Some students may be required to take English 1019 based on placement scores.)

Health and Physical Education (18 hours)
- P.E. 3450, School Health 3510, Psychology 3250, and 3260 elective hours.

Humanities (12 hours)
- Literature (8 hours); elective from anthropology, economics, geography, political science or sociology (6 hours), and
- Mathematics (3 hours); elective from Math 2110 recommended.

Natural Sciences (16 hours)
- Biology (12 hours); Physical science (6 hours).

Social Studies (16 hours)
- History 2510, 2520 and electives from anthropology, economics, geography, political science or sociology (8 hours).

COURSES REQUIRED (6 hours)
- Special Education 4400, 4410, 4415, 4430, 4435, 4440, 4450, 4460, 4470, 4520, 4560.

COURSES ELECTIVE (15 hours)
- Special Education 4880, 4881, 4882.

TOTAL MINIMUM REQUIRED .................................. 209 hours

*Requires admission to Teacher Education Program

C. Concentration in the Hearing Impaired

ADMISSION TO THE PROGRAM FOR TEACHERS OF THE HEARING IMPAIRED

In addition to the college requirements for Admission to Teacher Education, Special Educa-

tion students in the program for teaching the hearing impaired will follow these procedures:

1. File application for admission to the program.

2. The Program Screening Committee will re-

view all applications quarterly. The following criteria will be considered:
   a. cumulative grade point average;
   b. completion of these courses: Special Education 2110-20-30, 3210-20-30, 3333 and 9 additional hours of course work in major field (AREA OF CONCENTRATION);
   c. advisor's recommendations (based on personal interview and career planning);
   d. instructor's recommendations (from the courses in Special Education listed above);
   e. the candidate's personal aptitude for teaching in Special Education as indicated by practical experiences;
   f. writing sample;
   g. the candidate will grant full or provi-

sional admission or will deny admission. A can-

didate may appeal the decision to the Departmental Appeals Committee and the College Appeals

Committee.

3. Formal admission to the Program will be

granted after the Program Screening Committee reviews applications and the above criteria are

considered.

4. A comprehensive examination in Sign Lan-

guage and Finger-Spelling must be taken at least two quarters before student teaching. A remedial

course in Sign Language and Finger-Spelling will be offered each quarter.

5. Transfer students will follow the same ad-

mission procedures.

1. Specialization in Early Childhood Development

GENERAL EDUCATION .................................. 74 hours

Communications (8 hours)
- English 1010-20 and 1032, (Some students may be required to take English 1019 based on placement scores.)

Health and Physical Education (10 hours)
- School Health 3510, Physical Education 3450, physical education electives.

Psychology (4 hours)
- Psychology 2520

Humanities (11-12 hours)
- English literature
- 7-8 hours electives (choose 2 areas): anthropol-

ogy, art, history, philosophy, foreign language (above introductory level), religious studies, music, library, and information science.

Mathematics (3 hours)
- Mathematics 2110

Natural Science (1-2 hours)
- 8-12 hours in biological science:
   (choose one series) Biology 1210-20-30; Botany 1110-20;
   Physics 1410-20-30; Geology 1510-20; Astronomy 2110-20-30; Chemistry 1110-20-30.

TOTAL MINIMUM REQUIRED .................................. 189 hours

Social Studies (17-20 hours)

History 1510-20 or 2510-20
- Choose 3 areas: anthropology, economics, geography, political science, sociology.

CORE PROFESSIONAL EDUCATION .............................. 77 hours

COURSES REQUIRED (6 hours)
- Special Education 4400, 4410, 4415, 4430, 4435, 4440, 4450, 4460, 4470, 4520, 4560.

COURSES ELECTIVE (15 hours)
- Special Education 4880, 4881, 4882.

TOTAL MINIMUM REQUIRED .................................. 209 hours

2. Specialization in Elementary Education

GENERAL EDUCATION .................................. 77 hours

Communications (9 hours)
- English 1010-20 and 1032. (Some students may be required to take English 1019 based on placement scores.)

Health and Physical Education (15 hours)

Physical Education 3450; School Health 3510, physical education electives.

Psychology (4 hours)
- Psychology 2520

Humanities (12 hours)
- Literature (6); elective from philosophy, art, religious studies, or music.

Mathematics (3 hours)

Natural Sciences (16 hours)

Electrical and biological science (choose one series): Biology 1210-20-30, Botany 1110-20;

6-12 hours in physical science:

Social Studies (15 hours)

History 1510-20 or 2510-20.
- Choose 3 areas: anthropology, economics, geography, political science, sociology.

CORE PROFESSIONAL EDUCATION .............................. 77 hours

COURSES REQUIRED (6 hours)
- Special Education 4400, 4410, 4415, 4430, 4435, 4440, 4450, 4460, 4470, 4520, 4560.

COURSES ELECTIVE (15 hours)
- Special Education 4880, 4881, 4882.

TOTAL MINIMUM REQUIRED .................................. 209 hours

3. Specialization in Secondary Education

GENERAL EDUCATION .................................. 75 hours

Communications (9 hours)
- English 1010-20 and 1032. (Some students may be required to take English 1019 based on placement scores.)

Health and Physical Education (9 hours)
- School Health 3510 and physical education electives.

Humanities (11-12 hours)
- English literature
- 7-8 hours electives (choose from two areas): anthropology, art, history, philosophy, foreign language (above introductory level), religious studies, music, library, and information science.

Mathematics (4 hours)

Natural Sciences (20 hours)

If major is science education, student must take 12 hours in the biological sciences.
- 8-12 hours in biological science:
   (choose one series) Biology 1210-20-30, Botany 1110-20, microbiology, zoology.
Health and Physical Education (6 hours)
Activities courses recommended plus health and physical education electives (both areas must be represented).

Humanities (16 hours)
English (4 hours from 2000-level literature). Electives representing two areas from the following: anthropology, art, English (literature), foreign language (above introductory level), history (upper division), Library and Information Science 3510-20-30, music, philosophy, and religious studies.

Mathematics elective (4 hours).

Natural Sciences (16 hours)
5 hours biological sequence; 8 hours physical science.

Psychology (4 hours)
Psychology 2900.

Social Studies (20 hours)
History electives (8 hours) plus 12 hours representing three areas from anthropology, economics, geography, political science, sociology.

General Electives (6 hours).

CORE PROFESSIONAL EDUCATION: 9 hours Education C & I 3101*, 3020, Special Ed. 4030.

SPECIALIZED PROFESSIONAL EDUCATION: 3 hours Special Education 3333, Special Education 3333, three-hour sequence.

TEACHING AREAS AND ELECTIVES: 6 hours Speech Education 3333, three-hour sequence.

Clinical Practicum Courses (12-15 hours)*

Audiology and Speech Pathology (Prerequisite) 3430-30-40; Special Education 4320-40-40; Special Education 4341, 4342.

TOTAL MINIMUM REQUIRED: 181 hours.

*Requires admission to Teacher Education Program.

B. Distributive Education

GENERAL EDUCATION: 85 hours

Communications (12 hours)
English 1010-20 and 1031 or 1032 or 1033; speech elective.

Health and Physical Education (9 hours)
SCHOOL Health 20 and health and P.E. electives.

Mathematics (8 hours)
Mathematics 1540 and 1550.

Humanities (16 hours)
Literature elective (4) plus 12 hours humanities electives.

Natural Science (12 hours)
Biological or physical science sequence.

Psychology (7-8 hours)
Psychology 2500; Psychology 2520 or Educ. Psych. 3110.

Social Studies (20 hours)
History 1510-20 or 2510-20; Economics 2110-20-30; plus elective.

PROFESSIONAL EDUCATION: 42 hours
Ed. CJI 3010* or Bus. Ed. 4010; Educ. Psych. 3810; Dist. Ed. 4310-20-30; 4130, 4110-20; Ed. CJI 4750.

SPECIALIZED COURSES: 45 hours
Business Admin. 1110; Office Admin. 4310 or 4320; Account 3100; Marketing 3110-20, 4140, 4150; 4140; Finance 3120; Industrial Management 3010; Textile elective; Business Law 4110; Distributive Educ. 4140; Advertising 3000.

ELECTIVES: 12 hours

TOTAL MINIMUM REQUIRED: 183 hours.

*Requires admission to Teacher Education Program.

C. Industrial Education

Option 1. Concentration in Trades and Industries

GENERAL EDUCATION: 67 hours

Communications (12 hours)
English (9 hours): speech elective (3 hours).

Health and Physical Education (9 hours)
Health and P.E. electives. (Both areas must be represented.)

Humanities (15 hours)
Literature elective (4 hours). Two additional areas taken from the following: philosophy, anthropology, art or education, literature, foreign language, music or religious studies.

Mathematics (3 hours).

Natural Science (12 hours).

Psychology (4 hours)
Psychology 2500.

Social Studies (12 hours)
Two areas from the following must be represented: history, anthropology, economics, geography, political science, sociology.

PROFESSIONAL EDUCATION: 12 hours
Ed. CJI 3010* or Bus. Ed. 3010 (or any two); Special Education 3333; Ed. Psych. 3810.

PROFESSIONAL INDUSTRIAL EDUCATION: 42 hours
Indus. Ed. 3310, 3310, 3320, 3340, 3610, 4120, 4140, 4410, 4420, 4422.

OCCUPATIONAL COMPETENCY: 45 hours
Indus. Ed. 3010, 3020, 3030.

ELECTIVES: 20 hours

TOTAL MINIMUM REQUIRED: 186 hours.

*Requires admission to Teacher Education Program.

Option 2. Concentration in Industrial Arts

GENERAL EDUCATION: 67 hours

Communications (12 hours)
English (9 hours); speech (3 hours).

Health and Physical Education (9 hours)
Health and P.E. electives. (Both areas must be represented.)

VI. Vocational-Technical Education

A. Business Education

See curricula for Secondary Education (7-12) p. 107 for General Education and Professional Education requirements.

63 quarter hours in business and economics to meet five business endorsement areas approved by the department adviser. A statement of requirements and alternative programs may be obtained from the chairman of business education.
Humanities (15 hours)
- Literature elective (4 hrs); art or art education (6 hrs; 2 hrs. Additional hours taken from the following: history (upper division), philosophy, anthropology, foreign language (beyond introductory level), music or religious studies.
- Mathematics (3 hours).
- Natural Science (12 hours).
- Psychology (4 hours).
- Social Studies (12 hours).
- Two areas from the following must be represented: history, anthropology, economics, geography, political science, sociology.

PROFESSIONAL EDUCATION (10 hours)
- Educ CAI 301*, 3020, 3030* (select one); Special Education 3333, Ed Psych 3000, 3810.

PROFESSIONAL INDUSTRIAL EDUCATION (30 hours)
- Indus Ed 3110, 3310, 3320, 4210, 4410, 4420, 4691.

TEACHING AREAS (63 hours)
- Communication (Drafting, Graphic Arts)
- Indus Ed 1690, 2661, 3617, 3672, Journalism 3910.
- Power and Transportation (Prime Movers, Electricity/Electronics) Indus Ed 1610, 1630, 2611, 3632.
- Construction and Manufacturing
- Indus Ed 2419, 2641, 2651, 2656, 2660, 3640, 3651, 3652, 4220, 4662, 4670.
- ELECTIVES

TOTAL MINIMUM REQUIRED: 186 hours

*Requires admission to Teacher Education Program.

D. Vocational Home Economics Education
See page 58 for this program.

E. Vocational Agriculture Education
See page 104 for this program.

Departments of Instruction

Art and Music Education


Art Education (141)

1511 Field Experiences in Teaching Art (1) Field experiences in which students perform tasks related to teaching and to teacher roles. S/NC. May be repeated for credit.

2100 Introduction to Art Education in the Schools (3) Art grades 1 through 12; growth and development, objectives, motivation, evaluation. Experiences with school media. 1 hr. and 2 labs.

2110 Drawing, Painting, and Design Activities in Elementary School (3) Prereq: 2100. 1 hr. and 2 labs.

2120 Drawing, Painting, and Design Activities in Junior and Senior High School (3) Prereq: 2100. 1 hr. and 2 labs.

3110 Crafts in the Elementary School (3) Prereq: 2110. 1 hr. and 2 labs.

3210 Art in Secondary School Program (3) Program planning; materials and equipment; relation to other school subjects. 2 hrs. of field experience observation. Prereq: 9 hrs in art education. 1 hr and 2 labs.

3511 Field Experiences in Teaching Art (1) Field experiences in which students perform tasks related to teaching and to teacher roles. S/NC. May be repeated for credit.

3920 Clay in School Program (3) Exploring methods of hand-built forms, glazing and firing procedures. Prereq: 2100. 1 hr. and 2 labs.

3930 Textiles in School Program (3) Exploration of processes of weaving, embroidery, batik, and silk screen. Prereq: 2100. 1 hr. and 2 labs.

4120 Designing Teaching Aids for Art in School Program (3) Design and preparation of charts, exhibitions, slides, films, and other teaching aids for art grades one through twelve. Prereq: 2100 or consent of instructor. 1 hr and 2 labs.

4130 Three-Dimensional Design in School Program (3) Exploration of wood, wire, metal, plastics, and other sculptural materials. Prereq: 2100 or consent of instructor. 1 hr and 2 labs.

4150 Lettering, Posters, and Displays in the School Program (3) Design and layout; techniques and procedures. Prereq: 2100 or consent of instructor. 1 hr and 2 labs.

4160 Appreciation of the Arts in School Program (3) Prereq: 2100 or consent of instructor. 1 hr and 2 labs.

4360-4370 Problems in Art Teaching (3, 3.5) Prereq: Consent of instructor.

4410 The Administration and Organization of Recreational Arts and Crafts Programs (3) Purpose of art activity in recreation; scope of activities, organizational procedures, resources, and coordination required in community arts and crafts programs.

GRADUATE

5000 Thesis

5002 Non-Thesis Graduation Completion (3-15)

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

5310 Art of Education (3)

5320 Program Development in Art Education (3)

5850-5870 Problems in Art Education (3, 3.5)

Music Education (707)

The curricula in music education provide for five areas of concentrations: vocal music (voice principal); vocal music (piano or organ principal); elementary music education (voice principal); elementary music education (piano or organ principal); and instrumental music.

1010-20 Choral Laboratory (1, 1) Choral conducting; methods and materials, required of all music education majors. Prereq: approval of instructor.

1511 Field Experience in Teaching Music (1) Field experiences in which students perform tasks related to teaching and to teacher roles. S/NC. May be repeated for credit.

2100 Basic Experiences in Classroom Music (3) Vocal, instrumental, rhythmic, listening, music reading, and creative activities. Prereq: major in elementary or special education. Five hrs.

2110 Experiences in Classroom Music (3) Vocal, instrumental, rhythm, listening, music reading, and creative activities. For music education majors. Prereq: Approval of instructor, one year of music theory. 2 hrs. and 1 lab.

2411-12-13 Methods, Materials, and Techniques of String Class Instruction (2, 2, 2) Structure, techniques of playing, care, and repair of principal instruments in school instrumental organizations. Emphasis on techniques necessary for basic understanding and effective teaching of the instruments. Practical use of current instructional materials. 2 hrs per week.

2421-22-23 Methods, Materials, and Techniques of Woodwind Class Instruction (2, 2, 2) Structure, use, techniques of playing and care and repair of principal instruments in school instrumental organizations. Emphasis on techniques necessary for basic understanding and effective teaching of the instruments. Practical use of current instructional materials. 2 hrs per week.

2431-32 Methods, Materials, and Techniques of Brass Class Instruction (2, 2) Structure, use, techniques of playing, care and repair of principal instruments in school instrumental organizations. Emphasis on techniques necessary for basic understanding and effective teaching of the instruments. Practical use of current instructional materials. 2 hrs per week.

3110 Teaching Music in the Primary Grades (3) Singing, rhythmic, instrument, listening, creative, and vocal music reading activities; evaluation of materials appropriate for Grades K-3. For elementary education majors only. Prereq: 2100 or 2110. Educational Psychology 2430, upper-division standing.

3120 Teaching Music in the Intermediate and Upper Grades (3) Singing, rhythmic, instrumental, creative, and vocal music reading activities; evaluation of materials appropriate for Grades 4-6. Primarily for elementary education majors. Prereq: Music 2100 or 2110. Educational Psychology 2430 and upper-division standing.

3130 Teaching Music in the Elementary School (3) Singing, rhythmic, instrument, listening, creative, and vocal music reading activities; evaluation; materials appropriate for grades K-6. For music education majors only. Prereq: 2110. Educational Psychology 2430 or 3810 and two years of music theory.

3150 Teaching Music in Junior and Senior High Schools (3) Procedures, techniques, curriculum, scheduling, administration, evaluation, materials and equipment, community relations. Prereq: Two years of music theory; coreq: 3511.

3410 Teaching Instrumental Music (3) Problems and techniques, materials, instrument and equipment selection. Prereq: six hrs credit from 2411-21-31 series; coreq: 3410.

3511 Field Experiences in Teaching Music (1) Field experiences in which students perform tasks related to teaching and to teacher roles. S/NC. May be repeated for credit.

4350-4370 Problems in Music Teaching (3, 3.5)

4420-30 Choral and Instrumental Conducting (2, 3) Reading, conducting, and interpretation of vocal and instrumental scores suitable for school, church, and community groups. 4420 deals with vocal music; 4430 with instrumental music. Prereq: 1010-20 and three hours credit from 2411-21-31 series and two years of music theory. Must be taken in sequence. 2 hrs. and 1 lab.

4441-42-43 Teaching Class Piano (1, 1, 1) For majors in music, music education, or elementary education. Prereq: three hrs credit (2411). Coreq: 4440.


4460 Marching Band Techniques (3) Functions, organization, and direction of a school marching band. Prereq: Senior standing and approval of instructor; coreq: 3511.

4510 Choral Methods and Materials (3) Organization and administration, teaching techniques, choral literature, and choral techniques. Prereq: 1010-20, 4420, one year of voice instruction, two years of music theory. 2 lecture hrs and 2 one-hr labs; labs meet 1010-20.
GRADUATE
5000 Thesis
5002 Non-Thesis Graduation Completion (3-15)
5150 Studies in Secondary School Music (3)
5210 Psychological Foundations in Music (3)
5220 Administration and Supervision of School Music (3)
5230 Comparative Teaching Procedures in Music Education (3)
5240 Evaluation Procedures in Music Education (3)
5250 Role of Music in Education (3)
5260 Music for Early Childhood (3)
5270 Studies of Music for Children in Primary Grades (3)
5320 Advanced Choral Literature and Conducting (3)
5350-60-70 Special Problems in Music Education (3, 3, 3)
5410 Advanced Band Literature and Conducting (3)
5510-20-30 The Talent Education Program of Shinich Suzuki (2, 2, 2)
5710 Research in Music Education (3)
5810-20-30-40 Seminar (3, 3, 3, 3)

Continuing and Higher Education (267)


Associate Professors: M. C. McManus, Jr. (Head), Ph.D. Florida State; K. O. McCullough, Ph.D. Florida State.

Assistant Professor: W. D. Barton, Ed.D. Tennessee.

GRADUATE
5000 Thesis
5002 Non-Thesis Graduation Completion (3-15)
5060 Adult Education: A General Survey (3)
5110 Seminar in College Teaching (3)
5360-70-80 Problems in Continuing and Higher Education (1-3, 1-3, 1-3)
5410 College and University Law—The Legal Environment (3)
5420 College and University Law—Constitutional Rights and Responsibilities of Students (3)
5430 College and University Law—Tort Liability and Risk Management (3)
5440 American Higher Education (3)
5450 Instruction in Higher Education (3)
5460 Adult Development (3)
5470 The Curriculum of Undergraduate Higher Education (3)
5510 Governance of Colleges and Universities (3)
5550 Fiscal Problems in Higher Education (3)
5660 Program Planning in Continuing and Higher Education (3)
5860 The Community-Junior College (3)
5965-65-75 Practicum in Continuing and Higher Education (1-3, 1-3, 1-3)
5960-70-80 Seminar in Continuing and Higher Education (1-3, 1-3, 1-3)
6450 Advanced Seminar in Program Planning (3)

(See also course listings under the Departments of Curriculum and Instruction, Educational Administration and Supervision, and Educational Psychology and Guidance.)

Curriculum and Instruction


Instructors: M. A. Blank, M.S. Tennessee; V. G. Tuggle, M.S. Tennessee.

*Alumni Distinguished Service Professor.

Educational Curriculum and Instruction (301)

Undergraduate programs in the Department of Curriculum and Instruction provide the general professional courses for the preparation of teachers in elementary and secondary schools.

1410 Efficient Reading and Study Skills (1) improvement of reading and study skills S/NC.
1500 Introduction to Early Education (3) (Same as Child and Family Studies 1500).
2010-20-30 Field Study in Education (3, 3, 3) Problems of teachers in active service in the fields of methods of teaching, curriculum materials, school-community relationships, and school organizations.
3010 History and Philosophy of Education (3) Role of philosophy in education: realism, Neo-Thomism, pragmatism, and other contemporary movements; major ideas, historical roots, and modern applications of philosophy to Teacher Education. Undergraduate credit only.
3020 Principles and Organization of Education (3) Relation to current educational problems and practices: organization and operation of public education: professionalization of teaching. Undergraduate credit only.
3030 Social Foundations and Curriculum (3) Culture and society and their influences on curriculum; principles, problems, and procedures of subject matter selection; integration and grade placement; and time allotment; curriculum issues; state curriculum policies and practices. Prereq: Admission to Teacher Education. Undergraduate credit only.
3751 Analysis of Teaching (3) Use of interaction analysis to describe and classify verbal interactions between teacher and student; related nonverbal behavior techniques. Prereq: Consent of instructor.
3810 Microteaching (3) Emphasis upon the development of instructional skills. Students teach a series of lessons to small groups of students in elementary or secondary schools. Lessons are videotaped, and the students and instructor evaluate the teaching behaviors recorded on the tape. Prereq: Consent of instructor.
3260 Teaching Language Arts in the Elementary School (3) Methods and materials in teaching writing, spelling, and language. Undergraduate credit only. Should be taken prior to or concurrently with CAI 3280. Prereq: Educational Psychology 2430 or equivalent, admission to Teacher Education.
3270 Teaching Social Studies in the Elementary School (3) Methods and materials. Undergraduate credit only. Prereq: Educational Psychology 2430 or equivalent, admission to Teacher Education.
3280 Teaching Developmental Reading in the Elementary School (3) Beginning course in sequence designed to enable preservice teachers to develop skills and understandings necessary for operation of successful developmental reading program in the elementary school. Prereq: Ed. Psych. 2430 or equivalent and admission to Teacher Education.
3281 Teaching Developmental Reading in the Elementary School (3) Second course in sequence designed to teach content and skills of teaching reading in the elementary school. Prereq: 3280.
3310 History of Education (3)
3320 History of Education in the United States (3)
3350 Teaching Arithmetic in the Elementary School (3) Goals, methods, materials, and evaluation. Undergraduate credit only. Prereq: Educational Psychology 2430 or equivalent; Mathematics 2110-20-30, admission to Teacher Education.
3510 Books and Related Materials for Children (3) (Same as Library and Information Science 3510.)
3511-12-13 Field Experiences in Teaching: Elementary (1, 1, 1) Field experiences in which students perform tasks related to teaching and to teacher roles. May be taken separately or concurrently by consent of instructor. Must be taken before student teaching. Prereq: 3511—Ed. Psych. 2430 or equivalent; 3512-13—admission to Teacher Education. S/NC.
3520 Books and Related Materials for Young People (3) (Same as Library and Information Science 3520.)
3521-22-23 Field Experiences in Teaching: Secondary (1, 1, 1) Field experiences in which students perform tasks related to teaching and to teacher roles. May be taken separately or concurrently by consent of instructor. S/NC.
3531-32-33 Field Experiences in Teaching: Social Foundations (1, 1, 1) For description, see 3532-22-23. S/NC.
3551 Teaching of Speech and Drama, Grades 7-12 (4) (or subscription, see 3053)...
3562 Teaching of Modern Foreign Languages: Oral Communication Skills, Grades 7-12 (3) For description see Educ. C 1 & 3653. This course and
grouping, individualization, space utilization, organization, grading, integration, and achieving an effective social environment. For elementary classroom teachers, 10 hours.

4250 Initiating the Activities Program (3) Prereq: Educational Psychology 2430, six quarter hours of methods of teaching in the elementary school, and teacher in junior or senior standing.

4260 Philosophy of Education: Introductory Studies (3) Truth, knowledge, and valuation in relation to the work of the schools. Prereq: 3010, Educational Psychology 2430 or 3810, or equivalents.

4261 Educational Classics (3) Discussion of selected writings on education from Plato to Dewey.

4280 Diagnosis and Correction of Classroom Reading Problems (3) Prereq: 3280 or equivalent.

4300 Developmental Reading in the Secondary School (3)

4301 Teaching Developmental Reading (3) Methods and materials used in teaching reading in the elementary school. Course includes development of functional relationships with other curricular areas, diagnostic procedures, and remedial work. Not open to students with recent course work or background in the teaching of reading.

4303 Language Development of Children: Birth-Preadolescence (3) In-depth view of language development from birth through preadolescence; application of principles of language development to instructional programs for early and middle childhood.

4340 The Junior High School and Middle School (3) To identify and analyze distinguishing characteristics of the Junior High and Middle School curriculums.

4350-60-70 Problems in Teaching English (3, 3, 3)

4351-61-71 Problems in Teaching Mathematics (3, 3, 3)

4352-62-72 Problems in Teaching Social Studies (3, 3, 3)

4353-63-73 Problems in Teaching Science (3, 3, 3)

4354-64-74 Problems in Teaching Language Arts (3, 3, 3)

4355-65-75 Problems in General Curriculum (3, 3, 3)

4356-66-76 Problems in Instructional Materials (3, 3, 3)

4357-67-77 Problems in Teaching Foreign Languages (3, 3, 3)

4359-69-79 Problems in Teaching Conservation (3, 3, 3)

4381 Problems in Early Childhood Education (3) May be repeated for a total of 9 hrs. Six hrs can be taken concurrently.

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

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

4430 Practicum in Teaching in the Elementary School (3) Practicum experience in elementary school classroom teaching designed for students seeking elementary certification who have obtained degrees in areas other than elementary education, and who have obtained degrees and certification in areas other than this. Application must be made with student teaching office at least one quarter prior to registration for practicum. Prereq: 3260-70-80, 3350, 3720 or equivalent admission to Teacher Education.

4450 Teaching in Kindergarten: Overview (3) Relations of kindergarten to total elementary program: goals, historical settings and current developments.
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6750-60-70 Problems in Curriculum and Instruction (3, 3, 3)
6830 Studies in Mathematics Education (3)
6850 Principles of Educational Leadership (3)
6899 Internship (1-6)

**Educational Administration and Supervision (292)**

Professors:

Associate Professors:
H.F. Aldmon, Ed.D. Tennessee (Vice Chancellor for Student Affairs); G.W. Harris, Jr., Ph.D. Michigan; P.M. Husen, Ed.D. Stanford.

**GRADUATE**

5000 Thesis

5002 Non-Thesis Graduation Completion (3-15)

5100 Internship in Educational Administration (3)

5130 Introduction to Educational Administration (3)

5150-90-5200 Educational Specialist Research and Thesis (3, 3, 3)

5220 Philosophy and Theory in Educational Administration (3)

5230 Seminar in the Behavioral Sciences for Educational Administration (3)

5290 The Politics of Education (3)

5310 School Administration in a Multi-Ethnic Society (3)

5420 District Level Administration (3)

5430 Building Level Administration (3)

5440 Introduction to Law, Finance, and Business Management at the Building Level (3)

5450 Organization of the School Program (3)

5470 Introduction to School Facility Planning (3)

5480 Introduction to Supervision and Personnel Administration (3)

5490 Administration of Community Education (3)

5530 Introduction to Educational Planning (3)

5560 Analysis and Interpretation of Research for Educational Administrators (3)

5580 Seminar in Communication Skills for Educational Administrators (3)

5711-21-31 Problems in Educational Administration and Supervision: School Operation (3, 3, 3)

5712-23-32 Problems in Educational Administration and Supervision: Higher Education (3, 3, 3)

5713-23-33 Problems in Educational Administration and Supervision: State School Administration (3, 3, 3)

5714-24-34 Problems in Educational Administration and Supervision: Preparation Programs (3, 3, 3)

5715-25-35 Problems in Educational Administration and Supervision: Community Education (3, 3, 3)

5720 Seminar in Urban School Administration (3)

5730 School Business Management (3)

5740 School Law (3)

5755-61-71 Problems in Educational Administration and Supervision: Theory (3, 3, 3)

5752-62-72 Problems in Educational Administration and Supervision: Finance (3, 3, 3)

5753-63-73 Problems in Educational Administration and Supervision: Transportation (3, 3, 3)

5754-64-74 Problems in Educational Administration and Supervision: Business Management (3, 3, 3)

5755-65-75 Problems in Educational Administration and Supervision: Personnel (3, 3, 3)

5756-66-76 Problems in Educational Administration and Supervision: School Plant (3, 3, 3)

5757-67-77 Problems in Educational Administration and Supervision: Organization and Structure (3, 3, 3)

5758-68-78 Problems in Educational Administration and Supervision: School Law (3, 3, 3)

5759-69-79 Problems in Educational Administration and Supervision: Supervision (3, 3, 3)

5770 Maintenance of School Plants (3)

5780 Supervision (3)

5790 School Board-Superintendent Relationships (3)

5810 Survey Research Methods (3)

5830 Contemporary Economics and Educational Finance (3)

5880 Decision Making and Decision Theory in Educational Organizations (3)

5910-30-50 Problems in Lieu of Thesis (3, 3, 3)

5980 Administration in Higher Education (3)

5981 Specialized Seminar in Education Administration and Supervision: School Operation (3)

5982 Specialized Seminar in Education Administration and Supervision: Higher Education (3)

5983 Specialized Seminar in Education Administration and Supervision: State School Administration (3)

5984 Specialized Seminar in Education Administration and Supervision: Preparation Programs (3)

5991 Specialized Seminar in Education Administration and Supervision: Theory (3)

5992 Specialized Seminar in Education Administration and Supervision: Finance (3)

5994 Specialized Seminar in Education Administration and Supervision: Business Management (3)

5995 Specialized Seminar in Education Administration and Supervision: Personnel (3)

5998 Specialized Seminar in Education Administration and Supervision: School Law (3)

6000 Doctoral Research and Dissertation

6040 Seminar in Educational Administration and Supervision (1, 1, 1)

6100 Internship in Educational Administration (3)

6210 Modern Trends in the Theory and Practice of Educational Administrators and Supervisors (3)

6220 Programs for the Professional Preparation of Educational Administrators and Supervision (3)

6460 School Personnel Administration (3)

6480 Special Topics in School Personnel Administration (3)

6530 Futuristic Educational Planning Methods (3)

6550 State-Federal Relations in Education (3)

6560 Legal Foundations of Public Education (3)

6580 Seminar in Managing Conflict (3)

6750-60-70 Independent Studies in Educational Administration and Supervision (3, 3, 3)

6800 Administration of Complex Educational Organizations (3)

6870 Advanced Study in School Facility Planning (3)

6990 Specialized Doctoral Seminar in Politics of Education (3)

6996 Specialized Seminar: School Plant (3)

6997 Specialized Seminar in Organization and Structure (3)

6999 Specialized Seminar: Supervision (3)

**Educational Psychology and Guidance (311)**

Professors:

Associate Professors:

Assistant Professors:

1000 Career Development: Career and Educational Decision Making (3) Assists students in identifying where they are in their lives in relation to where they would like to be in terms of their values, skills, goals, plans, and interests. Utilization of this information in career decision-making process.

2000 Field Experience (1) Field experiences in working with children and youth and their teachers. Students will perform various teaching tasks and be given opportunity to act in teaching roles. May be repeated for a total of six credit hrs.
2430 Child Study (3) Child learning and development: study of individual children, ages 5-12. Prereq: Psychological 2500 or equivalent; coreq: either Educational Psychology and Guidance 2000 or a 2 hr/week field experience.

2510 Child and Adolescent Study (4) Encompasses study of principles of behavior, intervention techniques, principles of child and adolescent development, special categories of children, child in relation to family and community, and methods of studying children. Prereq: Educational Psychology 1000 and Psychology 2500 or consent of instructor.

2520 Personal and Skill Development of the College Student (4) Development of communication skills and social relationships: enhancement of self-concept and understanding of self; and assistance in developing effective study skills. Weekly two hour laboratory experience. Prereq: Educational Psychology 1000, Psychology 2500 and Educational Psychology 2510 or consent of instructor.

3000 Field Experience (1) Field experiences in working with children and youth and their teachers. Students will perform various teaching tasks and be given opportunity to act in teaching roles. May be repeated for a total of six credit hrs.

3100 Application of Learning Theory to Classroom Teaching (4) Overview of learning theories such as contiguity theory, reinforcement theory, cognitive theory, and statistical models with particular emphasis on concepts applicable to classroom teaching. Two hr lab and/or field experience arranged. Prereq: Psychology 2500.

3110 Classroom Behavior Management (4) Student will develop understanding of behavior management procedures and skill in utilizing behavior management procedures in shaping pupil classroom behaviors. Prereq: Psychology 2500.

3550 Child Psychology (4) (Same as Psychology 3550.)

3560 Individual Skills for Campus Leaders (3) Knowledge and skills for effectively managing leadership and administrative roles in campus organizations.

3730 Educational Psychology (3) Increasing effectiveness of learning. Prereq: Psychology 2110-20 or equivalent.

3810 Educational Psychology: Adolescence (3) Physical, emotional, intellectual, social and career education. Emphasis is on students in educational setting. Prereq: Psychology 2500 or equivalent; coreq: either Educational Psychology and Guidance 3000 or a 2 hr/week field experience.

4110 Psychology of Sex Role Development (3) Examination, from both a theoretical and research base, of factors which contribute to sex role development with attention to changes in sex role definition in society and role of education in these changes. Aimed at the undergraduate or graduate student with minimal background in behavioral sciences.

4120 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.

4350-60-70 Problems in Educational Psychology and Guidance (3, 3, 3)

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

4551-52-53-54-55-56 Student Leadership Workshops (1, 1, 1, 1, 1) Series of small group and individualized experiences to develop knowledge and skills required of students in leadership roles. Sections are designed for resident assistants, student government leaders, student activities, and other student organizations. Prereq: Consent of instructor. S/NC.

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

4650 The Construction of Classroom Tests (3) Concerned with teacher-made classroom tests: instructional objectives, principles of test construction, item analysis, evaluating a test's reliability and validity, interpretation of test scores, relationship between testing and grading.

4700 Assertiveness Training (1) Readings and group exploration of principles of assertiveness and the application of assertive behavior in a variety of settings.

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

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

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


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

4910 Diagnostic and Corrective Teaching (3) Teachers and supervisors study practical procedures for improving pupil's learning.

GRADUATE

5000 Thesis

5002 Non-Thesis Graduation Completion (3-15)

5040 Guidance and Pupil Personnel Services in Education (3)

5050 Children and Adolescents (3)

5060 Group Approaches with Students (3)

5070 Seminar in Elementary School Guidance (3)

5098 Field Work in School Psychology (1-4)

5100 Developmental Psychology (6)

5110 Psychology of Women (3)

5111-12-13 Seminar in Current Issues in School Psychology (1, 1, 1)

5120 Seminar in Bias-Free Counseling (3)

5140-50-60 Psychoeducational Assessment (3, 3, 3)

5149-59-69 Practicum in School Psychology I (2, 2, 2)

5180-60-8200 Educational Specialist Research and Thesis (3, 3, 3)

5210 Interpreting Published Articles: Statistics (3)

5220 Interpreting Published Articles: Research Design (3)

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

5320 Advanced Classroom Behavior Modification (3)

5330 Theory and Research in Human Learning (3)

5331 Current Developments in Human Learning (3)

5340 Group Dynamics (3)

5350 Educational Applications of Cognitive Theories (3)

5420 College and University Law—Constitutional Rights and Responsibilities of Students (3)

5550 Student Personnel in Higher Education (3)

5560 The College Student (3)

5570 Case Studies in College Student Personnel (3)

5720 Evaluation in Education (3)

5780 Career Development: Theory and Research (3)

5785 Career Development: Program Development Implementation and Evaluation (3)

5790 Career Development: Workshop (1-6)

5840 Student Appraisal (3)

5850-60-70 Special Topics and Problems in Educational Psychology and Guidance (1-6, 1-6, 1-6)

5880 Career Development: Occupational and Educational Resources (3)

5890 Counseling Theories and Techniques (3)

5897 Pre-Practicum (3)

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

5940 Counseling Practicum (3)

5945 Group Counseling Practicum (3)

5950-60 Theory and Practice in Consultation (3, 3)

5959-69 Practicum in Consultation (3, 3)

5980 Organization and Administration of Counselor Programs (3)

5990 Practicum in College Student Personnel (3)

6000 Doctoral Research and Dissertation

6040 Seminar in Educational Psychology and Guidance (No credit)

6099 Internship (1-6)

6110 Application of Research Design in Educational Psychology and Guidance (3)

6120 Application of Experimental Research Design in Educational Psychology and Guidance (3)

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

6550-60-70 Seminar in College Student Personnel (2, 2, 2)

6610-20-30 Seminar in Dissertation Proposal Writing (2, 2, 2)

6650-60-70 Systems Approaches in Psychological Services (3, 3, 3)

6659-69-79 Practicum in School Psychology III (2, 2, 2)

6750-60-70 Problems in Psychology and Guidance (3, 3, 3)

6810 Seminar in Counseling (3)

6840-50-60 Seminar in Professional Issues (1, 1, 1)

6910 Special Topics Seminar (3)

6941-42-43 Practicum in Guidance, Counseling and Personnel Services (3, 3, 3)

6944-45-46 Teaching Practicum in Educational Psychology and Guidance (3, 3, 3)

6950 Counseling Supervision (3)
degrees, see the Graduate Catalog.

The School of Health, Physical Education, and Recreation also provides activities programs for all students in physical education and service courses in health and safety.

Health and Safety Education


Associate Professors: I.A. Ahmad, Ph.D., Oregon, M.D. Punjab (India); A.J. Brown, Ed.D., Tennessee; J.D. Gorski, Dr. P.H., UCLA; C.B. Hamilton, Dr. P.H., Oklahoma.

Assistant Professors: J.S. Ellison, Ed.D., Tennessee; A.F. Thompson, Ph.D., Michigan.


Public Health (839)

1110 Principles in Personal Health (3) To develop ability to approach health scientifically and to develop justified confidence in judgments affecting personal health.

2040 Seminar in Human Sexuality (2) Problems and responsibilities of being male and female. S/NC.

2050 Seminar in Drug Use and Abuse (2) Intensive look at problems related to use and abuse of drugs. S/NC.

3000 Foundations of Health Science (3) In-depth study of content areas relating to personal health and contemporary health problems, i.e., mood modifying products, consumer health, international health, personal health practices, reciprocal relationships involving man, disease and environment. (Same as School Health 3000.)

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

3310 Communicable and Noncommunicable Diseases (3) Modern concepts of diseases; etiology of communicable and chronic diseases; problems including prevention and control. Prereq: One year of biological science and one course in bacteriology.

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

3330 Introduction to Public Health (3) Philosophy, organization, and functions of federal, state, and local official and voluntary public health agencies. Includes periodic field trips.

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

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

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

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

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

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

4411 Instructor's Advanced First Aid and Emergency Care (3) Designed to teach First Aid. Satisfactory completion qualifies one for American National Red Cross Certification as an Advanced First Aid and Emergency Care Instructor. (A requirement for this certification is that an applicant must be at least 21 years of age.) Prereq: 3210 or valid Advanced First Aid and Emergency Care Certificate.

4412 Cardiopulmonary Resuscitation (2) Theory and skills necessary to implement basic cardiac life support following cardiac arrest due to such conditions as heart attack, drowning, electrocution, suffocation, poisoning, drug intoxication, and vehicular and other accidents. Educational and preventive aspects of controlling cardiovascular disease will be stressed. (Same as School Health 4412.)

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

4700-10-20 Field Practice in Public Health (3, 3, 3) Field practice in public health under supervision of public health professor. S/NC.

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

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.

GRADUATE

5002 Non-Thesis Graduation Completion (3-15)

5010-20-30 Workshop in Public Health (3-6, 3-6, 3-6)

5070-80-90 Field Practice and Seminar in Public Health (3-5, 3-5, 3-5)

5100 Environmental Health (3-5)

5120-30 Occupational Health and Safety (5, 5)

5150 Industrial Toxicology (3)

5220 Health and Sickness in the Focus of Public Health Education (2)

5410 Epidemiology (3)

5420 Administration of Public Health (3)

5430 Vital and Medical Statistics (4)

5440 Methods and Materials in Public Health Education (4)

5540 Factors in Problem Solving for Community Health (5)

5550 The Public Health Educator in Community Organization and Development (4)

5560 Functions and Roles of the Public Health Educator (3)

5580 Physical Activity and Health (5)

5705 Advanced Professional Health Education: Health Planning I (3-5)

5710 Advanced Professional Health Education: Health Planning II (3-5)

5715 Advanced Professional Health Education: Health Planning III (3-5)

5730 Dental Health Education (3-5)

5735 Emergency Medical Services (3-5)

5745 Family Health Unit (3-5)

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

5755 Health Facilities Administration (3-5)

5760 Health Services Administration (3-5)

5785 Occupational Health Unit (3-5)

5790 Self-Care Unit (3-5)

5795 The Training of Paramedical Personnel (3-5)

5840-50-60 Problems in Public Health Education (1-3, 1-3, 1-3)

6000 Doctoral Research and Dissertation

6030 Critical Analysis of Writing and Research in Health Education (3)

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

6210 Health Aspects of Gerontology (3)

6220 Seminar on the Nation's Health (3)

6230 International Health (3)

Safety (890)

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


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

4412 Cardiopulmonary Resuscitation (2) (Same as School Health 4412.)

4420 Advanced Driver and Traffic Safety Education (6) Development of competency in teaching of driver education through use of simulation, multimedia and multiple-car driving range. Emphasis placed on teaching skills and supervision. Prereq: 4410.

4430 Sports Safety (6) Accident prevention and injury control in sports activities; philosophy of sports safety; human environmental factors and their interrelationships in sports injury and their control; risk-taking and decision solution strategies; and contributions of sports medicine to safety. 3 hrs lecture and 2 hrs lab.

4720 Workshop in Safety (3-6) Deals with special safety education problems. For advanced undergraduate students, graduate students, teachers, supervisors, and administrators. May be repeated for credit.

GRADUATE

5000 Thesis

5002 Non-Thesis Graduation Completion (3-15)

5320 Behavioral Problems in Safety Education and Accident Prevention (3)

5330 Problems and Research in Accident Prevention (3)
Physical Education (764)

Professors: G.F. Brady (Emeritus), Ph.D. Iowa; E.K. Capen (Emeritus), Ph.D. Iowa; B.D. Franky (Chairperson), Ph.D. Illinois; A.J. Kozar, Ph.D. Michigan; W.P. Liebman, Ph.D. Iowa; T.M. Pfister, Ph.D. Wisconsin; A.M. Pfister, Ph.D. Michigan; B.T. Howley, Ph.D. Wisconsin; N.E. Lay, Ph.D. Florida; B.J. Mead, Ph.D. Purdue.

Associate Professors: T.T. Howley, Ph.D. Wisconsin; N.E. Lay, Ph.D. Florida; B.J. Mead, Ph.D. Purdue.


1000 Introduction to Physical Education (2) Special emphasis on theoretical and practical aspects of physical education. S/NC.

1020 Physical Education: Swimming (2)

1021 Physical Education: Bowling (2)

1022 Physical Education: Basketball (2)

1032 Physical Education: Tennis (2)

2012 Physical Education: Soccer-Speedball (2)

2022 Physical Education: Volleyball (2)

2032 Physical Education: Golf (2)

2040-50-60 Dance Production (2, 2, 2) Preparation and presentation of public dance performances. Prereq: Approval of instructor.

2070 Orientation in Dance—Appreciation (3) History, aesthetic principles, and current trends in dance.

3000 Administration of Athletics (2) Conduct of program of athletic sports in high schools and colleges.

3010 Beginning Dance Techniques (2) Analytical and practical study of modern dance movements.


3040 Beginning Jazz Techniques (2) Instruction and practice in styles and techniques of jazz dance.

3050 Rhythmic Analysis (2) Emphasis on analysis of organic movement. Prereq: Junior standing, consent of instructor.

3060 Beginning Dance Composition (2) Experience in creative forms of dance. Prereq: 3010.

3070 Beginning Ballet Techniques (2) Introductory course designed to acquaint students with discipline of classical ballet, cultural, and educational values, and relationship to other dance forms.

3080 Officialing Women's Volleyball (3) Officialing based on rules of National Association for Girls and Women in Sport. National tests and ratings will be given. Both men and women are encouraged to take the course.

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

3100 Social Dance (2) Instruction, practice, and teaching in basic social dance steps.

3110 Athletic Coaching of Football (2) Fundamentals and coaching techniques. Prereq: approval of instructor.

3120 Coaching of Basketball (2) Individual and team fundamentals for the high school coach; attention given to conditioning, schedule making, and other business arrangements. Prereq: Approval of instructor.

3130 Athletic Coaching of Track and Field Events (2) Techniques and training procedures. Prereq: Approval of instructor.

3151 History of Dance and the Related Arts II (2) Survey of dance and the arts related to it tracing their development in the twentieth century.

3160 Officialing Women's Basketball (3) Officialing based on rules of National Association for Girls and Women in Sport. National tests and ratings will be given. Both men and women are encouraged to take the course.

3170 Weight Control and Physical Activity (3) Theoretical knowledge of and practical experience in principles and methods of weight control and related physical activity.

3180 Track and Field (2) Methods and practical experience in technical and coaching procedures. Special emphasis on teaching techniques, demonstration, progression, and analysis.

3200 Athletic Coaching of Baseball (2) Individual and team fundamentals for high school and college coaches. Prereq: Consent of instructor.

3210 History and Principles of Physical Education (3) Principles from basic sciences of anatomy, bacteriology, biology, chemistry, physiology, psychology, and sociology applied to health, physical education and athletic coaching.

3220 Physical Fitness Activities (3) Teaching of calisthenics, conditioning activities, and weight training with emphasis on physical fitness concepts including muscular development of the body.

3240 Team Sports (2) Instruction, practice, and student teaching in selected team sports.

3250 Athletic Training Techniques (3) Theory and practice in the prevention and care of basic athletic injuries.

3260 Practicum for Physical Education Majors (1-10) Observation and limited teaching, coaching, and leadership experiences in physical education classes. Experience is intended to cover the last three-year period of professional preparation. May be repeated. Maximum of 10 hrs credit. S/NC.

3290 Applied Anatomy and Kinesiology (3) Bones, joints, ligaments, and muscles involved in movements, reaction of joints and muscular mechanism to bodily development and efficiency.

3330 Stunts and Tumbling (2) Instruction and practice; student teaching and lesson planning stressed with focus upon safety techniques.

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

4550 Physical Education in the Elementary School (3) Movement experiences appropriate for elementary school children-planning and teaching a developmental program.

3510 Conceptual Bases for Study of Human Movement Behavior (2) Biophysical, percepto-cognitive, and psycho-social forces causing humans to move as they do. Prereq: 1011 or 1012.

3530 The Teaching of Swimming and Lifesaving (2) Certification in ARC Water Safety Instructor Training or Senior Lifesaving with additional practice in teaching of swimming.


3560 Human Growth and Motor Development (3) Structural and functional changes in man from birth to old age, and relationship of changes to physical performance and skill development.


3610-20 Individual and Dual Sports (2, 2) Instruction, student teaching, and practice in organizing adult sport and recreational activities suitable for schools, churches, or community recreation centers.

3650 Teaching Strategies and Program Implementation in Elementary Physical Education (3) Understanding and employing teaching strategies appropriate to elementary physical education, and study of program content and implementation. Prereq: 3570.

3660 Basic Movement Sequences for Children (3) Movement patterns and skills which are fundamental to dance, quiet and active games, skill, designing and presenting sequential learning tasks and creative activity experiences. Prereq or coreq: 3650.

3670 Practicum in Developmental Movement for Early Childhood (3) Experiences in designing and presenting developmental movement tasks to preschool children. Prereq or coreq: 3660.

3680 Structured Movement Activities in Elementary Physical Education (4) Self-testing, games and sports, and dance activities included in elementary school physical education program, with emphasis upon designing and presenting sequential learning experiences. Prereq: 3670.

3710 Camping (2) Theory and practice in leadership with practical experience in camp craft skills.

3720 Philosophy of Physical Education and Sport (3) Introduction to form and content of philosophy of physical education and sport. Specific emphasis on examination of metaphysical, epistemological and axiological status of physical education and sport.

3880 Social Recreation (3) Theory and practice in social recreation for camps, community centers, clubs, and schools. Course includes folk and square dancing, tennis, basketball, volleyball, ice skating, and other social activities. Prereq: 3880 or 3881 or 3882.

3910 Principles and Problems of Coaching (3) Examination of practical problems and situations which prepare students to make judgments and decisions in a coaching environment. Prereq: At least sophomore standing.

4010 Advanced Dance Technique (2) Development, improvement, and refinement of dance skills with emphasis on analysis and practice of dance principles; solo and group work. Prereq: 3020.

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

4060 Advanced Dance Composition (2) Creation and development of ideas, themes, and dance forms; solo and group work. Prereq: 3060.

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

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.

4120 Administration of Physical Education (3) Selected topics in organization and administration of a physical education program for schools. Emphasis placed on human relations approach to solving problems in administration.

4140 Tests and Measurements in Physical Education (3) Study of elementary statistics related to measurement. Critical examination of tests used to evaluate strength, sports skills, and physical fitness.

4150 Creative Rhythms for Children (3) Methods and materials for grades 1-6. 3hrs and 1 lab.

4160 Athletic Coaching Field Experience (2) Practical experience in coaching and related responsibilities. Must be repeated. Maximum credit 4 hrs. Prereq: Approval of instructor.

4230 Program Planning in Physical Education (3) Curriculum building, course construction, and lesson planning for public schools and colleges.

4310 Folk and Square Dance (2) Materials and methods for public schools, colleges, and recreation centers.

4320 Tap Dance (2) Instruction, practice, and student teaching.

4330-40-50 Specialization Study in Physical Education (1-3, 1-3, 1-3)

4410 Wrestling (2) Theoretical and practical work for prospective teacher; emphasis on safety procedures.

4430 Women's Gymnastics (2) Development of skills on balance beam, uneven parallel bars, and side horse vaulting; special emphasis on progress, safety, and teaching techniques. Open to men and women. Prereq: 3330.

4440 Men's Gymnastics (2) Development of skills on pommel horse, parallel bars, and long horse vaulting. Special emphasis placed on safety, progress, and teaching techniques. Open to men and women.

4450 Men's Gymnastics II (2) Development of skills on still rings, horizontal bar, trampoline, and exhibition gymnastics; special emphasis placed on safety, progression and teaching techniques. Open to men and women. Prereq: 4440.

4460 The Coaching and Judging of Women's Gymnastics (3) Appreciation of techniques used in the coaching and judging of women's gymnastics according to the rules of the United States Gymnastics Federation. National tests and ratings will be given. Both men and women are encouraged to take this course. Prereq: 2734 or 4440.

4550 Methods of Teaching Dance (2) Individual work with analysis and criticism. Prereq: senior standing and approval of instructor.

4880 Motor Behavior: A Theoretical Perspective (4) Examines motor behavior from an information processing perspective and applies current research to support theoretical base. Prereq: Senior or graduate standing or consent of instructor.

4890 Motor Behavior Laboratory (2) Provides a beginning experience in methodology and instrumentation for assessing factors related to or effecting motor learning/ performance. Prereq or coreq: PE 4880 or consent of instructor. Prereq: PE 4140 and/or PE 5320 or consent of instructor.

5000 Thesis

5002 Non-Thesis Graduation Completion (3-15)

5110 Administrative Problems in Physical Education (3)

5130 Methods in Physical Education (3)

5140 Advanced Philosophy of Sport (3)

5150 Systematic Philosophic Analyses of Sport (3)

5210 Principles and Philosophy of Physical Education (3)

5220 Readings in Physical Education (3)

5230 Supervisory Problems in Physical Education (3)

5310 Analysis of Basic Motor Skills (3)

5320 Seminar in Research Techniques in Physical Education (3)

5410-20-30 Specialization Study in a Selected Physical Education Area (1-3, 1-3, 1-3)

5500 Advanced Kinesiology (3)

5510 Selected Topics in Anatomy (3)

5550 Physical Rehabilitation (3)

5580 Physical Activity and Health (5)

5600 Applied Physiology (6)

5610 Advanced Exercise Physiology (4)

5620 Experimental Techniques in Applied Physiology (3)

5650 Scientific Bases for Physical Education (3)

5810-20-30 Seminar in Physical Education (1, 1, 1)

5910-20-30 Problems and Projects in Physical Education (1-3, 1-3, 1-3)

6000 Doctoral Research and Dissertation

6010 Seminar in Physical Education (1)

6220 Independent Research (3)

6410 Practicum in Kinesiology (3)

6510-20 Issues and Problems in Physical Education (3, 3)

6610 Seminar in Applied Physiology (2)

6840 Research Participation in Applied Physiology (1-4)

6810-20 Practicum (2, 2)

Service Program in Physical Education

The service program in physical education provides all students a program of physical education planned in accordance with their present and future needs and interests.

2701 ARC Advanced Life Saving (2)

2702 ARC Water Safety Instructor Training (2)

2703 ARC Water Safety Instructor for Handicapped (2)

2706 Archery (2)

2707 Badminton Elementary (2)

2708 Badminton Intermediate (2)

2711 Ballet Elementary (2)

2712 Ballet Intermediate (2)

2713 Ballet Advanced (2)

2714 Basketball (2)

2715 Bowling Elementary (2)

2716 Bowling Intermediate (2)

2717 Bowling Advanced (2)

2719 Equitation Elementary (2)

2722 Field Hockey (2)

2727 Flag Football (2)

2728 Folk and Square Dance (2)

2730 Foundations of Physical Fitness (Lecture, Lab, Activity) (2)

2731 Golf Elementary (2)

2732 Golf Intermediate (2)

2734 Women's Intermediate Gymnastics (Coed) (2)

2735 Women's Intermediate Gymnastics (Coed) (2)
Recruitment (853)
Professor: M.L. Peters (Chairman), Ph.D. Illinois.
Assistant Professors: M.J. Carter, Dr. Rec. Indiana; K.L. Krick, Dr. Rec. Indiana.
1000-2000-3000 Field Practice (2-3, 2-3, 2-3) Supervised practice in an approved agency offering leisure services. Each hour's credit requires enrollment in field agency. For recreation students only. Must be taken in sequence.
1100 Orientation to the Recreation Profession (3) Overview of types, functions, and interrelationships of delivery systems for recreation and park services.
3100 Recreation Leadership Procedures (3) Principles and practice of recreation leadership; techniques and methods of working with individuals and groups in leisure activity. Prereq: 1000, 1100.
3140 Philosophical Foundations of Recreation (3) Examination of recreation as personal experience; theories of play, philosophies of leisure and recreation; impact on economy; ecology, health; government, culture, and self-realization; history of recreation movement.
3200 Planning Leisure Programs (3) Principles and methods employed in planning effective and well-balanced leisure time programs for varied groups in various settings. Prereq: 2000, 3100.
3301 Outdoor Recreation Skills and Techniques I (3) Fundamentals necessary for safe participation in outdoor recreation activities such as kites, shooting, hunting, casting and angling, power boating, rafting, and backpacking. Emphasis: enjoyment of natural environment without disturbance or destruction of plant and animal habitats. Prereq: Consent of instructor.
3302 Outdoor Recreation Skills and Techniques II (3) Instruction in safe conduct of outdoor recreational activities such as sailing, skin diving, caving, orienteering, and nature interpretation without disturbance of environment. Provision of outdoor recreation experiences for the handicapped. Prereq: Consent of instructor.
3880 Social Recreation (3) (Same as Physical Education 3880.)
4130 Recreation Administration (3) Introduction to recreation administration, including planning, personnel, areas, and facilities, program services, finances, and public relations. Prereq: 3140, 3200, 3860 or consent of instructor.
4200 Survey of Recreation for Special Populations (3) Responsibility of recreation profession to minority groups whose leisure opportunities and needs may require special servicing. Prereq: 3140, 3200, 3860 or consent of instructor.
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. May be taken for variable credit up to 9 hrs. May be repeated for a maximum of 9 hrs credit with consent of the division. Prereq: Consent of instructor.
GRADUATE
5000 Thesis (9)
5002 Non-Thesis Graduation Completion (3-15)
5130 Interpretation of Leisure (3)
5140 Leisure Service Delivery Systems (3)
5150 Current Issues in Recreation (3)
5240 Therapeutic Recreation (3)
5250 Implementations of Recreation Services for the Ill or Disabled (3)
5260 Leisure and Mental Health (3)
5300 Seminar in Recreation (1)
5340 Administration of Recreation Funds (3)
5350 Organizational Policies for Recreation (3)
5360 Management and Operation of Recreation Facilities (3)
5440 Problems and Projects in Recreation (1-9)
5450 Specialized Study in Recreation (1-9)

Special Education and Rehabilitation (933)

The undergraduate programs in the Department of Special Education and Rehabilitation provide the general professional courses for the preservice education of candidates for certification in meeting the needs of exceptional children. Facilities are available for continuous observation and participation in direct relationships with exceptional children who are hospitalized, homebound, in residential schools, special classes, or regular classes.
Course sequences may be planned in the areas of (1) General Special Education; (2) the Hearing Impaired; (3) Speech and Hearing; (4) Rehabilitation Counselor Education.
It is possible to plan a program which will lead to certification in more than one area. For planning a program, the student must consult with an adviser in the chosen area.

General Special Education: 3333, 3520, 4110, 4120, 4130, 4150, 4351, 4361, 4440, 4460, 4740, 4800, 4861, 4882, 5260, 5620.
The Hearing Impaired: 2110, 2120, 2130, 3210, 3220, 3230, 3333, 34190, 4200, 4210, 4220, 4230, 4250, 4280, 4290, 4351, 4361, 4371, 4710, 4740, 4870, 4871, 4930, 5220, 5240, 5290, 5310, 5320, 5330, 5620.
Speech and Hearing: 3310, 3333, 3710, 4030, 4040, 4310, 4320, 4330, 4340, 4341, 4342, 4440, 4470, 4930. Other courses from Audiology and Speech Pathology: 3010, 3050, 3065, 3200, 4610, 4650.
Rehabilitation Counselor Education: 5100, 5110, 5115, 5120, 5130, 5140, 5145, 5146, 5147, 5160, 5180, 5700, 5710, 5720, 5730, 5740, 5760, 5780, 5790, 5770.
2110-20-30 Field Experience (1, 1, 1) Students observe, tutor, and perform teacher related tasks in special education programs. S/NC.
3210-20-30 Field Experience II (1, 1, 1) Students observe, tutor, and perform teaching-related tasks in special education programs. S/N.C.

3310 Articulation Disorders (4) (Same as Audiology and Speech Pathology 3310.)

3333 Education of the Exceptional Child (3) Principles, characteristics, and special needs; local and state programs for diagnosis and care; educational, psychological, and social problems of special classes; home teaching; social and vocational guidance.

3520 Language-Speech Handicapped Child in the Classroom (3) Recognizing and understanding speech problems; observing normal and defective speech development in children; incorporating speech improvement activities into the curriculum. For students not majoring in speech and hearing.

3710 Audiology I (3) (Same as Audiology and Speech Pathology 3710.)

4000 Rehabilitation Practicum (3) Evaluation of client data in predicting rehabilitation prognosis. Prereq: 4230.

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

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

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

4120 Education of the Mentally Retarded Child (3) Philosophy and rationale; understanding the significance and incidence of the mentally retarded; methods and materials in special and regular classes. Prereq or parallel: 4110.

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

4150 Education Problems of Hospitalized and Homebound Children (3) School and home responsibilities for physical care and social relationships, educational adjustment, vocational needs, and cooperation with related service resources.

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

4190 Speech Development of the Hearing Impaired (3) Relationship of speech development to speech systems, relationship of hearing to speech development, speech and language development for hearing impaired children. Prereq: Speech 3050. (Same as Audiology and Speech Pathology 4190.)

4200 Practicum in Speech Development of Hearing Impaired (3) Application of theories and principles of speech and language development and improvement with hearing impaired children. Prereq: 4190 and consent of instructor. (Same as Audiology and Speech Pathology 4200.)

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

4230 Language Development for the Hearing Impaired (2) Techniques; various systems by which formal language is presented. Prereq: 4210 or consent of instructor. (Same as Audiology and Speech Pathology 4230.)

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

4231 Communication Processes for the Hearing Impaired II (3) Intermediate course in manual communications skills and techniques with emphasis on vocabulary development with receptive and expressive flosures. Prereq: Spec. Ed. 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 instrumentation for assessment of hearing level; interpretation of audiograms; selection and use of hearing aids; rehabilitation of aural handicap, medical and other rehabilitative disciplines. Observations and practicum.

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

4280 Curriculum Development in Elementary and Secondary Schools for the Hearing Impaired (3) Adaptation of curriculum development and methods in public school education to meet needs of deaf and hard-of-hearing students in residential and integrated settings.

4290 The Teaching of Reading to Hearing Impaired Children (3) Reading activities, developmental approaches, theories, and specialized materials for curricula in teaching reading.

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

4320 Clinical Practice in Speech Pathology (1-4) (Same as Audiology and Speech Pathology 4320.)

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

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

4345 Clinical Practice in Speech Correction in the Public Schools (3) Prereq: Audiology and Speech Pathology 4320-30-40, Special Ed. 4030 and consent of instructor. S/N.C.

4360 Seminar in Speech Correction in the Public Schools (3) Prereq: Audiology and Speech Pathology 4320-30-40, Special Ed. 4030 and consent of instructor.

4390-80-70 Problems in the Education of Exceptional Children (3, 3, 3) Prereq: Consent of Instructor.

4351-61-71 Practicum in Special Education (3, 3, 3) Students prepare and deliver units of instruction in special education programs. S/N.C.

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

4410 High School Program for the Mentally Retarded (3) Trends, issues and research relating to core and work study programs.

4450 Clinical Practice in Audiology (1-4) (Same as Audiology and Speech Pathology 4450.)

4460 Clinical Practice in Audiology (1-4) (Same as Audiology and Speech Pathology 4460.)

4470 Clinical Practice in Audiology (1-4) (Same as Audiology and Speech Pathology 4470.)

4610 Nature and Characteristics of Learning and Behavior Disorders (3) Forms of academic and socially disturbing behavior, degree of severity, possible causes, and relationships to each other. Relationships with respect to personality characteristics and developmental factors interpreted through behavior field training of diagnostic and practical situations in which learning and behavior disorders may occur.

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

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 social behaviors. To perform in a residential classroom; and to take part in discussion and evaluation of relevant academic curriculum and reinforcer arrangement. Prereq: 4610 and 4620 or consent of instructor.

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

4700 Audiology for Educators of the Deaf (4) (Same as Audiology and Speech Pathology 4700.)

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

4740 Diagnostic and Remedial Approaches in Special Education and Rehabilitation (3) Critical examination of special test and methods employed in measurement of educational needs of children and adults who are mentally retarded, emotionally disturbed, multiple handicapped or physically handicapped.

4810 Student Teaching Mental Retardation (3) Prereq: Major in education of mental retardation. S/N.C.

4811 Student Teaching Mental Retardation (8) Prereq: Major in education of mental retardation. S/N.C.

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

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.

4870 Student Teaching with Hearing Impaired Children (9) Supervised practicum with preschool, day school, and residential pupils. S/N.C.

4871 Practicum with Hearing Impaired Children (6) S/N.C.

4880 Student Teaching in Special Education (1-4) Application for student teaching must be filed not later than January 1 of the academic year preceding the academic year in which practicum. Prereq: 4110, 4120, 4130, 4150, 4351, 4361, 4740, S/N.C.

4881 Student Teaching in Special Education (4) Application for student teaching must be filed not later than January 1 of the academic year preceding the actual experience. Prereq: 4110, 4120, 4130, 4150, 4351, 4361, 4740, S/N.C.

4882 Student Teaching in Special Education (1-6) Application for student teaching must be filed not later than January 1 of the academic year preceding the actual experience. Prereq: 4110, 4120, 4130, 4150, 4351, 4361, 4740, S/N.C.

4921 Student Teaching in Crippling and Special Healthcare Conditions (1-15) Observation and supervised practicum in home, hospital, and classroom. S/N.C.

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

4923 Student Teaching of the Partially Seeing (3) Observation and supervised practicum in special and regular classes. S/N.C.

4924 Student Teaching of the Emotionally Disturbed (3) Individual tutoring and classroom observation and teaching. Prereq or parallel: Educational Curriculum and Instruction 4720 or 4820. S/N.C.
6210 Curriculum Planning in Vocational-Technical Education (3)
6220 Program Planning and Development in Vocational-Technical Education (3)
6230 Evaluation of Vocational-Technical Education Programs (3)
6310 Administration of Vocational-Technical Education (3)
6411-12-13 Internship in Vocational-Technical Education (3, 3, 3)

Agricultural Education (056)

Associate Professors: D.G. Craig, Ed.D. Cornell; J.T. Todd (Chairman), Ed.D. Illinois.
3450 Agricultural Experience and Future Farmers of America Programs (3) Prereq: Consent of instructor.
3460 Methods in Teaching Agriculture (3) Prereq: Consent of instructor.
3470 Program Development and Adult Education in Agriculture (3) Prereq: Consent of instructor.
4350-60 Student Teaching in Agricultural Education (4-6) Offered in off-campus centers. Application must be filed not later than final quarter of junior year. Courses must be taken concurrently. Prereq: 3450, 3460, 3470, consent of instructor. Undergraduate credit only. S/NC.
4510-20-30 Problems in Ag-business Education (1-6, 1-6, 1-6) Total not more than 9 hrs.
4710-20-30 Seminar in Agricultural Education (1, 1, 1) Prereq: 4550 or consent of department head.
GRADUATE 5000 Thesis
5002 Non-Thesis Graduation Completion (3-15)
5011-21-31 Problems in Lieu of Thesis (3, 3, 3)
5110-20-30 Current Literature (1, 1, 1)
5320-30 Agricultural Education in Off-Farm Agricultural Occupation (3, 3, 3)
5340 Agricultural Education for First-Year Teachers (3)
5470 Adult Education in Agriculture (3)
5480 Supervision of Student Teaching in Agricultural Education (3)
5490 Supervised Occupational Experience in Agriculture (3)
5620 Teaching Agricultural Mechanization in Vocational Agriculture (3)
5750-60-70 Special Problems in Agricultural Education (3, 3, 3)

Business Education (207)

Professors: G.A. Wagoner (Chairman), M.S. Indiana; E.W. Davis (Emeritus), M.A. New York; E.R. Smith, Ph.D. Ohio State.
4010 Principles of Business Education (3) Historical background and present status; principles of vocational education applied to business education; guidance activities of business teachers.
4120 Teaching General Business Subjects (2) Materials, evaluation procedures and recent research in subject fields.

4130 Teaching Typewriting (2) Materials, methods evaluation procedures and recent research in subject fields.

4140 Teaching Shorthand (2) Materials, methods, evaluation procedures and recent research in subject fields.

4150 Teaching Bookkeeping (2) Materials, methods, evaluation procedures and recent research in subject fields.

4290 Curriculum Construction in Business Education (3) Aims, principles, practices, and problems involved in construction of business curricula for various types of educational institutions in which business subjects are taught.

4610-20-30 Problems in Business Education (3, 3, 3) Current business education problems, viewpoints of leaders in field, special attention to problems of those enrolled.

4611 Problems in Business Education (1½)

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5002 Non-Thesis Graduation Completion (3-15)

5011 Problems in Lieu of Thesis (3)

5110 Graduate Seminar: Current Problems (3)

5111-12-13 Graduate Seminar: Current Problems in Business Education (1, 1, 1)

5120 Graduate Seminar: Tests and Measurements (3)

5130 Graduate Seminar: Guidance (3)

5140 Organization and Operation of Area Vocational-Technical Schools (3)

5410-20-30 Practicum in Business Education (2, 2, 2)

5510 Evaluation of Research in Business Education (3)

5611-21 Problems in Business Education: Typing (3, 3)

5612-22-32 Problems in Business Education: Shorthand (3, 3, 3)

5614 Methods and Materials for Vocational Office Education (3)

5623-33 Problems in Business Education: Bookkeeping and Accounting (3, 3)

5624 Problems in Business Education: Clerical Practice (3)

5615-25-35 Problems in Business Education: General Business (3, 3, 3)

5618 Organization and Management of Vocational Office Education Program (3)

5628 Problems in Business Education: Administration (3)

6110-20-30 Current Issues in Business Education (3, 3, 3)

6210-20-30 Advanced Studies in Business Education (3, 3, 3)

6410 Higher Education for Business (3)

Distributive Education (273)

Professor: C.B. Coakley (Chairman), Ph.D. Wisconsin.
Assistant Professor: D.E. McNelly, Ed.D Missouri.

4110 Student Teaching in Distributive Education (9) Full-time, supervised experience in classroom teaching, coordination, club work, and adult education. Prereq: 4310, 4320, Education 3030; Education Psychology 3610; 4140 or equivalent. Undergraduate credit only. S/NC.

4120 School and Community Relationships for the Teacher Coordinator (6) Content dependent upon teaching assignment. Prereq: consent of instructor. Must be taken with 4110. Undergraduate credit only. S/NC.

4130 Areas of Distribution (3) Marketing, product or service technology, social skills, basic skills, and distribution. Prereq: consent of instructor. Must be taken with 4110. Undergraduate credit only. S/NC.

4140 Supervised Distributive Experience (3) Minimum 200 hours experience in approved distributive business; concurrent academic project.

4310 Organization and Operation of Distributive Education Programs (3) Background and development needs, federal and state legislation, curriculum implications; establishing, evaluating, reporting, and improving the programs.

4320 Methods and Materials in Distributive Education (3) Prereq: 4310 or consent of instructor.

4330 Coordination Techniques in Distributive Education (3) Selecting training agencies; job analysis; selecting and briefing the training supervisors; advisory committees; adult education and other community services. Prereq: 4310 and 4320.

4510-20-30 Problems in Distributive Education (1-3, 1-3, 1-3) Selected research problems in teaching and coordinating distributive education programs. Prereq: 4310 and 4320. May be repeated. Maximum 6 hrs credit each.

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5002 Non-Thesis Graduation Completion (3-15)

5110 Administration and Supervision of Distributive Education (3)

5120 Organizing and Teaching Adult Distributive Education (3)

5210-20-30 Special Problems in Distributive Education (3, 3, 3)

5616-26-36 Problems in Distributive Education: Retailing (3, 3, 3)

Home Economics Education (490)

Professors: N.P. Logan (Chairman), Ed.D. Tennessee; I. Brown (Emeritus), Ph.D. Ohio State.

Associate Professors: J.H. McMinn, Ph.D. Florida State; S.W. Miller, Ph.D. Ohio State.

2240 Introduction to Teaching Vocational Home Economics (3) Introductory and exploratory experiences planned with a teaching career in vocational home economics. Includes observation and participation within various educational and vocational settings.

3240 Strategies of Teaching Home Economics (4) Teaching strategies, methods, techniques and use of media. Field experience included. Prereq: 2240.

4240 Curriculum Development in Vocational Home Economics (4) Planning of curriculum and design of instruction for the classroom. Prereq: 2240, 3240. To be scheduled one of the two quarters immediately preceding student teaching.

4310 Student Teaching (8) Underlying philosophy, techniques, and materials: relation to school program and community. S/NC.

4509 Field Experience in Home Economics Related Occupations (4) Supervised field experience and seminar in teaching of occupations which utilize home economics skills and knowledge. Prereq: Consent of instructor. S/NC. May be repeated.

4610 Student Teaching (9) Open to seniors or graduate students who have successfully completed one year's study at The University of Tennessee. Off-campus teaching centers (minimum of eight weeks). Prereq: 2240, 3240, 4240; coreq: 4310. S/NC.

4718-28-38 Honors: Home Economics Education (3, 3, 3) For juniors and seniors showing special ability and interest in home economics education. Prereq: Consent of department head.

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5002 Non-Thesis Graduation Completion (3-15)

5130 Furthering Good Human Relationships in the Classroom (3)

5220 Evaluation in Home Economics (3)

5310 The Problem Method of Teaching (3)

5440 Curriculum Development and Implementation in Family Relationships Instruction (3)

5520 The Teaching of Home Economics in College (3)

5530 Organization of the Homemaking Curriculum in Secondary Schools (3)

5610 Supervision of Home Economics in the Public Schools (3)

5620 Wage Earning Programs in Home Economics (3)

5710-20-30 Special Problems for Non-Thesis Students (3, 3, 3)

5810-20-30 Problems in Home Economics Education (1-3, 1-3, 1-3)

5910-20 Seminar in Home Economics Education (3, 3)

Industrial Education (547)

Professors: J.L. Reed (Chairman), M.S. Oklahoma; R.W. Haskell, Ph.D. Purdue.

Associate Professors: J.D. Bles, Ph.D. Missouri; G.D. Cheek, Ph.D. Kansas; D.V. Brown, P.E., Ed.D. Utah State; R.R. Hanson, Ph.D. Purdue.


1240 Welding and Cutting Practices (3) Prereq: 1642.

1610 Engine Analysis (3) Designed to give experimental laboratory experience in automotive technology. Engine tune-up and engine diagnostic techniques and procedures are studied and practiced.

1620 Graphic Communications (3) Drafting as a means of communication in technology. Orthographic and multi-view drawing, conventional practices, pictorial techniques and applications of photography.

1630 Basic and Applied Electricity (3) Operation and characteristics of electrical systems and devices. Construction of demonstration apparatus and various electrical projects involving function of different types of circuits.

1642 General Metals (3) Basic course dealing with processes, equipment, materials, products, and organization of metal-working industries. Includes processes in machining, foundry, sheetmetal, and fabrication.

1661 General Woodworking (3) Basic course dealing with processes, tools, equipment, products, organization of woodworking industry. Stressing importance of safety and using hand tools and basic machinery.

2010-20-30 Basic Experiences in Trade and Industrial Education (3, 3, 3) Methods and materials of instruction. 3 periods.
2611 Power Mechanics (3) Includes various prime movers, methods of utilization, distribution and transmission of power with internal combustion engines. Maintenance and repair of small engines is stressed.

2621 Architectural Graphics (3) Introduction to fundamentals of graphic representation and residential architecture. Light construction principles are stressed and working drawings for a residential building are developed. Prereq: 1620.

2631 Fundamentals of Applied Electronics (3) Semi-conductors, electrical circuits, including amplifiers, oscillators, switching and timing circuits, applications including sounds in video systems, relays, control and industrial devices. Prereq: 1630.

2641 Machine Tool Processes (3) Introductory course of the function, care, set-up, operation and theory of basic machine tools. Prereq: 1642.

2652 General Plastics (3) Characteristics of thermoplastics and thermal setting materials, methods of determination and resin conversion to finished product.

2660 Furniture and Cabinet Construction (3) Comprehensive study of cases and carcass construction with emphasis placed upon furniture and built-ins. Prereq: 1661.

3010 Related Science, Mathematics, and Technology in Occupations (15) Credit may be earned only through examination. Applicants must show evidence of bonafide occupational experience compatible with State Plan requirements. Occupational experience must be in a recognized trade area. S/NC.

3020 Manipulative Skills in Occupations (15) Credit may be earned only through examination. Applicants must show evidence of bonafide occupational experience compatible with State Plan requirements. Occupational experience must be in a recognized trade area. S/NC.

3030 Knowledge of Related Subjects in Occupations and Personal Qualifications (15) Credit may be earned only through examination. Applicants must show evidence of bonafide occupational experience compatible with State Plan requirements. Occupational experience must be in a recognized trade area. S/NC.

3040-41-42 Physical Testing Technology (3, 3, 3) Skills and techniques involved in radiography, metallography, tensile and compression testing, and other destructive and nondestructive testing methods. Undergraduate credit only.

3050 Welding, Brazing, Cutting, and Related Processes (3, 3, 3) Manipulation of welding equipment and fundamental techniques of welding. Undergraduate credit only.

3060-61-62 Electronic Technology (3, 3, 3) Basic principles and application of electronics. Undergraduate credit only.

3080-81 Machining of Metals (3, 3) Introduction to machine shop technology and procedures which provides information and practice in using basic machine tools. Undergraduate credit only.

3110 History and Philosophy of Industrial Education (3)

3210-20-30 Part-time Programs in Cooperative Industrial Training (3, 3, 3) Principles of organization, methods, and materials.

3310 Shop Organization and Management (3)

3320-30 Materials and Methods for Teachers of Shop and Related Subjects (3, 3)

3340 School Shop Safety (3)

3610 Development and Utilization of Advisory Committees (3) Philosophy and rationale for use of craft advisory committees. Their selection, organization, implementation and utilization.

3612 Automotive Mechanics (3) Advanced laboratory experience in tune-up, overhaul, transmission, and the suspension system. Prereq: 1610.

3621 Industrial Graphics (3) Auxiliary views, sections, conventional practices, finishes, dimensioning, working drawings and machine drafting. Prereq: 1620.

3632 Industrial Electricity and Equipment Control (3) Involves construction and application of industrial electric equipment both single and polyphase: production, use and control of electric current. Emphasis placed on circuit tracing, installation, maintenance, and trouble connecting industrial equipment. Prereq: 1630.

3640 Advanced General Metals (3) Provides experiences in areas of hot and cold forming of metals, molding and metal finishing, tool grinding, heat treatment, fabrication and precision measurement. Prereq: 2641.

3651 Plastic Processing (3) Plastics production equipment and related product design and processing of plastics. Prereq: 2652 and 1661.

3662 Construction Methods and Materials (3) Materials, methods, and equipment used in residential construction, including location and excavation, foundation, framing, roofs, interior and exterior finishes, installation and acceptable practices in assembly. Prereq: 1661.

3672 Graphic Arts Reproduction Processes (3) Graphic arts skills in printing and duplicating techniques and other modes of graphic communication.

4073-74-75 Tool and Machine Design (3, 3, 3) Tool and machine design, calculations, design systems, and designing procedures. Undergraduate credit only.

4090 Numerical Control (3) Tooling, manual programming, automatic programming, automatic programming language and use of automatic programmer as a computer. Undergraduate credit only.

4110 Foremanship Training by the Conference Method (3)

4120-30 Job Analysis (3, 3) Principles, practice, instructional methods.

4210 Methods of Teaching Shop and Related Subjects (3) Undergraduate credit only.

4220 Vocational Technical Laboratory Equipment Maintenance (3) Understanding of preventive maintenance, maintenance and calibration of instruments and power equipment used in industrial education shops.

4310-20 Curriculum Building in Trade and Industrial Subjects (3, 3) Arranging course material for trade subjects, following up results of job analyses, preparing checking sheets and individual job sheets in both trade and related subjects. Prereq or coreq: 4120.

4350-60-70 Problems in Industrial Education (3, 3, 3)

4410 Directed Teaching (6) Observation of all types of trade and industrial classes; preparation of lesson plans and supervised teaching in at least two types. Prereq: Senior standing in industrial education. Prereq or parallel: 4210. 1 hr and 5 periods. Undergraduate credit only. S/NC.

4420 Directed Teaching (9) Guided observation and teaching in trade, industrial, and/or technical programs in secondary, adult, adult, post secondary, and junior college industrial vocational and technical curricula. Undergraduate credit only. S/NC.

4510-11-12 Seminar in Industrial Education (3, 3, 3) Educational innovations, current events, problems, and other topics associated with the field of industrial education.

4520-21-22 New Developments in Industrial Education (3, 3, 3) Developments, pressing problems, and recent trends in field of industrial education as presented by professional circles in conjunction with knowledgeable resource personnel.

4621 Special Topics in Drafting (3) Industrial practices in specialized areas of drafting selected for the individual student. Prereq: 6 hrs drafting.


4670 Manufacturing Processes (3) The manufacturing processes of industry and their relationship to careers. Prereq: 2621, 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, interrelationship of power sources; content, curriculum, and techniques of laboratory operation. Prereq: Consent of instructor.

4690 Visual Communications in Industrial Arts (3) Methods of developing and transmitting ideas and information as related to industry and society. Content, curriculum and techniques of laboratory operation. Prereq: Consent of instructor.

4691 Course Construction in Industrial Arts (3) Advanced work in the selection and arrangement of course content. Emphasis upon instructional objectives, project selection and informational assessments and evaluation. Prereq: Consent of instructor.

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5002 Non-Thesis Graduation Completion (3-15)

5110-20-30 Administration and Supervision of Industrial Education (3, 3, 3)

5140 Organization and Operation of Area Vocational-Technical Schools (3)

5210-20-30 Special Problems in Industrial Education (3, 3, 3)

5310 Method of Research in Industrial Education (3)

5410 Improving Teachers in Service (3)

5420 Advisory Committees and Apprentice Training (3)

5430 Vocational School Administration and Management (3)

5440 Advanced Methods of Teaching Skills and Technical Information (3)

5510-20-30 Seminar in Industrial Technical Education (3, 3, 3)

5540 New Developments in Industrial Technical Education (3)
College of Engineering

Fred N. Peebles, Dean
William A. Miller, Associate Dean
William K. Stair, Associate Dean

The engineer applies mathematical and scientific knowledge in planning economical ways of providing materials and energy in forms that are useful to humankind. In today's technology-based society, everyone feels the effects of the engineer's plans and decisions. Hence, there is a continuing and urgent need for engineering graduates who possess a thorough understanding of mathematical and scientific principles, who can apply these principles to the solution of practical problems, and who can view the solutions in their overall social perspective so that the actions that they recommend will be truly beneficial. It is the purpose of the College of Engineering to educate men and women to the high levels of technical competence and social understanding that will enable them to fulfill their responsibilities as professional engineers.

Graduates of the B.S. curricula offered by the college may enter directly a position in industry, government, or private practice or may pursue advanced study in graduate school. Their professional activities include research, development, design, operations analysis, construction, production supervision, and technical sales. Many practice their profession in Tennessee; but engineering knows no geographical bounds, and graduates of the college serve throughout the nation and in other countries as well.

The college had its beginnings early in the history of the University when surveying was introduced into the curriculum in 1838. In 1877 civil engineering was first recognized as a curriculum. The first mechanical course appeared in about 1887; other mechanical courses followed, and in 1877 this body of studies was designated as mechanical engineering. By 1877 mining had found a place in the University, but it was later dropped. Electrical engineering appeared in about 1896, when a Professor of Physics and Electrical Engineering was appointed. Although metallurgy was announced in the catalog as early as 1888, it was dormant until it was revived in the Department of Chemical Engineering shortly after 1940. A separate degree in metallurgical engineering was authorized in 1957. Although the rudiments of chemical engineering appeared in the form of industrial chemistry shortly after 1900, a full chemical engineering program and a department were not established until 1936. Industrial engineering was introduced in 1940, was dropped for a time during the war years, and was reinstated in 1947.

Nuclear engineering was established as a separate curriculum in 1957 in response to the rapidly increasing demand for engineers with a knowledge of nuclear phenomena. Engineering physics, a program operated jointly with the physics department, first appeared as an engineering curriculum in about 1942. Curricula in aerospace engineering and engineering mechanics were added in 1966, and a curriculum in engineering science was added in 1967.

The first dean of the college, Professor Charles E. Ferris, was appointed in 1912. Prior to that time the engineering programs were organized as a school, with a chairman of the faculty. Other former deans are Nathan W. Dougherty, who served from 1940 to 1956, Armour T. Granger, who served from 1956 to 1965, and Charles H. Weaver, who served from 1965 to 1968.

The Cooperative Engineering Program was established in 1926. The University of Tennessee was one of the early pioneers in this valuable type of education, which originated at the University of Cincinnati in 1905. A Cooperative Engineering Scholarship Program was formally established in 1957, with emphasis on participation by students of superior ability. A conventional cooperative program, open essentially to all students in good standing in the college, was re-established in 1967.

The Engineering Experiment Station was established in 1922.

The college has 10 major undergraduate curricula in which a student may specialize: aerospace, chemical, civil, electrical, industrial, mechanical, metallurgical, nuclear engineering, engineering physics and engineering science.

Agricultural engineering is taught in the College of Agriculture with facilities located on the Agricultural Campus. The agricultural engineering curriculum is offered cooperatively by the College of Agriculture and the College of Engineering. Details of the curriculum may be found in the College of Agriculture section of this catalog.

Facilities

The College of Engineering is housed in Ferris, Estabrook, Perkins, Dougherty and Berry Halls, and the Nuclear Engineering Building, all located on the southeastern end of the campus.

Ferris Hall. This building houses the offices, laboratories, and shops of the electrical engineering department and the Water Resources Laboratory. There is also an auditorium with a seating capacity of about 300 persons, and a remote input/output terminal connecting with The University of Tennessee Computing Center.

Estabrook Hall. Some operations of the Departments of Civil Engineering and Engineering Science and Mechanics, and of the Engineering Experiment Station are carried on in Estabrook Hall.

Perkins Hall. This building houses the Departments of Civil Engineering, Engineering Science and Mechanics, Industrial Engineering, and the Office of the Dean of the College of Engineering.

The building contains laboratories, drafting rooms, and a small auditorium with a capacity of about 80 persons.

Nuclear Engineering Building. This building houses operations of the nuclear
Admission to the Cooperative Engineering Program is open to any student in the college (or in agricultural engineering in the College of Agriculture) who is in good standing, whose record indicates capability and dependability, and who is acceptable as an employee. In general, work periods begin at the end of the second or third quarter of the freshman year and continue for seven alternating work and school cycles. Applicants must be able to schedule a minimum of five such cycles before the beginning of their senior work in order to qualify for co-op placement. Academic schedules for co-op students are shown elsewhere in this section. A brochure with further details may be obtained from the Office of the Coordinator, Cooperative Engineering Program, College of Engineering.

Chi Epsilon National Headquarters

The college is also honored to have the National Headquarters of Chi Epsilon, the National Civil Engineering Honor Society, located in Perkins Hall. Chi Epsilon was founded in 1922. Dader C. Jamison, Jr., associate professor of civil engineering, serves as the first executive secretary of Chi Epsilon.

Cooperative Engineering Program

The five-year Cooperative Engineering Program is offered to students in the college in order to provide a superior engineering education that affords the opportunity to combine significant experience in industry with academic preparation. Cooperative work assignments differ from part-time or summer employment in that they involve regularly scheduled cycles of full-time academic employment alternated with full-time work quarters—usually seven, a minimum of five—in career-related, planned assignments of progressive complexity and responsibility. In exposing the student in this manner to the world of work, the college and the facilities of industry join together to offer a broader and richer preparation for full-time employment. Academic preparation is offered by the college. The experience in an industrial and professional environment contributes to the student's maturity, increases the scope of acquaintances and concepts, and enables the student to define more clearly educational and career interests and objectives. Some of the experience received is at a subprofessional level not available to an engineer after graduation, yet is of great significance in total education and effectiveness.
capacity of its resources, and to report the results exclusively to the company requesting the study. In such case, the whole expense will be carried by the parties requesting the investigation. Bulletins are published from time to time covering the results of various investigations. Upon request, unpublished results of current studies are made available to interested parties.

**Curricula in Engineering**

**NATIONAL ACCREDITATION**

Since 1936 engineering programs at institutions of higher learning have been accredited by the Engineers Council for Professional Development (ECPD), an organization formed by many engineering societies. Currently accredited engineering curricula at UTK include aerospace, agricultural, chemical, civil, electrical, engineering science, industrial, mechanical, metallurgical, and nuclear. The advanced professional programs are also accredited in civil, electrical, environmental, mechanical, and nuclear engineering.

**COURSE LOAD**

The maximum number of hours which can be taken by an undergraduate without special permission is 19 hours. The dean of engineering must give permission to take 20 hours or more.

**GENERAL REQUIREMENTS**

**NOTE:** Students are advised to consult the University's degree requirements as stated in the front section of this catalog as well as departmental requirements.

**Inspection Trip.** Each candidate for graduation majoring in aerospace, mechanical, chemical, or metallurgical engineering must participate in inspection trips scheduled by the major department.

**Transfer Credit.** Every attempt will be made to give maximum credit for courses taken elsewhere and transferred to the college. Discussions concerning the evaluation of transfer credits should be conducted with the head of the department into which the student proposes to transfer following the evaluation of transfer credits by the Admissions Office.

**Program for Second B.S. Degree.** Upon approval by the dean of engineering and the Committee on Degrees of a program of study recommended by the major engineering department, a student who already holds a bachelor's degree may obtain the appropriate first degree in engineering upon completion of a minimum of 45 quarter hours credit. The prevailing University regulations on residence and quality point averages shall apply.

**Satisfactory/No Credit Courses.** An undergraduate engineering student may count toward a degree up to 12 quarter hours obtained by Satisfactory/No Credit (S/NC) grading. Such courses must be used for humanistic-social (non-technical) elective credit in engineering or must be engineering courses using only this type of grading.

**Humanities and Social Studies Electives.** The college assumes an obligation to include in each of the engineering curricula a means whereby students gain greater insight into their interaction with society, both personally and professionally. For this purpose, a part of each engineering curriculum is devoted to humanities and social studies electives. Broadly stated, these electives serve three main purposes: to provide an expanded sensitivity to the human aspects of the practice of engineering; to enrich the student's knowledge of the world in which he or she lives; and to better understand the behavior patterns, history and government; and to provide a basis for the appreciation of and the ability to deal with complex interactions between technology and society in the contemporary world. Engineers are now working with new constraints that demand a consciousness of the social and political implications of their work. They are interacting with the public in a way that the public demands greater participation in the decision-making process concerning the utilization of technology. Because of the significance of this technology-society interaction, engineers, individually and as a group, are encouraged to seriously consider their selection of required electives in this area.

Students are urged to plan a non-technical elective program which will enhance their own interests and objectives. It is recognized that, just as engineers show individual preference for concentration in one of the areas of engineering, they differ in their interests in the many areas of the humanities and social sciences. However, these subjects should be pursued with sufficient depth in terms of courses to permit a reasonable level of comprehension of the selected areas. In order to increase the effectiveness of this interest and to meet ECPD accreditation guidelines, the Humanities and Social Studies Electives Committee of the college provides a list of approved courses in the form of 13 coherent groups of courses identified in three broad areas as follows:

**Area I. Human, Economic, and Political Relationships to Engineering**

A. Governance and Political Science
B. Economics
C. Sociology and Psychology
D. Human Values

**Area II. Society—Its Culture, History and Literature**

A. Fine Arts
B. American Culture
C. History
D. Literature
E. Anthropology

**Area III. Technology and Society**

A. Human Values
B. Technology Assessment
C. Communication
D. Resources

Courses in the list which follow are selected by the committee with revisions as course offerings and needs change. They are recommended as satisfying the non-technical (humanistic-social) electives requirement in the various curricula of the college. However, the structure and permissible courses of the non-technical electives content of each engineering curriculum is established by the respective departments. Therefore, individual departments may delete courses from this list, require certain courses, or require selection of courses from specific subgroups. Students should consult their departments for any restrictions.

It is recognized that individual students may desire to take courses not on the approved list. The academic advisor should discuss their interests and desires with their academic advisor prior to registering for elective courses if such courses are to be used to satisfy degree requirements. Also, the catalog may state prerequisites, for upper-division courses in the list. In such cases, students are encouraged to consult the instructor in the particular course. With respect to student records, deviations from this list are handled by means of a substitution sheet which originates with the adviser.

**ELECTIVE OPTIONS IN HUMANITIES AND SOCIAL STUDIES**

**Area I. Human, Economic, and Political Relationships to Engineering**

**IA. Governance and Political Science**

Business Law 4110
Economics 3340
Geography 3610
History 3730, 4311-21, 4370, 4380
Political Science 2510-20, 3545-46, 3555, 3566, 3710-20, 3750-60, 3801-02, 4300-04, 3880, 4535-36, 4540-50, 4545-46, 4665-66, 4940
Sociology 3300, 3420, 4330, 4530

**IB. Economics**

Economics 2110-20, 2118-28-38, 3110, 3120, 3220, 3240, 3250
Geography 2110-20, 3410
Geology 2310
Management 4320

**IC. Sociology and Psychology**

Geography 3000, 3600, 3660
Journalism 4410
Psychology 2500, 3120, 3220, 3550, 3650, 4610, 4650-60, 4900
Sociology 1510, 1520, 3030, 3150, 3320, 3410, 3610, 3620, 4330, 4560

**ID. Human Values**

Geography 3000
History 4640-50-60
Philosophy 2310, 2410, 3111-21-31-41, 3112-12, 3440, 3890, 3910
Religious Studies 2610, 3550, 3600-10-20, 3740

**Area II. Society—Its Culture, History and Literature**

**IIA. Fine Arts**

(Note: No more than 8 quarter hours may be taken in the performing arts—voice, instrumentation, band, chorus, etc.)
Art 1815-25, 3735, 3736, 3745, 3746, 3765, 3766
English 2660, 3411-12-20-30
Music 3xxx Ensemble
Music 1210-20, 1340, 2310-20-30-40, 3350, 4210-40, 4241, 4260-70
Theatre 1510, 3522-53-54

**IIB. American Culture**

American Studies 3010
Art 3735, 3736, 3745, 3746
Black Studies 2010-20, 3550-60, 4830
English 2530, 2540, 2640-50, 3010-20-30, 3080, 3160, 3310, 3430, 4050-60, 4620, 4851-52
History 3430, 3450, 3660, 3910, 3920, 3930, 3940, 4240
The Voluntary ROTC Program.
Engineering students may participate in the ROTC Program. Advanced ROTC
courses (3000 and 4000 series) may be counted as technical elective credit toward
an engineering degree up to a total of nine (9) quarter hours. No ROTC course can be
used as a humanistic-social elective. Individual departments determine the
appropriate substitutions.

Approval of Electives and
Substitutions. Not later than the beginning of the third quarter prior to anticipated
graduation, each student shall discuss with an adviser the status of the program
of study. Any necessary additions to or substitutions in the program, or electives
requiring special approval, shall be cleared in written form at that time, and it
is each student's responsibility to see that all necessary approvals are secured.

CURRICULA, TABULAR VIEW
In the following pages are given the course requirements for the various
engineering curricula. With no deficiencies in entrance requirements and with careful
scheduling of courses, students should complete the regular curricula in four
academic years, or the cooperative curricula in five years.
In the following tabulations, the numbers immediately following the names
of the courses refer to the description of the courses under "Departments of
Instruction." The numbers in the columns indicate the number of quarter hours of
credit applicable to each course. Non-technical electives are normally the same
as humanities-social studies electives.

Aerospace Engineering

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<thead>
<tr>
<th>Freshman</th>
<th>Hours</th>
<th>Credit</th>
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<tbody>
<tr>
<td>Math 1840-50-60</td>
<td>4</td>
<td>4</td>
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<tr>
<td>Chemistry 1110-20-30</td>
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<td>4</td>
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<tr>
<td>English 1010-20-33</td>
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<tr>
<td>Graphics 1410-20</td>
<td>3</td>
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<td>Basic Engineering 1310-20-30</td>
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<td>4</td>
</tr>
<tr>
<td>Basic Engineering 1410</td>
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<table>
<thead>
<tr>
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<tr>
<td>Aero. Engr. 2040</td>
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<tr>
<td>Math 2840-50-60</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Physics 2310-20-30</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Engr. Sci. &amp; Mech. 3311, 3700</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Met. Engr. 2110</td>
<td>3</td>
<td>-</td>
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<tr>
<td>Economics 2110</td>
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<td>-</td>
</tr>
<tr>
<td>Computer Science 3510</td>
<td>3</td>
<td>-</td>
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1Humanities/social studies electives.

Before entering the third quarter of the junior year, the student, with the aid and
approval of the adviser, must select a program of technical electives.

<table>
<thead>
<tr>
<th>Junior</th>
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<tr>
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<td>Aero. Engr. 3511</td>
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<td>Aero. Engr. 3610-20</td>
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<td>Aero. Engr. 3630-40</td>
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<tr>
<td>Elec. Engr. 3110-20-30</td>
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<td>3</td>
</tr>
<tr>
<td>Engr. Sci. &amp; Mech. 3320</td>
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<tr>
<td>Mech. Engr. 3311, 3321-30</td>
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<td>2</td>
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<td>Mech. Engr. 3410</td>
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<tr>
<td>Mech. Engr. 3440, 4420</td>
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<tr>
<td>Mech. Engr. 3910</td>
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</table>

1Humanities/social studies electives.
Agricultural Engineering
(See College of Agriculture Section.)

Biomedical Engineering
Available in Engineering Science Degree Program

<table>
<thead>
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<th>Hours</th>
<th>Credit</th>
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<tr>
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<tr>
<td>See Basic Curriculum, Engineering Science</td>
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</table>

Sophomore
Mathematics 2840-50-60 .... 4 4 4
Physics 2310-20-30 .... 3 3 3
Biology 1210-20 and 3120 .... 4 4 4
Engr. Sci. & Mech. 3410, 3700, 3110 .... 4 4 4
*Humanities/social studies electives .... 4 4 4

Junior
Chemistry 3211-21-31, 3219-29-39 .... 4 4 4
Elect. Engr. 3110-20 .... 3 3 3
Chemet. Engr. 2010-30 .... 4 4 4
Engr. Sci. & Mech. 3311 .... 4 4 4
Computer Science 3150 .... 3 3 3
Mech. Engr. 3440 or 3540 .... 3 3 3
Mathematics elective .... 3 3 3
Engr. Sci. & Mech. 3120 or 3320 .... 3 3 3
*Humanities/social studies electives .... 4 4 4

Senior
Engr. Sci. & Mech. 4810, 4620 .... 4 4 4
Engr. Sci. & Mech. 4610 .... 4 4 4
Zoology 3080 or 3050 .... 5 5 5
*Eng. sci. electives (including bio. med. engr. elect.) .... 4 4 4
*Technical elective .... 6 6 6
*Humanities/social studies electives .... 8 8 8

Civil Engineering

<table>
<thead>
<tr>
<th>Hours</th>
<th>Credit</th>
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<tbody>
<tr>
<td>Freshman</td>
<td>I / II / III</td>
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</tbody>
</table>
| Math 1840-50-60 .... 4 4 4
| Chemistry 1110-20-30 .... 4 4 4
| English 1010-20-33 .... 3 3 3
| Graphics 1410-20 .... 4 4 4
| Basic Engineering 1310-30-20 .... 4 4 4
| Basic Engineering 1410 .... 2 2 2 |

Sophomore
Chemet. Engr. 2010-20-30 .... 4 4 4
Chem. Engr. 2011 .... 4 4 4
Chem. Engr. 3410 .... 4 4 4
Chem. Engr. 2140-49 .... 4 4 4
Math 2840-50-60 .... 4 4 4
Engr. Sci. & Mech. 2720 .... 4 4 4
*Humanities/social studies electives .... 4 4 4
Physics 2310-20 .... 3 3 3

Sophomore
Chem. Engr. 3240-40 .... 4 4 4
Chem. Engr. 3010 .... 3 3 3
Chem. Engr. 3450, 3610 .... 4 4 4
Chem. Engr. 3040, 3050 .... 4 4 4
Chemistry 3211-19, 3221-29 .... 4 4 4
Math 3150 .... 3 3 3
Elect. Engr. 3110 and either 3120 or 3130 .... 3 3 3
Met. Engr. 3150 .... 4 4 4
*Humanities/social studies electives .... 4 4 4

Senior
Chem. Engr. 3620, 4220 .... 3 3 3
Chem. Engr. 4410-20 .... 3 3 3
Chem. Engr. 3450, 4530 .... 3 3 3
Chemet. Engr. 4340-20 .... 1 1 1
Met. Engr. 3520 .... 3 3 3
Chemistry 3430, 4110 .... 3 3 3
Major electives .... 3 3 3
Technical electives .... 4 4 4
*Humanities/social studies electives .... 4 4 4

Chemical Engineering

<table>
<thead>
<tr>
<th>Hours</th>
<th>Credit</th>
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</thead>
<tbody>
<tr>
<td>Freshman</td>
<td>I / II / III</td>
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</tbody>
</table>
| Math 1840-50-60 .... 4 4 4
| Chemistry 1110-20-30 .... 4 4 4
| English 1010-20-33 .... 3 3 3
| Graphics 1410-20 .... 4 4 4
| Basic Engineering 1310-30-20 .... 4 4 4
| Basic Engineering 1410 .... 2 2 2 |

Electrical Engineering

<table>
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<td>I / II / III</td>
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</table>
| Math 1840-50-60 .... 4 4 4
| Chemistry 1110-20-30 .... 4 4 4
| English 1010-20-33 .... 3 3 3
| Graphics 1410-20 .... 4 4 4
| Basic Engineering 1310-30-20 .... 4 4 4
| Basic Engineering 1410 .... 2 2 2 |

Sophomore
Math 2840-50-60 .... 4 4 4
Physics 2310-20-30 .... 3 3 3
Elect. Engr. 2010-20-30 .... 3 3 3
Met. Engr. 2110 .... 2 2 2
Engr. Sci. & Mech. 3170-20-30 .... 3 3 3
Mech. Engr. 3250-30-40 .... 3 3 3
Elect. Engr. 3080-90 .... 3 3 3
Math 3150 .... 3 3 3

During the third quarter of the junior year the student, in consultation with the adviser, should choose one of the following areas of interest. Courses marked with footnote 1 may be replaced by other courses approved by the student's area adviser. Notice that any given senior course is offered only once every third quarter including the summer quarter.

SOPHOMORE YEAR—AREAS OF INTEREST

Electromagnetic Fields and

<table>
<thead>
<tr>
<th>Hours</th>
<th>Credit</th>
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| Comm. Engrs. 2040-50-60 .... 4 4 4
| Eng. Elect. 4450 .... 3 3 3
| Elect. Eng. 4680-90 .... 3 3 3
| Elect. Eng. 4610 .... 3 3 3
| Elect. Eng. 4790 .... 3 3 3
| Elect. Eng. 4670 .... 3 3 3
| Elect. Eng. 4680 .... 3 3 3
| Elect. eng. electives .... 4 4 4
| Economics 2110 .... 3 3 3
| Humanities/social studies electives .... 4 4 4

TOTAL: 203 hours

Energy Conversion and

<table>
<thead>
<tr>
<th>Hours</th>
<th>Credit</th>
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</table>
| Elect. Eng. 4410-20-30 .... 3 3 3
| Elect. Eng. 4370 .... 3 3 3
| Elect. Eng. 4480 .... 3 3 3
| Elect. Eng. 4610 .... 3 3 3
| Elect. Eng. 4670 .... 3 3 3
| Nuclear Eng. 4610 .... 3 3 3
| Elect. Eng. 4820 .... 3 3 3
| Elect. Eng. 4690 .... 3 3 3

Economics 2110 .... 3 3 3

Humanities/social studies electives .... 4 4 4

TOTAL: 203 hours

Plasma and Electro-Optics Engineering

<table>
<thead>
<tr>
<th>Hours</th>
<th>Credit</th>
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</table>
| Elect. Eng. 4460, 4470, 4480 .... 3 3 3
| Elect. Eng. 4020, 4490, 4500 .... 3 3 3
| Elect. eng. tech. electives .... 3 3 3
| Economics 2110 .... 3 3 3
| Elect. eng. tech. electives .... 3 3 3
| Tech. electives .... 3 3 3
| Humanities/social studies electives .... 4 4 4

TOTAL: 203 hours

Systems and Networks

<table>
<thead>
<tr>
<th>Hours</th>
<th>Credit</th>
</tr>
</thead>
</table>
| Elect. Eng. 4810 .... 3 3 3
| Elect. Eng. 4830 .... 3 3 3
| Elect. Eng. 4370, 4350, 4410 .... 3 3 3
| Elect. eng. tech. electives .... 3 3 3
| Economics 2110 .... 3 3 3
| Elect. eng. tech. electives .... 3 3 3
| Tech. electives .... 3 3 3
| Humanities/social studies electives .... 4 4 4

TOTAL: 203 hours
### Computer Engineering

<table>
<thead>
<tr>
<th>Course</th>
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<tbody>
<tr>
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<tr>
<td>Elec. Engr. 4630</td>
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<td>Elec. Engr. 4670</td>
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<td>Elec. Engr. 4650</td>
<td>3</td>
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</tr>
<tr>
<td>Elec. Engr. 4700</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Elec. Engr. 4690</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Elec. Engr. 4700</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Math 4710 or 4510</td>
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<tr>
<td>Elec. Engr. 4710</td>
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</tr>
<tr>
<td>Economics 2110</td>
<td>3</td>
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<tr>
<td>Elec. Engr. 4830</td>
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**TOTAL:** 203 hours

### Electronics and Instrumentation

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<tr>
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<td>Elec. Engr. 4680</td>
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<tr>
<td>Elec. Engr. 4690</td>
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<td>Elec. Engr. 4710</td>
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<td>3</td>
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<tr>
<td>Elec. Engr. 4720</td>
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<td>3</td>
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<tr>
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**TOTAL:** 203 hours

### Bioelectric Option

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<td>Chemistry 2320</td>
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<td>Zoology 3300-20-30</td>
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<td>3</td>
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<tr>
<td>Elec. Engr. 4890</td>
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<td>Economics 2120</td>
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<tr>
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**TOTAL:** 206 hours

### Mechanical Engineering

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<tr>
<td>Chemistry 1110-20-30</td>
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<td>English 1010-20-33</td>
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<td>Graphics 1410-20</td>
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<tr>
<td>Basic Engineering 1310-20-30</td>
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**TOTAL:** 206 hours

### Industrial Engineering

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**TOTAL:** 203 hours

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**TOTAL:** 206 hours

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**TOTAL:** 196 hours

### Senior

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**TOTAL:** 206 hours

### College of Engineering

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**TOTAL:** 206 hours

### Before entering the third quarter of the junior year the student, with the aid and approval of an adviser, must select a program of mechanical engineering and technical electives. The following areas of specialization are available in the senior year: Energy, Environmental, Manufacturing, Machine Design, Propulsion and Aerospace. See page 154.
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*Not required in the cooperative program.

*A minimum of one-half (12 quarter hours) of the humanities/social studies electives must be taken from a single group under one of the three areas.

### Nuclear Engineering

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# Cooperative Curriculum in Aerospace Engineering

## Students Working Spring and Fall Quarters—Group A

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TOTAL: 203 hours

## Students Working Summer and Winter Quarters—Group B

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TOTAL: 203 hours

¹Humanities/social studies electives; minimum of 20 hours required.
¹Technical electives: upper division courses in engineering, mathematics or physical science as approved by the department.
## Cooperative Curriculum in Agricultural Engineering (See College of Agriculture Section)

### Cooperative Curriculum in Chemical Engineering

**Students Working Spring and Fall Quarters—Group A**

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**Students Working Summer and Winter Quarters—Group B**

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**TOTAL: 200 hours**

*A minimum of one-half (12 quarter hours) of the humanities/social studies electives must be taken from a single group under one of the three areas of the humanities and social studies electives.*
# Cooperative Curriculum in Civil Engineering

**Students Working Spring and Fall Quarters—Group A**

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**Total: 201 hours**

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**Students Working Summer and Winter Quarters—Group B**

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**Total: 201 hours**

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*Humanities/social studies courses approved by the department.
*Math/science courses approved by the department.
*Technical electives must be approved by the student’s adviser and the primary and one secondary area must come from the departmental list of approved courses for 15 credits and 6 credits respectively.
*Mechanical Engineering 3520 or 3311 may be substituted.
Cooperative Curriculum in Electrical Engineering

Students Working Spring and Fall Quarters—Group A

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| FIFTH YEAR | See Senior Year Areas of Interest, page 130. |

Students Working Summer and Winter Quarters—Group B

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| FIFTH YEAR | See Senior Areas of Interest, page 130. |
## Cooperative Curriculum in Engineering Physics

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**FIFTH YEAR**

| Physic 4110 | 3          | Physics 4120 | 3          | Physics 4130 | 3          |
| Physics 4240 | 3          | Physics elective | 3         | Physics elective | 3          |
| or 4250      | 3          | Tech. elective | 3          | Tech. elective | 3          |
| Elective     | 3          | Elective      | 3          | Elective      | 3          |
| Elective     | 3          |              |            |              |
| Elective     | 3          |              |            |              |

**TOTAL: 199 hours**

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## Students Working Summer and Winter Quarters—Group B

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**FIFTH YEAR**

| Physics 4110 | 3          | Physics 4120 | 3          | Physics 4130 | 3          |
| Physics 4240 | 3          | Physics elective | 3         | Physics elective | 3          |
| or 4250      | 3          | Tech. elective | 3          | Tech. elective | 3          |
| Elective     | 3          | Elective      | 3          | Elective      | 3          |
| Elective     | 3          |              |            |              |
| Elective     | 3          |              |            |              |

**TOTAL: 199 hours**

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1. To be taken from the College of Liberal Arts: Language, Literature and Arts, or History and Society, with at least 16 hours from courses approved for Language, Literature and Arts.
2. The honors sequence (Physics 1318-28-38) is recommended for qualified majors.
3. To be taken in College of Engineering.
5. From engineering, mathematics, computer science, physics, chemistry, or astronomy.
6. Students not pursuing graduate studies may substitute Physics 3710-20-30.
### Cooperative Curriculum in Engineering Science

#### Students Working Spring and Fall Quarters—Group A

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**TOTAL:** 196 hours

### Students Working Summer and Winter Quarters—Group B

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**TOTAL:** 196 hours

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1. Humanities/social studies courses approved by the department.
2. Appropriate courses approved by the department.
3. Appropriate courses in the College of Engineering approved by the department.
4. Upper-division courses in mathematics, statistics, natural science, or engineering approved by the department.
## Cooperative Curriculum in Industrial Engineering

### Students Working Spring and Fall Quarters—Group A

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**TOTAL: 206 hours**

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**TOTAL: 206 hours**
### Cooperative Curriculum in Mechanical Engineering

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**SECOND YEAR**

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**THIRD YEAR**

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**FIFTH YEAR**

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| Mech. Engr. 4320 | .1 |
| Mech. Engr. 4410 | .4 |
| Mech. Engr. 4471 | .3 |
| Mech. Engr. 4670 | .3 |
| Mech. Engr. elect. 3 |
| Tech. Elect. 3 |
| Humanities/social studies elect. . . . |

**TOTAL: 203 hours**

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#### Students Working Summer and Winter Quarters—Group B

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**SECOND YEAR**

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| Mechanics 2110 | .3 |
| Humanities/social studies elect. . . . |

**THIRD YEAR**

| Mech. Engr. 3221 | .2 |
| Mechanics 3620 | .3 |
| Mechanics 3650 | .3 |
| Mechanics 3440 | .3 |
| Mechanics 3410 | .3 |
| Elec. Engr. 3110 | .3 |

**FOURTH YEAR**

| Mech. Engr. 3321 | .2 |
| Mechanics 3620 | .3 |
| Mechanics 3650 | .3 |
| Mechanics 3440 | .3 |
| Mechanics 3410 | .3 |
| Elec. Engr. 3120 | .3 |

**FIFTH YEAR**

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| Mech. Engr. 4320 | .1 |
| Mech. Engr. 4410 | .4 |
| Mech. Engr. 4471 | .3 |
| Mech. Engr. 4670 | .3 |
| Mech. Engr. elect. 3 |
| Tech. Elect. 3 |
| Humanities/social studies elect. . . . |

**TOTAL: 203 hours**

---

1 Humanities/social studies electives: minimum of 20 hours required.
2 Mechanical engineering electives: senior courses in mechanical or aerospace engineering not otherwise required.
3 Technical electives: upper-division courses in engineering, mathematics or physics as approved by the department.
## Cooperative Curriculum in Metallurgical Engineering

**Students Working Spring and Fall Quarters—Group A**

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**Students Working Summer and Winter Quarters—Group B**

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1A minimum of one-half (12 quarter hours) of the non-technical electives must be taken from a single group under one of the three areas of the humanities and social studies electives.
Cooperative Curriculum in Nuclear Engineering

**Students Working Spring and Fall Quarters—Group A**

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**SECOND YEAR**

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<td>Met. Engr. 3110</td>
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<tr>
<td>Nuc. Engr. 2310</td>
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**THIRD YEAR**

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<tbody>
<tr>
<td>Math 2860</td>
</tr>
<tr>
<td>Physics 3710</td>
</tr>
<tr>
<td>Engr. Sci. &amp; Mech. 3311</td>
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<tr>
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**FOURTH YEAR**

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<tr>
<td>Math 4710</td>
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<tr>
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**FIFTH YEAR**

| Nuc. Engr. 4110 | 3 |
| Nuc. Engr. 4210 | 3 |
| Nuc. Engr. 4310 | 3 |
| Nuc. Engr. 4720 | 4 |
| Nuc. Engr. 3150 | 3 |
| Tech. elect. | 3 |

TOTAL: 198 hours

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**Students Working Summer and Winter Quarters—Group B**

<table>
<thead>
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<th>Fall</th>
<th>Winter</th>
<th>Spring</th>
<th>Summer</th>
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<td>Chemistry 1130</td>
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**SECOND YEAR**

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<td>Math 2840</td>
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<td>Nuc. Engr. 2310</td>
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**THIRD YEAR**

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<td>Nuc. Engr. 2330</td>
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**FOURTH YEAR**

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<tbody>
<tr>
<td>Math 4710</td>
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<tr>
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<tr>
<td>Nuc. Engr. 3010</td>
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<tr>
<td>Elec. Engr. 3120</td>
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<td>Humanities/social studies elect.</td>
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</table>

**FIFTH YEAR**

| Nuc. Engr. 4110 | 3 |
| Nuc. Engr. 4210 | 3 |
| Nuc. Engr. 4310 | 3 |
| Nuc. Engr. 4720 | 4 |
| Nuc. Engr. 3150 | 3 |
| Tech. elect. | 3 |

TOTAL: 198 hours
Departments of Instruction

Agricultural Engineering
(See College of Agriculture)

Basic Engineering and Graphics
(Non-Departmental Unit)

Basic Engineering (179)
Coordinator: W.T. Snyder

1310 Basic Mechanics I (4) Forces, vector quantities, and moments; resultant of force systems; simple static equilibrium. Required of all engineering students except engineering physics majors. Coreq: Math 1840. 3 hrs and one 3-hr lab.

1320 Basic Mechanics II (4) Displacement vectors; particle kinematics and projectile motion; kinetcs of particles using Newton's laws, frictional forces, and impulse-momentum. Required of all engineering students except engineering physics majors. Prereq: 1310; coreq: Math 1850. 3 hrs and one 3- hr lab.

1410 Engineering Computations (2) Presentation of data; elementary problem solving; use of slide rules and digital computer; treatment of error; empirical methods. Prereq: Math 1840. 2 hrs plus open computer lab.

Graphics (443)
Coordinator: J.N. Snider

Basic Faculty: Professors C.A. Newton (Emeritus), M.S. Syracuse; W.W. Thomas, Jr. (Emeritus), B.S. Tennessee; Associate Professors E.K. Boyce, M.S. Tennessee; W.A. Lyday, Jr., M.S. Tennessee.

1310-20-30 Fundamentals of Engineering Graphics (2, 2, 2) Graphic representation of three-dimensional patterns and size by orthogonal and pictorial projection; sketching and dimensioning; tolerances. Problem solving utilizing spatial relationships and graphic vector analysis, and graphic presentation of engineering data. Must be taken in sequence. Two 3-hr periods or three 2-hr periods.

1410-20 Fundamentals of Engineering Graphics (3, 3) Graphic representation of three-dimensional shape and size; space relationships; graphic presentation of engineering data. Required of all engineering students. Must be taken in sequence. One lecture and three 2-hr periods or two 3-hr periods.

Engineering Studies
(Non-Departmental Unit)

Engineering Studies (338)
Coordinator: E.E. Stansbury

2100 Introduction to Engineering Methodology (4) Designed to introduce non-engineering students to representative methods utilized in engineering design, development, operation, and evaluation of processes and products for society; use of physical laws and examples of techniques such as modeling, systems analysis, economic balances; problems of resource use and technology control; thematic approach used.

4100 History of Engineering (4) History of technology and engineering with emphasis on identification of and developments in major areas such as transportation, communication, energy, manufacturing, design, and materials. Relationship to social and political structures of historical periods. Open to all students.

4200 Technology Forecasting and Assessment (4) Procedures and problems in forecasting of consequences of existing and new technologies; assessment of and decisions on use of these technologies. Societal and technological implications of consequence-based assessment and control of technology. Open to all students.

4300 The Interaction Between Science and Engineering (4) Historical-to-current analysis of interactions between science and engineering—patterns of mutual stimulation and of distinction. Open to all students.

Chemical, Metallurgical and Polymer Engineering

Professors: H.F. Johnson (Head), D. Eng. Yale, P.E.; D.C. Bogue, Ph.D. Delaware; C.R. Brooks, Jr., Ph.D. Tennessee; E.S. Clark, Ph.D. California (Berkeley); O.L. Culberson, Ph.D. Texas; L.W. Crawford, Ph.D. Cincinnati; J.F. Fellers, Ph.D. Akron; F. Franzaler, Jr., D. Eng. Johns Hopkins; H.W. Hau, Ph.D. Wisconsin; S.H. Jury (Emeritus), Ph.D. Cincinnati, P.E.; C.D. Lundin, Ph.D. Rensselaer Polytechnic Institute; C.F. Moore, Ph.D. Louisiana State; B.F. Oliver, Ph.D. Pennsylvania State; J.J. Perona, Ph.D. Northwestern; J.W. Prados (President Visiting Professor for Academic Affairs), Ph.D. Tennessee; J.E. Surfiel, Ph.D. Tennessee; E.E. Stansbury, Ph.D. Cincinnati; C.O. Thomas, Ph.D. Pennsylvania; J.L. Wright, Ph.D. Delaware; M.A. Yalor, Ph.D. Wisconsin.

Associate Professor: W.T. Becker, Ph.D. Illinois.

Assistant Professors: D.D. Bruns, Ph.D. Houston; P.J. Mescher, Ph.D. Pennsylvania.

*Alumni Distinguished Service Professor
*Distinguished Service Professor
*Space Institute, Tullahoma

BACHELOR OF SCIENCE PROGRAM

Separate complete curricula are offered in chemical engineering and in metallurgical engineering. However, the first two years of these curricula are identical and a decision as to choice can be made in the third year. Both curricula are arranged to provide a central core of courses with flexibility in the upper-division years to permit emphasis on preparation for graduate study or technical employment.

GRADUATE STUDY PROGRAMS

Graduate programs leading to the degrees of Master of Science and Doctor of Philosophy with majors in chemical engineering, metallurgical engineering or polymer engineering are offered. A program leading to the M.S. and Ph.D. degrees with specialization in polymer science and engineering in chemical engineering is conducted jointly with the Department of Chemistry which offers a degree with specialization. These programs have been strengthened by fellowships or grants provided by industrial companies including Dow, DuPont, General Electric, Shell, Texaco, Procter and Gamble, Celanese, Monsanto, American Enka, Union Carbide, Stauffer, Owens Corning, Cities Service, and Eastman Kodak, and by graduate fellowships and traineeships provided by National Science Foundation. Other aid to students has been available through research assistantships on contracts with industry and governmental agencies. The University's Graduate School operates a Resident Graduate Program at Oak Ridge, Kingsport, and in Seattle.

See the Graduate Catalog for detailed information.

Chemical and Metallurgical Engineering (227)


2111 Sophomore Inspection Trip (0) Inspection trip to industrial plant. Usually scheduled in fall on ETEA day. Required of chemical engineering and metallurgical engineering majors. S/NC.


2203 Process Principles and Materials III (4) Materials structure—property relationships for metals, inorganic and organic compounds, with emphasis on mechanisms of control of properties by chemical composition, thermal and mechanical treatment; crystallography, imperfections, mechanical properties, heat treatment, molecular weight and particle size distributions. Prereq: 2010; Chemistry 1130. 3 hrs and 1 lab period.

2220 Analog Computer Practice (1) Introduction to fundamentals of analog programming. Analog computer facilities and analog option troubleshooting will be emphasized. Prereq: Math 2840; Physics 2310 or Elec. Engr. 3110 or consent of instructor. One lab. S/NC.

2230 Mini Computer Practice (1) Use of mini computers. Prereq: Basic Engineering 1410, or consent of instructor. One lab. S/NC.

2240 Mini Computer Data Acquisition (1) Mini computers for data acquisition. Prereq: 2230 or consent of instructor. One lab. S/NC.

3100 Introduction to the Materials of Technology (4) Examination of electromagnetic, electronic, and properties of metallic, ceramic, polymeric, and composites materials based upon an historical perspective and current practices in technology, architecture, and art. Lectures and demonstrations. Open to students in all colleges. Prereq: Introductory science course.

4310-20 Seminar (1, 1) Presentation and discussion of economic, political, humanistic, and other topics of interest to chemical and metallurgical engineers. S/NC.

Chemical Engineering (226)

3010 Industrial Inspection Trips (1) Technology of chemical process industries emphasizing Tennessee industry, plant tours. S/NC.

3040 Chemical Engineering Thermodynamics (4) Application of the second law of thermodynamics to physical and chemical processes and thermodynamic cycles; applications of the Gibbs function to one, two and three phase chemical systems; use of tabular and graphical data in equilibrium calculations. Prereq: Chemistry 1130; coreq: Math 2840. 3 hrs and 1 lab period.

3230 Special Problems (3) Investigation of chemical engineering problems.

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

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

3440 Stagewise Operations (3) Analytical and graphical methods to stagewise separatory operations. Prereq: Chemet. Engr. 3040.

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

3610 Introduction to Process Dynamics and Control (3) Introduction to concepts of process dynamics and control. Steady-state analysis of chemical process control systems. Unsteady state numerical methods. Chemical engineering Laplace transform techniques, block diagram algebra and transfer functions. Mathematical models for several processes to be developed and analyzed in detail. Prereq: Math. 2840.

3620 Chemical Process Control (3) Basic control theory applied to chemical processes: feedback control systems, cascade control, feedforward control, stability analysis, frequency response. Survey of modern control of typical industrial unit operations. Prereq: 3610.

4010-20 Thesis (3, 3) Investigation and report of elementary chemical engineering problem.

4110 Chemical Engineering Data Analysis (3) Analytical and experimental identification of system extremes; statistical properties of samples and system sources; empirical modeling of processes; statistical process control. Prereq: 3420, Math 3150.


4130 Introduction to Optimization (3) Principles and applications of optimization techniques to chemical process design, unconstrained optimization, sensitivity analysis, quality directed optimization, inequality constrained optimization, and dynamic programming. Prereq: Math 2640.

4220 Chemical Engineering Laboratory (3) Laboratory study of reaction systems and properties of systems specific to chemical engineering operations. Prereq: 3440-50, 3620, 4530.

4230 Project Laboratory (3) Laboratory investigation of chemical engineering problem, stressing techniques of group effort. May be repeated.


4420 Process Design and Economic Analysis (3) Development of basic information on a process, into an integrated plant design considering mass and energy balances. Product specifications, equipment cost, capital investment, operating costs and economic merit. Prereq: 4410, 4530.

4430 Special Problems in Design and Economics (3) Extension of 4420 for student participation in A.E. 1110, 1112; other design projects. Prereq: 4420.

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

4470 Sulfur Removal from Coal and Associated Problems (3) Chemical and physical properties of domestic coals, sulfur distributions; beneficiation by both physical and chemical methods; fluidized bed combustion with both natural and synthetic SO₂ sorbents; stack gas SO₂ scrubbing. Prereq: Consent of instructor.

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

4530 Chemical Engineering Reaction Kinetics (3) Chemical reaction rates in closed and flow systems; interpretation of laboratory and pilot plant data; reactor design. Prereq: 3420, Chemet. Engr. 3040, Chemistry 3430.


4620 Process Modeling, Simulation and Control of Chemical Processes (3) Development of process models, experimental process identification, process control, conventional and nonconventional feedback control, advanced control concepts. 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 applicable to biological systems. Derivations of general equations of biomass and energy transfer. Thermodynamics of transport and equilibrium in biological systems. Discussion of Volterra's equation and biological clocks, etc. 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 transports; structure and rheology of physiological fluids, membrane and interfacial phenomena; analysis and design of artificial organs. Prereq: 3440 and 3450 or consent of instructor.

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

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

4761-82-83 Topics in Chemical Bioengineering (3, 3, 3) Problems of interest in chemical bioengineering. Prereq: Consent of instructor.

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

GRADUATE

5000 Thesis (3)

5010 Graduate Seminar (1)

5050 Engineering Analysis (3)

5120 Heat Convection (3)

5130 Methods of Optimization (3)

5210 Process Dynamics (3)

5250 Chemical Process Industry Economics (3)

5310 Thermodynamics of Heterogeneous Equilibrium (3)

5320 Statistical Thermodynamics (3)

5410-20-30 Research and Design in Chemical Engineering (3, 3, 3)

5510 Chemical Reactor Design (3)

5610 Stagewise Mass Transfer Operations (3)

5620 Differential Mass Transfer Operations (3)

5680 Mechanics of Viscous Flow (3)

6000 Doctoral Research and Dissertation

6130 Process Optimization (3)

6210 Advanced Diffusional Operations (3)

6250 Venture Analysis in the Process Industries (3)

6310 Thermodynamics of Irreversible Processes (3)

6320 Statistical Thermodynamics of Non-equilibrium Systems (3)

6410 Stability Phenomena in Chemical Engineering: Discrete Systems (3)

6420 Stability Phenomena in Chemical Engineering: Continuous Systems (3)

6510 Applied Chemical Reaction Kinetics (3)

6520 Catalytic Reactor Design (3)

6610 Special Topics in Chemical Engineering (3)

6710 Process Dynamics (3)

Metallurgical Engineering (679)

2110 Engineering Materials I (3) Introductory course correlating the atomic, crystal, and microstructure of solids and mechanical, physical, and chemical properties of engineering significance. 3 hrs or 2 hrs and 1 lab.

2210 Electron Microscopy (1) Designed to present to science and engineering students a brief introduction to the operation of the electron microscope and its applications to scientific problems. Prereq: Physics 2310-20. 5 hrs lab. S/NC.

3010 Industrial Inspection Trips (1) Technology of metallurgical industries, emphasizing Tennessee industry; plant trips. S/NC.

3040 Metallurgical Thermodynamics (4) Applications of laws of thermodynamics to problems of material interest. Second law and entropy; auxiliary functions; relationships between free energies and phase diagrams; reaction equilibria in condensed and vapor phase. Use of heat capacity and free energy data in calculations. Concepts of activity and activity coefficient and their variation with T, P, and composition. Prereq: Chemet. Engr. 2020; Chemistry 1130; coreq: Math 2840. 3 hrs and 1 lab period.

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 of resultant properties for mechanical and industrial engineering students.
4710 Production Metallurgy (3) Thermodynamic and kinetic principles of melting, smelting, refining.
Prereq: Chem. Engr. 3040.
4730 Mechanical Metallurgy I (3) Elastic behavior. Description of stress, strain, and elastic con-
situtive relations. Effects of composition, micro-
structure, and loading on mechanical behavior. Failure by yield, 2 hrs and 1 lab or 3 hrs. Prereq: 2110 or Chem. Engr. 2030, and Engr. Sci. & Mech. 3311. Also suggested for mechanical engineering, engineering mechanics and engineering science students.
4740 Mechanical Metallurgy II (3) Ductile and brittle fracture, creep and stress rupture, fatigue, and
residual stresses. Effects of state of stress, loading
rate, time, temperature, and metallurgical structure. 2 hrs and 1 lab or 3 hrs. Prereq: 3120 or
3230, and 4730 or Mech. Engr. 3650 or consent of
instructor. Also suggested for mechanical engi-
neering, engineering mechanics, or engineering
science students.
4760 Casting and Welding (3) Principles and proc-
esses of casting and welding: heat transfer, so-
lidification, segregation, gas-metal and slag-metal
interactions, thermal treatments, associated
strresses. Prereq: 3120 or 3230. 3 hrs or 2 hrs and 1
lab.
4770 Mechanical Metallurgy III (3) Finite plastic
strain. Plastic stress-strain relations. Principles of
fabrication: forging, swaging, extrusion, rolling,
dee deep drawing. 2 hrs and 1 lab or 3 hrs. Prereq: 4730
or consent of instructor. Also suggested for
mechanical engineering, engineering mechanics,
and engineering science majors.

Graduate Program Information:

Graduate Programs in Engineering:

Polymer Engineering (805)
4220-40 Project Laboratory (3, 3) Laboratory inves-
tigation of polymer engineering problem. Written report required for each quarter.
4910 Applied Polymer Science (3) First course in
physical properties of polymers. Polymer struc-
ture, crystalline and glass transitions, physical
properties of amorphous and crystalline polymers,
crystallization kinetics and mechanical properties
are discussed. Prereq: Senior standing in engi-
neering or science.
4920 Polymer Processing (3) Rheological proper-
ties of polymer melts and solutions, viscometry,
unit operations of fiber, plastics and rubber indus-
tries: dimensional analysis and scale-up, flow
through dies and pipelines, screw extrusion, spin-
ing of fibers, injection molding. Prereq: Senior
standing in engineering or science.
4930 Principles of Fiber Textile Engineering (3)
Chemical and crystalline structure of important
fibers; melt, wet and dry spinning of man-made
fibers; drawing and texturizing; preparation of
yarn; dyeing, weaving and knitting. Emphasis on
quantitative aspects. Prereq: Senior standing in
engineering or science.
4940 Plastics Fabrication Operations (3) Lecture
and laboratory course treating unit operations of
plastics industry. Types and mechanisms of oper-
ation of machinery used and structure and proper-
ties of fabricated parts. Operations to include
extrusion, co-extrusion, injection molding includ-
ing structural foam, thermofoming, blow molding,
rotational molding, etc. Prereq: Senior standing in
engineering or science.

Graduate Courses:

5000 Thesis
5010 Graduate Seminar (1)
5050 Engineering Analysis (3)
5110 Point Defects and Dislocations (3)
5120 Plastic Deformation I (3)
5130 Plastic Deformation II (3)
5140 Diffusion and Annealing in Solids (3)
5150 Phase Transformations (3)
5170-80 Plastic Deformation (3, 3)
5210-20-30 Welding Metallurgy (3, 3, 3)
5310 Solidification and Crystal Growth I (3)
5410-20-30 Advanced X-Ray Diffraction (3, 3, 3)
5510-20 Applied Properties of Solids (3, 3)
5540-50 Electron Microscopy I and II (3, 3)
5610-20 Radiation Effects on Materials (3, 3)
5750 Corrosion (3)
5810-20-30 Special Topics in Metallurgy (3, 3, 3)
5840-50 Metallurgy of Deformation and Fracture
(3, 3)
5910-20-30 Metallurgical Thermodynamics (3, 3, 3)
6000 Doctoral Research and Dissertation
6110-20-30 Theoretical Metallurgy (3, 3, 3)
6210-20-30 Rate Processes in Metallurgy (3, 3, 3)
6230-30 Solidification and Crystal Growth II and III
(3, 3)
6240 Thermodynamics of Solids (3, 3)
6810 Mechanical and Physical Properties of Crystals
(3)
6820 Mechanical and Physical Properties of Crystals
(3)
6830 Seminar in Anisotropic Properties of Crystals
(3)
Civil Engineering

Involving Environmental Engineering

Professors:
- W.L. Grecco (Head), Ph.D. Michigan State, P.E.
- E.G. Burdette, Ph.D. Illinois, P.E., F.A. Gifford
- Ph.D. Pennsylvania State; D.W. Goodpasture
- Ph.D. Illinois, P.E.; W.A. Goodwin
- M.S.C.E. Kentucky, P.E.
- K.W. Heathington, Ph.D. Northwestern, P.E.
- J.B. Humphrey, Ph.D. & M.P.E.
- F.C. Larson (Emeritus), M.S. Virginia
- Polytechnic, P.E., B.O. Marks, Ph.D. FI.
- Oklahoma State, Ph.D. Washington; M.E.
- E.G. Shelton (Emeritus), M.C.E. Brooklyn
- Polytechnic Institute, B.A. Tschicz, Sc.D. New
- Massachusetts Institute of Technology, P.E.;
- F.J. Wegmann, Ph.D. Northwestern.

Associate Professors:
- W.F. Brandes (Director), Water Resources
- Research Center, M.S. Illinois; A. Chatterjee;
- Ph.D. North Carolina State; J.H. Hansen*, Ph.D.
- Missouri; D.C. Jameson, Jr., M.S. Tennessee
- P.E.; A.R. Moore, M.S. Tennessee
- D.E. Overton, Ph.D. Maryland; R.R. Fury, B.S.
- Marquette, P.E.; D.W. Weeter, Ph.D. Purdue
- P.E.

Assistant Professors:
- R.D. Ball, Ph.D. Delaware; G.A. Briggs, Ph.D.
- Pennsylvania State; R.L. Church, Ph.D. Johns
- Hopkins; W.T. Davis, Ph.D. Tennessee;
- S.L. Hana, Ph.D. Pennsylvania State;
- R.B. Jackson, M.S. Stanford.

*Space Institute, Tullahoma

BACHELOR OF SCIENCE PROGRAM

The curriculum in civil engineering is designed to provide training in fundamental engineering sciences, certain non-technical subjects and technical subjects in various civil engineering fields to serve as a basis for entrance into civil engineering practice, and/or for graduate study. By use of technical electives (27 hours maximum), a student can specialize as primary or secondary areas of study in construction, environmental engineering, structures, transportation, or water resources. Primary specialization will be shown on student's transcript.

Students are required to maintain a cumulative grade point average of at least 2.00 in all civil engineering and environmental engineering courses taken at The University of Tennessee, Knoxville and used to satisfy the graduation requirements.

MASTER OF SCIENCE and
MASTER OF ENGINEERING PROGRAMS

Graduate programs in civil engineering and environmental engineering leading to the degree of Master of Engineering are offered to graduates of recognized undergraduate curricula.

The general requirements for the masters' degrees are stated in the Graduate Catalog.

DOCTORAL PROGRAM

Graduate work leading to the degree of Doctor of Philosophy with a major in civil engineering is offered. Major fields of study include environmental engineering, structural engineering, transportation, construction management, and water resources.

The general requirements for the doctoral degree are stated in the Graduate Catalog.
Electrical Engineering (320)

Professors: J.M. Googe (Head), Ph.D. Georgia Institute of Technology, P.E.; J. Alexoff, Ph.D. Wisconsin, P.E.; J.M. Bailey, Ph.D. Georgia Institute of Technology; A.O. Bishop, Jr., Ph.D. Clemson; T.V. Blalock, Ph.D. Tennessee; R.E. Bodenheimer, Ph.D. Northwestern; W.L. Green, Ph.D. Texas A & M; R.C. Gonzalez, Ph.D. Florida; G.W. Hoffman, Ph.D. Harvard; E.C. Heubeckmann, Ph.D. Texas; J.C. Hung, Ph.D. New York, P.E.; E.J. Kennedy, Ph.D. Tennessee, P.E.; W.O. Leffelt, M.S. Tennessee; M.O. Pace, Ph.D. Georgia Institute of Technology; Ph.D. Pennsylvania; J.F. Pierce, Ph.D. Pittsburgh, P.E.; R.W. Rochelle, Ph.D. Maryland; J.R. Roth, Ph.D. Cornell, Ph.D. Minnesota; B. Smith, Jr., M.S. Illinois, P.E.; J.D. Tillman, Jr., Ph.D. Stanford; J. Reed, President; E.E. Dean; S. Institute, Ph.D. Wisconsin, P.E.


* Distinguished Professor
* Space Institute, Tullahoma

UNDERGRADUATE

The Bachelor of Science in Electrical Engineering is planned to provide a foundation in both the basic sciences and specialized areas of modern electrical engineering. The curriculum also contains a suitable amount of cultural work to encourage the growth of the student toward the goal of becoming a professional person with strong social awareness. In the senior year, the student may specialize in any one of the following areas of electrical engineering: bioelectric engineering, computer engineering, electromagnetic fields and communications, electronics and instrumentation, energy generation and power systems, and plasma and electro-optics engineering, and systems and networks. All of these areas except the bioelectric engineering option are continued through the Engineering program. The senior year curriculum is sufficiently flexible to allow a student to take several courses outside of the chosen area of specialization.

All sophomore and junior course work is offered every quarter and the senior work is scheduled so that the student may enter at the beginning of any quarter. This arrangement allows maximum flexibility, since the student may elect the normal four-year schedule, may choose to graduate in three calendar years, or may take the Cooperative Engineering Program.

In addition to the usual research and teaching facilities in machinery, electronics, microwaves, solid state devices and control equipment, the department has both digital and analog computers.

MASTERCourse PROGRAM

Graduate work leading to the Master of Science degree in electrical engineering is offered in each academic year of full-time study or the degree may be obtained in two or three years of study in the evening.

Graduate assistantships and scholarships are available for outstanding students. Graduate assistants may obtain the master's degree in one calendar year.

Course work leading to the degree of Master of Science in Electrical Engineering is offered in the evening. Each course meets for two and one-half hours each week.

THE DOCTORAL PROGRAM

Graduate work leading to the degree of Doctor of Philosophy with a major in electrical engineering is offered. The department also participates in the engineering science doctoral program.

General policies of the Graduate School, residence, language, research examinations, and admission to candidacy requirements are explained in the Graduate Catalog.


2030 Circuits III (3) Polyphase networks considered as networks with more than one source. Magnetically coupled circuits. Transient analysis of circuits containing more than one storage element using classical methods. Steady-state analysis of networks containing sinusoidal sources of more than one. Coreq: Math 2020, 2040 concurrently, 3 hrs including biweekly lab.


3050 Basic Field Theory (3) Forces between charges, electric and magnetic fields, Gauss' law and divergence, potential, line integrals, material and magnetic circuits, Maxwell's equations, dynamic potentials. Coreq: Math 2040.

3060 Propagation I (3) Plane waves, reflection, guided waves, transmission lines, standing waves, impedance, matching, graphical methods, rectangular wave guides. Coreq: Math 2040, 3 hrs including biweekly lab.

3080 Energy Conversion (3) Magnetic circuits, transformer theory and operation, principles of electromagnetic energy conversion with emphasis on input-output characteristics; steady-state analysis of induction motors and d. c. machines. Coreq: Math 2040, 3040 includes a biweekly lab.

3090 Energy System Operation (3) Synchronous machines, transmission-line, and transformers as power system elements; power system representation, per unit calculation, symmetrical components, and fault studies. Coreq: Math 3080 includes a biweekly lab.


3110 Basic Electrical Engineering—Circuits and Fields (3) For non-electrical engineering majors. Coreq: Math 2050, 3110, 3 hrs including biweekly lab.

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

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

3135 Basic Electrical Engineering—Circuits—Instrumentation (3) For non-electrical engineering majors. Use of operational amplifiers for analog signal processing, operational amplifiers, signal conditioning, input-output devices-transducers, recorders, oscilloscopes; automated data collection; safety and grounding requirements. 2 hrs lab. Coreq: Math 3120.

3180 Logic Design of Digital Systems (3) Introduction to boolean algebra and design of combinational circuits, and flipflop characteristics. Design of clocked sequential systems and other systems containing memory. Introduction to microcomputer architecture and system components to include basic structure and function of Arithmetic, Storage, Input/Output, and Control Systems. Instruction set capabilities and machine language programming. Coreq: Math 3010, 3190, 3180, 3 hrs including biweekly lab.

3190 Plasma I (3) Engineering applications of physical electronics devices and effects. Topics include electrostatic precipitators and plasma light sources, laser operation and applications (electro-optical, and electronics) and other techniques of advanced power production. 3 hrs biweekly lab. Coreq: Physics 2100-2130.

3270 Linear Systems Analysis (3) Steady-state and transient response of linear systems: polynomials, phase, pole-zero plots; block diagram transformation; signal flow graphs; analogous systems, properties of second order systems, introduction to feedback theory; stability criteria. Coreq: Math 3010 and 3040, 3 hrs including biweekly lab.

3810 Electrons I—Basic Electronic Processes (3) Current conduction in semiconductors and high vacuum; theory of p-n junctions, characteristics of diodes; rectifiers and diode switches. Coreq: Math 3040 concurrently, 3 hrs including biweekly lab.

3820 Electrons II—Basic Electronic Devices (3) Characteristics and equivalent circuits of vacuum tubes and vacuum tube technology. Coreq: Math 3810, 3820, 3 hrs including biweekly lab.

3830 Electrons III—Basic Electronic Amplifiers (3) Vacuum tubes, self-bias, grid bias circuits, transistor amplifiers, tuned amplifiers; basic power amplifiers; bias stability, feedback. Coreq: Math 3810 and 3820, 3 hrs including biweekly lab.
4020 Direct Electrical Energy Conversion (3) Basic principles, typical devices and applications for production of electrical energy by thermoelectric effects, thermionic conversion, magnetohydrodynamics, solar panels, biofuels. Laboratory demonstrations. Prereq: 3500, 3190 and 3810.

4080 Microwave Circuits and Electronics (3) Circuits represented by wave shattering, isolators, gyrometers, couplers, microwave vacuum diodes and klystrons, cross-field devices, parametric amplifiers, power generator semiconductors, varactor semiconductors. Prereq: 3060. 3 hrs including bi-weekly lab.

4080 Propagation II (3) Metal tube, dielectric rod, and stripline waveguides. Waveguide resonators and other loading components. Design of structures utilized for microwave power transmission and for microwave integrated circuits. Prereq: 3060. 4 labs.


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

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

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


4470 Plasma II (3) Magnetohydrodynamics. Prereq: 3190.

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


4500 Electro-Optic Detection and Instrumentation (3) Sensitivity, resolution (frequency response) and noise concepts of pactical and practical engineering devices. Signal processing, spatial recording media (e.g., photographic emulsions) and temporal detectors (e.g., photodiodes) will be given. Last third of the course will be devoted to selected electro-optic instrumentation systems (e.g. laser light scattering, optical data processing, holographic interferometry).

4540 Automatic Control (3) Time and linear systems, state variables, optimization, single and multiple inputs, sensors, actuators, and controllers. Wave propagation in free space, earth's troposphere and ionosphere. Wave reflections from earth. Prereq: 3060.

4570 Electro-Acoustics (3) Reproduction of monophonic and stereophonic sound; microphone, loud speakers, disc recording, magnetic recordings, film recording, acoustics of studios, audiophones and loudspeakers. Prereq: Senior standing.

4600 Instrument Transducers and Signal Conditioning Electronics (3) Study of various sensors and transducers utilized for parameter measurement. Use of operational amplifier in signal conditioning; design examples such as active filters, amplifiers, attenuators, and function generators. Analysis of interfacing problems between transducers and signal-conditioner. Applications to environmental monitoring instrumentation. Prereq: 3120 or 3830.

4610 Analog-Digital Systems (3) Principles of analog computing components. Applied to analog computing to include problem setup and scaling. Characteristics of analog multipliers, dividers and function generators are developed. Presents comparators, digital to analog conversion, and analog to digital conversion techniques. Prereq: 3180 and 3830. 3 hrs including bi-weekly lab.

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

4630 Digital System Organization and Design (3) Considers system organization of digital systems including microprocessors, microprocessors archi- tectures and comparisons. Characteristics of ALU and CPU architectures, storage systems (RAM, ROM, and PROM building blocks), and input/output systems are developed. Control Unit organization to include serial/parallel modes of operation, synchronous/asynchronous time sequencing and microprogramming of control functions. Prereq: 3180. 3 hrs including bi-weekly lab.

4660 Bioelectric Instrumentation (3) Nature and origin of bioelectric potentials, transducers, amplifier requirements, recording systems and noise problems. Prereq: Senior standing.

4680 Electronic Power Amplifiers (3) Transistor and vacuum tube amplifiers: distortion, thermal considerations; r.f. power amplifiers; regulators. Prereq: 3830. 3 hrs including bi-weekly lab.

4690 Communications Electronics (3) Oscillators, modulation and demodulation; basic communication systems. Prereq: 3830. 3 hrs including bi-weekly lab.

4700 Switching Circuits (3) Pulse amplification, gating circuits, multivibrators, wave shaping circuits, trigger circuits. Prereq: 3010, 3830. 3 hrs including bi-weekly lab.

4740 Integrated Circuits (3) Processing and fabrication of active and passive components for monolithic and hybrid circuits. Design of linear and digital and large scale integration. Prereq: 3820.

4750 Interactive Computer Graphics (3) (Same as Computer Science 4750 and Geography 4750.)


4800 Hardware-Software Interface in Minicomputer and Microprocessor System Design (3) Presented minicomputer and microcomputer hardware design. Hardware-software interaction and tradeoff. Priority interrupt structures are designed and utilized. Telecommunications. Prereq: Oriented, contract course. Completion of two projects, one utilizing a minicomputer and the other a microcomputer are minimal course requirements. Prereq: 3180.

4810 Discrete-Data Systems (3) Introduction to analysis and design of discrete data control systems using frequency domain techniques. Real-time digital filtering and digital computers in closed-loop feedback systems.

4820 Introduction to Pattern Recognition (3) Role of pattern recognition within framework of artificial intelligence. Topics dealing with the design of learning and adaptive machines. Typical applications of pattern recognition to problems of practical significance. Computer simulation of elementary pattern recognition problems. Prereq: Either 3100 and Computer Science 3150, or Statistics 3450 and Computer Science 1510. (Same as Computer Science 4820.)

4830 Digital Image Processing (3) Principal methods of coding, storing, and processing images by means of digital computers. Computational algorithms for image operations. Prereq: 3100 and Computer Science 3150, or Statistics 3450 and Computer Science 1510. (Same as Computer Science 4830.)

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

4910-20-30 Special Electrical Engineering Problem (3, 3, 3) Problems in electrical engineering involving laboratory and research experiment.

GRADUATE

5000 Thesis

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

5070-80 Modern Transform Methods (3, 3)

5110 Introduction to Network Analysis (3)

5120 Network Synthesis and Design (3)

5130 Advanced Network Analysis (3)

5170 Bioengineering Systems I: Models, Systems Analysis and Simulation (3)

5180 Bioengineering Systems II: Bioelectric Phenomena (3)

5190 Bioengineering Systems III: Instrumentation and Analysis (3)

5210-20 Advanced Electrical Machinery (3, 3)

5230 Advanced Electrical Machinery Applications (3)

5240-50-60 Control Systems (3, 3, 3)

5310 Basic Requirements for Plasma Fusion (3)

5320 Diagnostics for Fusion (3)

5330 Engineering of Fusion (3)

5340 Introduction to Quantum Electronics (3)

5350 Properties of Quantum Devices (3)

5360 Application of Quantum Electronic Devices (3)

5370 Advanced Direct Electrical Energy Conversion I (3)

5380 Advanced Direct Electrical Energy Conversion II (3)

5390 Advanced Direct Electrical Energy Conversion III (3)

5410 Power System Networks (3)

5420 Fault and Load Flow Studies (3)

5430 Power System Stability and Control (3)
Engineering Science and Mechanics


*Space Institute, Tulahoma

BACHELOR OF SCIENCE PROGRAM

The curriculum in engineering science will provide students an opportunity for education in the sciences of engineering science, mathematics, and physical (or biological) science. Such a program will prepare students for a career in engineering development and research, professional education at the M.S. level, or additional graduate study leading to the master's or the doctoral degrees. The curriculum will provide students a broad engineering education which permits a strong emphasis on engineering principles and basic science.

In the first two years students in the engineering science program study engineering science, engineering, and mathematics. The engineering science program in the upper-division years is essentially an elective curriculum in which the special interests of students can be met which cannot be accommodated in other programs. Examples of special interest elective groups presently available in the engineering science program are biomedical engineering, engineering mechanics, engineering analysts and synthesis, environmental sciences, and engineering materials. Other elective groups are currently being developed and will be available in the future.

The biomedical engineering elective group provides the basic background for an engineer to contribute to the fields of biology and medicine in such technical areas as research and diagnostic equipment, the development of artificial organs, and the application of the engineering sciences to further the basic understanding of biological systems. With some modifications, the program can emphasize other areas such as the use of computer systems to automate hospital operations, to analyze medical data, and to contribute to the broad area of health care delivery systems. Interested and qualified students may choose to use this program as a background for graduate study in engineering or the life sciences.

The program includes the courses required for entrance into most medical schools, including The University of Tennessee Center for the Health Sciences in Memphis.

The engineering mechanics elective group focuses on analytical and experimental methods used in investigating the interaction of forces and matter. It is designed to enable students to develop engineering capabilities of engaging in research and development in industrial and governmental research laboratories. Because such preparation involves emphasis on the link between the basic sciences and engineering fundamentals, the engineering mechanics elective group provides a good theoretical background for students wishing to pursue engineering graduate studies.

The engineering analysis and synthesis elective group offers a concentration on the application of such mathematical techniques as numerical analysis and similitude for the solution of practical engineering problems. As such, heavy emphasis is placed on the use of digital computing.

The environmental sciences elective group introduces the student to some of the areas of knowledge and to some of the basic skills involved in engineering efforts aimed at solving environmental and ecological problems. This program gives the necessary background in both stress/structural analysis for a higher level of competence in this specialty during professional practice or through formal graduate study.

The engineering materials elective group provides background in the use of materials in the solution of engineering problems. This includes the selection of the proper materials to support the anticipated loads and consideration of the environmental conditions that are expected to exist during the design life of the system. There is a special need in industry for individuals with background in both stress/structural analysis and materials properties. The engineering materials elective group provides the student an opportunity to acquire this background.

The basic engineering science curriculum provides an opportunity to study significant blocks of the engineering science areas recognized by the American Society for Engineering Education such as (1) mechanics; (2) electrical science, electric and magnetic fields, circuits, and electronics; (3) thermodynamics and statistical mechanics; (4) materials science; (5) information science; (6) transfer and rate processes such as heat, mass, and momentum transfer. Other modern engineering fields which may be studied in the engineering science option are the space sciences and the environmental sciences. It is not expected that a student will study all the engineering sciences but will structure a course plan to provide depth in some of the engineering sciences.

Because of the large number of elective courses to be selected in the engineering science degree program, faculty advising plays an essential role in the process of developing the student's