**University Evening School**

**Director:** S. C. Bills, Ed.D., Tennessee.

**Assistant Director:** J. C. Sekul, Ph.D., Tennessee.

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**Assistant Professor:** G. M. Fisher, M.S., Tennessee; C. B. Maramvot, Ed.D., Tennessee.

**Instructor:** A. J. MacColl, 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 majors 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 majors in Anthropology, Economics, History, Mathematics, 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.

### Special Mini-Term Programs

The University Evening School offers two special Mini-Terms a year—one during the month of September and one during the month of December. Students may enroll in one concentrated credit course during the various Mini-Term periods.

Courses and instructors listed for the Mini-Term are carefully selected to reflect a broad academic base of individualized offerings suited to an intensive program of study. Courses cover traditional material and information included in regular quarterly offerings; however, many are supplemented with films, team teaching, field trips, independent research projects, and specialized areas of study. Thus, each offering will afford students an opportunity to immerse themselves in the discipline selected.

### 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 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 Assistanceenda Grant Program in the Evening School Office.

### Elderly and Disabled Persons

Recent state-wide legislation gives Tennessee citizens who are 60 years of age or older, or 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.

### Workshops and Off-Campus Programs

A comprehensive program of services is offered as a convenience for former Evening School students.

For additional information concerning any of these programs or services, please contact the University Evening School, 451 Communications & University Extension Building.
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 1928, 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 for Teacher Education, 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.

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. Course Load—Permission for more than 18 hours in a quarter must be obtained from the Office of the Dean. 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 80 quarter hours. Admission to Teacher Education will be a prerequisite for enrollment in many upper-division College of Education courses that are 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 2.2 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 those 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 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. 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.

(6) Basic Achievement Test: Students are required by the State Department of Education to pass tests in reading, language, and math. Application forms may 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 all student teaching programs 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.

Making application for student teaching is not contingent upon admission to the Teacher Education Program. Students should apply for student teaching at the appropriate time regardless of their status in the process of admission to the Teacher Education Program. 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 field experiences required in the program curriculum.

(4) Completion of at least 80 percent of course work in the endorsement area(s).

(5) Completion of the special methods courses at The University of Tennessee.

(6) Completion of the Student Teaching Seminar and the September experience (non-credit).

(7) Senior standing and a minimum grade point average of 2.0 on work completed at The University of Tennessee.

(8) A minimum grade point average of 2.2 in the student teaching experience.

(9) A 15-hour student teaching experience is evaluated on a satisfactory-to-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 location 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 in the Records Office.

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 University of Tennessee graduates for the professional certificate. To receive this certification, the student 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.

(6) Completion of the National Teacher Examinations.

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 College Teaching (advanced graduate) degree, the Doctor of Education, and the Doctor of Philosophy degree. For further information, see the Graduate Catalog.

Undergraduate Curricula

The college offers courses leading to the Bachelor of Science in Education and to eligibility for teacher certification in Tennessee and in those states which grant reciprocity privileges to graduates of institutions accredited by the the National Council for Accreditation of Teacher Education (NCATE).

A core of studies provides the foundation for specialization in all teacher education curricula. In addition, approved concentrations must be completed in subject fields specifically related to the public school curriculum. A choice is to be made among programs leading to recommendation for certification at one of three levels: elementary (kindergarten-8), secondary (grades 7-12), or special subjects in grades 1-12.

Courses in library science are available to students who are interested in beginning positions in any library or in preparation for further graduate study in professional librarianship. The minimum requirements for full-time librarianship in any size school in Tennessee can be met through completion of the basic library service courses (3510, 3520, 3530, 4140, 4150, 4270, 4330, 4750).

Endorsement as a librarian requires 27 quarter hours in library science. At the undergraduate level, only a minor in library science is available. Students in the college will select an appropriate curriculum from those outlined under the undergraduate curriculum section. Students interested in this program should consult with a member of the faculty of the Graduate School of Library and Information Science.

Married students will be placed as near their homes as possible in order to preserve family life. Mississippi, some of which are at a considerable distance from the City of Claxton, will be assigned to the student's wishes. Student teaching centers are maintained in East Tennessee, some of which are at a considerable distance from the City of Claxton.
I. Curricula for Elementary Teachers

A. Kindergarten through Grade 8

General Education

- Communications (12 hours)
  - English 1010 or 1011; 1020; 1031 or 1032; 1033
  (English 1019 may be required for some students)

- Social Studies (9 hours)
  - World History, U.S. History, or Social Studies

- Natural Science (12 hours)
  - Biology 1210-20-30 or Botany 1110-20

- Mathematics (9 hours)
  - Calculus I and II

- Fine Arts
  - One course in Music, Art, or Drama

- Physical Education
  - Physical Education electives (3 hours)

- Health and Physical Education
  - Health and Physical Education (9 hours)

- Computer Science
  - Computer Literacy

- Area of Concentration
  - 12 hours from Natural Sciences, Economics, or History

- Electives
  - 17-21 hours

II. Joint Elementary-Mathematics Education Certification

(Enroll with S. B. Doss)

General Education

- English Literature (4 hours)
- Social Studies (9 hours)
- Physical Education and Health (3 hours)
- Logarithm and Trigonometry (3 hours)

- Area of Concentration
  - Mathematics (31 hours)

- Electives
  - 17-21 hours

Satisfactory/No Credit Courses

For the curricula listed under Roman numerals I, II, and III only, a student may include a maximum of 30 hours in non-directed electives taken on a Satisfactory/No Credit basis. NON may not be used in required courses or controlled electives, except where the course is offered on an SNC basis (such as student teaching and field experiences). An area of concentration will be considered as non-directed electives where specific courses or controlled electives are required.

NOTE: Students are advised to consult the University's degree requirements as stated in the front section of this catalog as well as the requirements for the college or department.

TOTAL MINIMUM REQUIRED ........198 hours

Grade Point Average

18 hours in mathematically intensive courses

UNIVERSITY OF TF... (Mathematics + B.S. Degree)
A. English Education
   a. 45 quarter hours in English, including three in
      only 4 hours.
   b. 27 quarter hours in another language with no less
      than 18 quarter hours of upper-division courses.
   c. 4 quarter hours in anthropology.

B. Foreign Language Education
   a. 36 quarter hours in a language with no less than
      18 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. 3 foreign language electives selected from one or
      more areas.

C. Mathematics Education
   a. Mathematics and Physical Sciences (72 hours)
      (1) Mathematics is considered as one subject for high
      school endorsement.
      (2) Requires admission to Teacher Education Program.
   b. Science electives-(32 hours minimum), ap-
      propriate science coursework for upper levels in
      biology, chemistry, geology, physics.
   c. Required electives:
      Mathematics C&I 4520, 4520A, 4520B, 4520C.
      Educational Psychology 4700.

Endorsements: Mathematics, Physical Sciences, Biological Sciences, General Science.

D. Psychology Education
   a. Concentration in psychology or industrial psychology.
   b. Mathematics (45 hours) must include at least one
      year in calculus or analytic geometry and calculus.
   c. 27 hours in another subject used as a minor.
   d. 40 hours in psychology.

Endorsements: Mathematics, Psychology.

E. Science Education
   a. Biological Science (72 hours minimum)
      a. Biology 1210-20-30 or 1110-20-30, totaling 40-45
      hours.
      b. Biology 2330 or 2330A (12 hours).
      c. Biology 2350 (12 hours).
      d. Biology 2360 or 2360A (12 hours).
      e. Biology 2370 (12 hours).
      f. Biology 2380 or 2380A (12 hours).

Endorsements: Biology (Life Sciences) and General Science.

F. Health and Physical Education (9 hours)
   a. 3000-4000 level courses in physical education.
   b. 3-4 hours in speech.

Endorsements: Health and Physical Education.

G. Educational Psychology (4 hours)
   a. Psychology 3010 (4 hours).
   b. Psychology 3120 (4 hours).

Endorsements: Biological science (excluding Math 2012, 2110, 2120, 2130).

H. Mathematics (4 hours)
   a. Mathematics C&I 4720, 4720A, 4720B, 4720C.
   b. Mathematics 4730 (4 hours).
   c. Mathematics 4740 (4 hours).

Endorsements: Mathematics, Psychology.

I. Natural Science (72 hours minimum)
   b. Biology 2330 or 2330A (12 hours).
   c. Biology 2350 (12 hours).
   d. Biology 2360 or 2360A (12 hours).
   e. Biology 2370 (12 hours).
   f. Biology 2380 or 2380A (12 hours).


J. Humanities (15-16 hours)
   a. Literature courses-(32 hours minimum), ap-
      propriate literature coursework for upper levels in
      literature.
   b. Humanities (15-16 hours)
      a. Literature courses-(32 hours minimum), ap-
         propriate literature coursework for upper levels in
         literature.
   c. Electives-12 additional hours in physical science.

Endorsements: Mathematics, Physical Sciences, Biological Sciences, General Science.

K. Art Education
   a. Art education courses-(24 hours minimum), ap-
      propriate art coursework for upper levels in
      art.
   b. Electives-12 additional hours in physical science.

Endorsements: Mathematics, Physical Sciences, Biological Sciences, General Science.

L. Foreign Language Education
   a. 45 quarter hours in English, including three in
      only 4 hours.
   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. 3 foreign language electives selected from one or
      more areas.

Endorsements: Mathematics, Physical Sciences, Biological Sciences, General Science.

M. Health and Physical Education (9 hours)
   a. 3000-4000 level courses in physical education.
   b. 3-4 hours in speech.

Endorsements: Biological science (excluding Math 2012, 2110, 2120, 2130).

N. Mathematics (4 hours)
   a. Mathematics C&I 4720, 4720A, 4720B, 4720C.
   b. Mathematics 4730 (4 hours).
   c. Mathematics 4740 (4 hours).

Endorsements: Mathematics, Psychology.

O. Natural Science (72 hours minimum)
   b. Biology 2330 or 2330A (12 hours).
   c. Biology 2350 (12 hours).
   d. Biology 2360 or 2360A (12 hours).
   e. Biology 2370 (12 hours).
   f. Biology 2380 or 2380A (12 hours).


P. Humanities (15-16 hours)
   a. Literature courses-(32 hours minimum), ap-
      propriate literature coursework for upper levels in
      literature.
   b. Humanities (15-16 hours)
      a. Literature courses-(32 hours minimum), ap-
         propriate literature coursework for upper levels in
         literature.
   c. Electives-12 additional hours in physical science.

Endorsements: Mathematics, Physical Sciences, Biological Sciences, General Science.

Q. Art Education
   a. Art education courses-(24 hours minimum), ap-
      propriate art coursework for upper levels in
      art.
   b. Electives-12 additional hours in physical science.

Endorsements: Mathematics, Physical Sciences, Biological Sciences, General Science.

R. Foreign Language Education
   a. 45 quarter hours in English, including three in
      only 4 hours.
   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. 3 foreign language electives selected from one or
      more areas.

Endorsements: Mathematics, Physical Sciences, Biological Sciences, General Science.

S. Health and Physical Education (9 hours)
   a. 3000-4000 level courses in physical education.
   b. 3-4 hours in speech.

Endorsements: Biological science (excluding Math 2012, 2110, 2120, 2130).

T. Mathematics (4 hours)
   a. Mathematics C&I 4720, 4720A, 4720B, 4720C.
   b. Mathematics 4730 (4 hours).
   c. Mathematics 4740 (4 hours).

Endorsements: Mathematics, Psychology.

U. Natural Science (72 hours minimum)
   b. Biology 2330 or 2330A (12 hours).
   c. Biology 2350 (12 hours).
   d. Biology 2360 or 2360A (12 hours).
   e. Biology 2370 (12 hours).
   f. Biology 2380 or 2380A (12 hours).


V. Humanities (15-16 hours)
   a. Literature courses-(32 hours minimum), ap-
      propriate literature coursework for upper levels in
      literature.
   b. Humanities (15-16 hours)
      a. Literature courses-(32 hours minimum), ap-
         propriate literature coursework for upper levels in
         literature.
   c. Electives-12 additional hours in physical science.

Endorsements: Mathematics, Physical Sciences, Biological Sciences, General Science.

W. Art Education
   a. Art education courses-(24 hours minimum), ap-
      propriate art coursework for upper levels in
      art.
   b. Electives-12 additional hours in physical science.

Endorsements: Mathematics, Physical Sciences, Biological Sciences, General Science.
B. Transfer students must take proficiency exam in music voice and dictation prior to registration in Vocal Major.

V. Health, Physical Education, Recreation, and Safety

A. Concentration in Elementary Physical Education (8 hours)

GENERAL EDUCATION (8 hours)

English (3 hours) 1010 or 1011; 1020; 1031 or 1033; English 1032; 1034

Psychology (3 hours) 2500; at least 12 additional hours selected from history, anthropology, art, foreign language, music, economics, geography, political science, sociology, psychology, physical education, education, and 4 hours selected from philosophy, foreign language, upper-division history, or religious studies.

Elementary Education (1 hour)

Art 1815-25; English literature 2000 and above; Theatrical Arts 1130-30-40, 2231; Music 1000, 1210, 2111, 2231; Drama 1100, 2111, 2231

Mathematics elective (3) 2310-20-30.

Elementary Education 3320, 3250, 3910, 3000, 4160. Two courses in the area of coaching to be chosen from Education 3320, 4010, 4060, 4310, 4320, 4550.

Electives (20 hours) 20 hours to be used for endorsement, minor, or free electives.

TOTAL MINIMUM REQUIRED 196 hours

V. Health, Physical Education, Recreation, and Safety

A. Concentration in Elementary Physical Education (8 hours)

GENERAL EDUCATION (8 hours)

English (3 hours) 1010 or 1011; 1020; 1031 or 1033; English 1032; 1034

Psychology (3 hours) 2500; at least 12 additional hours selected from history, anthropology, art, foreign language, music, economics, geography, political science, sociology, psychology, physical education, education, and 4 hours selected from philosophy, foreign language, upper-division history, or religious studies.

Elementary Education (1 hour)

Art 1815-25; English literature 2000 and above; Theatrical Arts 1130-30-40, 2231; Music 1000, 1210, 2111, 2231

Mathematics elective (3) 2310-20-30.

Elementary Education 3320, 3250, 3910, 3000, 4160. Two courses in the area of coaching to be chosen from Education 3320, 4010, 4060, 4310, 4320, 4550.

Electives (20 hours) 20 hours to be used for endorsement, minor, or free electives.

TOTAL MINIMUM REQUIRED 196 hours

B. Minor in Elementary Physical Education

A. Concentration in Elementary Physical Education (8 hours)

GENERAL EDUCATION (8 hours)

English (3 hours) 1010 or 1011; 1020; 1031 or 1033; English 1032; 1034

Psychology (3 hours) 2500; at least 12 additional hours selected from history, anthropology, art, foreign language, music, economics, geography, political science, sociology, psychology, physical education, education, and 4 hours selected from philosophy, foreign language, upper-division history, or religious studies.

Elementary Education (1 hour)

Art 1815-25; English literature 2000 and above; Theatrical Arts 1130-30-40, 2231; Music 1000, 1210, 2111, 2231

Mathematics elective (3) 2310-20-30.

Elementary Education 3320, 3250, 3910, 3000, 4160. Two courses in the area of coaching to be chosen from Education 3320, 4010, 4060, 4310, 4320, 4550.

Electives (20 hours) 20 hours to be used for endorsement, minor, or free electives.

TOTAL MINIMUM REQUIRED 196 hours

Notes:
1. Requires admission to Teacher Education Program.

D. Minor in Secondary Physical Education

(Open only to students with a concentration in elementary physical education.)

P.E. 4150, 4160, 4300; 5100 or 5102; 4310, 4410 or 4420; 5100, 3020; 3022; P.E. electives (2 hours)

E. Minor in Coaching (28-31 hours)

Option I. Physical Education 2070, 3040, 3070, 3080, 2110, 2140-30-60 or 40-61-62; 4 hours selected from Sociology 1520, 3130, 3410, 3420, 3430 or Education 2560. Two courses in the area of coaching to be chosen from Education 3110, 3120, 3130, 3140, 4460.

F. Major in Dance

GENERAL EDUCATION .... 98 hours

Behavioral Sciences (16 hours minimum)

Psychology (8 hours) Psychology 3030 plus 4 hours of electives.

Secondary Social Sciences (9 hours) Sociology 1100; 1010 or 1020 plus 4 hours of electives. Health and Safety (3 hours) Health 3205, 3206.

G. Minor in Dance (27-28 hours)

OPTION I. Physical Education 2070, 3040, 3070, 3080, 2110, 2140-30-60 or 40-61-62; 4 hours selected from Sociology 1520, 3130, 3410, 3420, 3430 or Education 2560. Two courses in the area of coaching to be chosen from Education 3110, 3120, 3130, 3140, 4460.

H. Concentration in Recreation

GENERAL EDUCATION (8 hours)

Natural Sciences (18 hours minimum)

Mathematics (3-4 hours) mathematics selected from: chemistry, physics, geology, biology, or botany.

Natural Sciences (3-4 hours) selected from biology or botany, zoology, the area of athletic or physical education. At least 6 additional hours selected from any or a combination of the above:

Mathematics (3-4 hours) selected from Mathematics 1540-90-95, 1630, 2120, Statistics 2100.

Social Sciences (12 hours minimum) selected from Sociology 1000, 1010, at least 8 additional hours selected from Sociology 1630, 3130, 3410, 3420, 3430, 3440 or Rural Sociology 3460 or Human Services 2990, 4900, 3900 or Political Science 3000. At least 6 additional hours selected from Sociology 1100, 1300, Econometrics 2130-20-30, 3020, 3240.

Health and Safety (10 hours minimum) Psychology 5010; at least 12 additional hours selected from Sociology 2540, 3520, 3530, 3560, 3575-80, or Education 2430, 2440-50-60, 4100, 4800, or CFS 2110, 2190-30-40, 4520, 4530, 4540.
Communications (16 hours minimum) English 1010 or 1011; 1020; 1032; Speech 2311 and at least 12 additional hours selected from Speech 2351, 2352. Art 2016, Communications 1110, Journalism 2110, 2161, Edu. C 4370.

Health and Safety (3 hours minimum) Health 2110. Public Health 3610 or Safety 2420.

Humanities (16 hours minimum) At least 4 hours selected from English 2000 level and above, at least 3 hours selected from history, at least 2 hours selected from English 1900 level and above, History 1050-20, 1950-60, 2510-20, 2350. Anthropology 2100, Geography 2660, Classics 2100-25, 2150-20, 3010-30, 3030-40, 3060, Philo- sophy 1510-20, 2410, 3100, 3310, 3630, History 1050-20, 1950-60, 2510-20, 2350.

Arts (12 hours minimum) At least 3 courses from the following: Music 1210-20, 3100-20, 3200, 3410, 4260, 4270, Theater 3350-54, 4260-63, Art 2105, 2724, 3730-36, 3756-96, 1816-29, P.E. 3070, 3090, 3151.


Field Study (21-24 hours) Recreation 1500, 3000, 4000, 4190, 4650.

Skills Areas (18-24 hours) Each student selects two of the following skill areas and completes at least 3 courses (9-12 hours) in each:
- Language Areas: Speech 1211 or 2021 or 2311 or any speech elective.
- Physical Education and Sports: Physical education 2-fund teams, 3 in fund teams, 1 optional. (18-24 hours minimum) FREE ELECTIVES: to be added to above requirements to total/minimum of 102-126 hours for the degree.

M. Major in Public Health Education (16 hours)

Health and Physical Education (18 hours)

English 1010 or 1011; 1020; 1032; Speech 2311.

Health and Physical Education (11 hours) School Health 3930, School Health 3120.

Sports electives (4 hours). Physical education electives (4). Required Courses (9 hours): Art or music elective (4); Biology 1230; Public Health 3210; Speech (3 hours). Public health required courses (6): 3310, 3320, 4410. Electives (3): Speech 1211 or 2021 or 2311 or any speech elective. Public health electives (4).

Admissions to Teacher Education Program. (Some students may be required to take English 1018 based on placement scores.)

J. Major in Social Health Education

General Education (87 hours)

English 1010 or 1011; 1020; and 1032. Speech 2311.

Health and Physical Education (11 hours) School Health 3930, School Health 3120.

Psychology or Educational Psychology (9 hours): Psychology 1470; 1470. Electives (9 hours). Speech 1211 or 2021 or 2311 or any speech elective. Public health electives (4).

Required Admission to Teacher Education Program. (Some students may be required to take English 1018 based on placement scores.)

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

Health and Physical Education (23 hours)

School health electives (9): 3410, 3420, 3430, 4410, 4420, Public Health required courses (6): 3120, 3510, 3520, 3620, 4200, 4210.


L. Minor in School Health Education (30 hours)

School Health 3030, 3130, 3410, 3420, 3430; Safety 2410, Public Health 3120, 3130, 4110 Nutrition 1230 or Public Health 4420 or School Health 3650.

VI. Special Education

A. Concentration in General Special Education (42 hours)

Math 1110, 1111, 1112; 3410, 3420, 3430; 4410, 4420, 4430, 4470, Theater 3350-54, 4260-63, Art 2105, 2724, 3730-36, 3756-96, 1816-29, P.E. 3070, 3090, 3151.

Cultural Arts (12 hours minimum) At least 3 courses from the following arts: Music 1210-20, 3100-20, 3200, 3410, 4260, 4270, Theater 3350-54, 4260-63, Art 2105, 2724, 3730-36, 3756-96, 1816-29, P.E. 3070, 3090, 3151.


Field Study (21-24 hours) Recreation 1500, 3000, 4000, 4190, 4650.

Skills Areas (18-24 hours) Each student selects two of the following skill areas and completes at least 3 courses (9-12 hours) in each:
- Language Areas: Speech 1211 or 2021 or 2311 or any speech elective.
- Physical Education and Sports: Physical education 2-fund teams, 3 in fund teams, 1 optional. (18-24 hours minimum) FREE ELECTIVES: to be added to above requirements to total/minimum of 102-126 hours for the degree.

M. Major in Public Health Education (16 hours)

Health and Physical Education (18 hours)

English 1010 or 1011; 1020; and 1032. Speech 2311.

Health and Physical Education (11 hours) School Health 3930, School Health 3120.

Psychology or Educational Psychology (9 hours): Psychology 1470; 1470. Electives (9 hours). Speech 1211 or 2021 or 2311 or any speech elective. Public health electives (4).

Required Admission to Teacher Education Program. (Some students may be required to take English 1018 based on placement scores.)

J. Major in Social Health Education

General Education (87 hours)

English 1010 or 1011; 1020; and 1032. Speech 2311.

Health and Physical Education (11 hours) School Health 3930, School Health 3120.

Psychology or Educational Psychology (9 hours): Psychology 1470; 1470. Electives (9 hours). Speech 1211 or 2021 or 2311 or any speech elective. Public health electives (4).

Required Admission to Teacher Education Program. (Some students may be required to take English 1018 based on placement scores.)

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

Health and Physical Education (23 hours)

School health electives (9): 3410, 3420, 3430, 4410, 4420, Public Health required courses (6): 3120, 3510, 3520, 3620, 4200, 4210.

C. Concentration in the Hearing Impaired

ADMISSION TO THE PROGRAM FOR TEACHERS OF THE HEARING IMPAIRED

In addition the college requirements for Admis-
sion to Teacher Education, Special education stu-
dents in the program for teaching the hearing im-
paired will follow these procedures:

1. The Program Planning Committee will award
   hours of course work in the major (AREA OF
   CONCENTRATION);

2. The Program Screening Committee will award
   hours of course work in Special Education listed above;

3. The candidate's portfolio for teaching in
   Special Education as indicated by practicum ex-
   periences;

4. Writing sample;

5. Cumulative grade point average in General Ed-
cuation.

1. Specialization in Early Childhood Development

GENERAL EDUCATION

English 1010 or 1011, 1020, 1110, 1120 or 1132.
(Mathematics 1110 or 1120 required, English 1120 rec-
ommended). Social Studies: History (8) or Social
Studies (9), Social Studies 1110-20, History 1110-
20, History 2510-20 or 2520-20.

AREA OF CONCENTRATION

Mathematics (3 hours)

Psychology 2500.

Humanities (11-12 hours)

English literature; Anthropology, Art, sociology.

Natural Sciences (30 hours)

8-12 hours in physical science; Physics 1410-20, 2110;
8-12 hours in biological science (choose one course:
Biology 1210-20-30, Botany 1110-20, 1130-20, 1132-
20, 1150-20, Biochemistry 2020).

Physical education electives (both areas must be
represented).

Area of Concentration

要求 admission to Teacher Education Program.

2. Specialization in Elementary Education

GENERAL EDUCATION

Communications (9 hours)

English 1010 or 1011, 1020, 1110, 1120 or 1132.
(Mathematics 1110 or 1120 required, English 1120 rec-
ommended). Social Studies: History (8) or Social
Studies (9), Social Studies 1110-20, History 1110-
20, History 2510-20 or 2520-20.

AREA OF SPECIALIZATION

Mathematics elective (4 hours).

English literature; Anthropology, Art, sociology.

Natural Sciences (30 hours)

8-12 hours in physical science; Physics 1410-20, 2110;
8-12 hours in biological science (choose one course:
Biology 1210-20-30, Botany 1110-20, 1130-20, 1132-
20, 1150-20, Biochemistry 2020).

Physical education electives (both areas must be
represented).

Area of Concentration

要求 admission to Teacher Education Program.

3. Specialization in Secondary Education

GENERAL EDUCATION

Communications (9 hours)

English 1010 or 1011, 1020, 1110, 1120 or 1132.
(Mathematics 1110 or 1120 required, English 1120 rec-
ommended). Social Studies: History (8) or Social
Studies (9), Social Studies 1110-20, History 1110-
20, History 2510-20 or 2520-20.

AREA OF SPECIALIZATION

Mathematics elective (4 hours).

English literature; Anthropology, Art, sociology.

Natural Sciences (30 hours)

8-12 hours in physical science; Physics 1410-20, 2110;
8-12 hours in biological science (choose one course:
Biology 1210-20-30, Botany 1110-20, 1130-20, 1132-
20, 1150-20, Biochemistry 2020).

Physical education electives (both areas must be
represented).

Area of Concentration

要求 admission to Teacher Education Program.

4. Specialization in Multiple Handicapped

GENERAL EDUCATION

Communications (9 hours)

English 1010 or 1011, 1020, 1110, 1120 or 1132.
(Mathematics 1110 or 1120 required, English 1120 rec-
ommended). Social Studies: History (8) or Social
Studies (9), Social Studies 1110-20, History 1110-
20, History 2510-20 or 2520-20.

AREA OF SPECIALIZATION

Mathematics elective (4 hours).

English literature; Anthropology, Art, sociology.

Natural Sciences (30 hours)

8-12 hours in physical science; Physics 1410-20, 2110;
8-12 hours in biological science (choose one course:
Biology 1210-20-30, Botany 1110-20, 1130-20, 1132-
20, 1150-20, Biochemistry 2020).

Physical education electives (both areas must be
represented).

Area of Concentration

要求 admission to Teacher Education Program.
Natural Sciences (16 hours) 4 hours biological sequence, 8 hours physical sequence.

Psychology (4 hours) 2010, 2040, 2810.

Social Studies (25 hours) History electives (9 hours) plus six hours representative in anthropology, economics, geography, political science, sociology.

General Electives (9 hours)

CORE PROFESSIONAL EDUCATION 9 hours Education C 1301P, 3020, Special Ed. 4050.

TEACHING AREAS AND ELECTIVES 69 hours Special Education 3333, three-hour elective (4110 for General Education and Professional Education), Psychology 2500, 2520.

c. Six quarter hours selected from the following:

Certification: 'See Speech and Hearing Center staff for assignments each requires admission to Teacher Education Program.

4342 3200, 4610, 4650, 4800, 4640 recommended.

Audiology and Speech Pathology 3010, 3050, 3065, 4800, 4640 recommended.

Option 1. Concentration in Trades and Industries

G. Vocational-Technical Education

V. Vocational-Technical Education

A. Business Education See curricula for Secondary Education (1-12) p. 104 for General Education and Professional Education.

65-quarter hours in business and economics to meet five business education areas approved by the department. A statement of requirements and alternative programs may be obtained from the chairman of the business education.

B. Distributive Education GENERAL EDUCATION 65 hours English 1010 or 1011; 1020; 1031 or 1032 or 1033; 2110.

Health and Physical Education (9 hours) Health 3101; Health and P.E. electives.

Mathematics (9 hours) Mathematics 1400 and 1450.

Humanities (16 hours) Literature electives (6 plus 12 hours humanities electives).

Psychology (7-8 hours) Psychology 2110.

Social Studies (20 hours) History 1810-20 or 2510; Economics 2110-20; plus elective.

PROFESSIONAL EDUCATION 42 hours Ed.C.I. 3010-20; Ed.C.I. 3020 or Bus. Ed.GI. 4010, Ed. Psych. 3610, Dist. Ed. 4190-20; 4100, 4100-20; Ed. C.I 4170.

46 hours Business Adm. 1110; Office Adm. 4310 or 4320; Accounting 4110; Marketing 4110-20; 4150, 4150-20; Finance 3120; Industrial Management 3120; Taelectric 6110; Distributive Ed. 4140; Advertising 3600.

ELECTIVES 12 hours TOTAL MINIMUM REQUIRED 183 hours

VI. Vocational-Technical Education

A. Business Education See curricula for Secondary Education (1-12) p. 104 for General Education and Professional Education.

65-quarter hours in business and economics to meet five business education areas approved by the department. A statement of requirements and alternative programs may be obtained from the chairman of the business education.

B. Distributive Education GENERAL EDUCATION 65 hours English 1010 or 1011; 1020; 1031 or 1032 or 1033; 2110.

Health and Physical Education (9 hours) Health 3101; Health and P.E. electives.

Mathematics (9 hours) Mathematics 1400 and 1450.

Humanities (16 hours) Literature electives (6 plus 12 hours humanities electives).

Psychology (7-8 hours) Psychology 2110.

Social Studies (20 hours) History 1810-20 or 2510; Economics 2110-20; plus elective.

PROFESSIONAL EDUCATION 42 hours Ed.C.I. 3010-20; Ed.C.I. 3020 or Bus. Ed.GI. 4010, Ed. Psych. 3610, Dist. Ed. 4190-20; 4100, 4100-20; Ed. C.I 4170.

46 hours Business Adm. 1110; Office Adm. 4310 or 4320; Accounting 4110; Marketing 4110-20; 4150, 4150-20; Finance 3120; Industrial Management 3120; Taelectric 6110; Distributive Ed. 4140; Advertising 3600.

ELECTIVES 12 hours TOTAL MINIMUM REQUIRED 183 hours

VI. Vocational-Technical Education

A. Business Education See curricula for Secondary Education (1-12) p. 104 for General Education and Professional Education.

65-quarter hours in business and economics to meet five business education areas approved by the department. A statement of requirements and alternative programs may be obtained from the chairman of the business education.

B. Distributive Education GENERAL EDUCATION 65 hours English 1010 or 1011; 1020; 1031 or 1032 or 1033; 2110.

Health and Physical Education (9 hours) Health 3101; Health and P.E. electives.

Mathematics (9 hours) Mathematics 1400 and 1450.

Humanities (16 hours) Literature electives (6 plus 12 hours humanities electives).

Psychology (7-8 hours) Psychology 2110.

Social Studies (20 hours) History 1810-20 or 2510; Economics 2110-20; plus elective.

PROFESSIONAL EDUCATION 42 hours Ed.C.I. 3010-20; Ed.C.I. 3020 or Bus. Ed.GI. 4010, Ed. Psych. 3610, Dist. Ed. 4190-20; 4100, 4100-20; Ed. C.I 4170.

46 hours Business Adm. 1110; Office Adm. 4310 or 4320; Accounting 4110; Marketing 4110-20; 4150, 4150-20; Finance 3120; Industrial Management 3120; Taelectric 6110; Distributive Ed. 4140; Advertising 3600.

ELECTIVES 12 hours TOTAL MINIMUM REQUIRED 183 hours

VI. Vocational-Technical Education

A. Business Education See curricula for Secondary Education (1-12) p. 104 for General Education and Professional Education.

65-quarter hours in business and economics to meet five business education areas approved by the department. A statement of requirements and alternative programs may be obtained from the chairman of the business education.

B. Distributive Education GENERAL EDUCATION 65 hours English 1010 or 1011; 1020; 1031 or 1032 or 1033; 2110.

Health and Physical Education (9 hours) Health 3101; Health and P.E. electives.

Mathematics (9 hours) Mathematics 1400 and 1450.

Humanities (16 hours) Literature electives (6 plus 12 hours humanities electives).

Psychology (7-8 hours) Psychology 2110.

Social Studies (20 hours) History 1810-20 or 2510; Economics 2110-20; plus elective.

PROFESSIONAL EDUCATION 42 hours Ed.C.I. 3010-20; Ed.C.I. 3020 or Bus. Ed.GI. 4010, Ed. Psych. 3610, Dist. Ed. 4190-20; 4100, 4100-20; Ed. C.I 4170.

46 hours Business Adm. 1110; Office Adm. 4310 or 4320; Accounting 4110; Marketing 4110-20; 4150, 4150-20; Finance 3120; Industrial Management 3120; Taelectric 6110; Distributive Ed. 4140; Advertising 3600.

ELECTIVES 12 hours TOTAL MINIMUM REQUIRED 183 hours

VI. Vocational-Technical Education

A. Business Education See curricula for Secondary Education (1-12) p. 104 for General Education and Professional Education.

65-quarter hours in business and economics to meet five business education areas approved by the department. A statement of requirements and alternative programs may be obtained from the chairman of the business education.

B. Distributive Education GENERAL EDUCATION 65 hours English 1010 or 1011; 1020; 1031 or 1032 or 1033; 2110.

Health and Physical Education (9 hours) Health 3101; Health and P.E. electives.

Mathematics (9 hours) Mathematics 1400 and 1450.

Humanities (16 hours) Literature electives (6 plus 12 hours humanities electives).

Psychology (7-8 hours) Psychology 2110.

Social Studies (20 hours) History 1810-20 or 2510; Economics 2110-20; plus elective.

PROFESSIONAL EDUCATION 42 hours Ed.C.I. 3010-20; Ed.C.I. 3020 or Bus. Ed.GI. 4010, Ed. Psych. 3610, Dist. Ed. 4190-20; 4100, 4100-20; Ed. C.I 4170.

46 hours Business Adm. 1110; Office Adm. 4310 or 4320; Accounting 4110; Marketing 4110-20; 4150, 4150-20; Finance 3120; Industrial Management 3120; Taelectric 6110; Distributive Ed. 4140; Advertising 3600.

ELECTIVES 12 hours TOTAL MINIMUM REQUIRED 183 hours
Singing, rhythmic, instrument, listening, creative.

3110 Teaching Music in the Primary Grades (3)
Standing and effective teaching of the instruments.

3120 Teaching Music in the Intermediate and Upper Grades (3) Singing, rhythmic, instrumental, listening, creative; and music reading activities; evaluations; materials appropriate for grades 4-6; Primarily for elementary education majors. Prerequisites: Music Prac 2110 or 2110; Educ. Psych. 2430 or upper-division standing.

3130 Teaching Music in the Elementary School (3) Singing, rhythmic, instrumental, listening, creative; and music reading activities; evaluations; materials appropriate for grades K-3. For elementary education majors only. Prerequisites: 2100 or 2110; Educ. Psych. 2430, upper-division standing.

3140 Seminar in Teaching Music (1, 1) Field experiences in which students perform tasks related to teaching and to teacher roles. S/N/C only. May be repeated for credit.

4330-4370 Problems in Music Education (3, 3, 3, 3) Problems and techniques, materials, and equipment; evaluation and research activities; evaluations; materials appropriate for grades K-6. For music education majors only. Prerequisites: 2110; Educ. Psych. 2430 or 3610; 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. Prerequisites: Two years of music theory; coreg: 3511.

3160 Aural and Orff Musical Instruments (3) Aural and Orff musical instruments, techniques, scales and modes. For elementary education majors only. Prerequisites: Approval of instructor, one year of music theory. 2 hrs and 1 lab.

2411-13 Methods, Materials, and Techniques of Band 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 and 1 lab.

2421-23 Methods, Materials, and Techniques of Choral 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 and 1 lab.

3510-3511 Advanced Band Literature and Conducting (3) Functions, orches- trator; coreq: 3511.

3560 Marching Band Techniques (3) Functions, orches- trator; coreq: 3511.

4420-4421 Advanced Band Literature and Conducting (3) Functions, orches- trator; coreq: 3511.

4430-4431 Advanced Band Literature and Conducting (3) Functions, orches- trator; coreq: 3511.

4450 Music in Special Education (3) Techniques and materials for exceptional children. Prerequisite: Approval of instructor.

4460 Music Instruction in Special Education (3) Techniques and materials for exceptional children. Prerequisite: Approval of instructor.

4510 Choral Methods and Materials (3) Organization and administration, teaching techniques, conducting, rehearsal, and performance techniques. 2 lecture hrs and 1 two-hour lab, labs meet with 1010-20.
College of Education

3562 Teaching Language Arts in the Elementary School (3) Methods and materials in teaching writing, reading, and language undergroup credit only. Must be taken prior to or concurrently with CM 3567, Prepr. Educ. Psych. 2450 or equivalent, admission to Teacher Education.

3572 Teaching Social Studies in the Elementary School (3) Methods and materials in teaching history, government, and social science undergroup credit only, admission to Teacher Education.

3580 Teaching Developmental Reading in the Elementary School (5) Beginning course in teaching reading; requires basic knowledge of child development and classroom management; possible field experience in public schools, required for certification in reading. Prepr. Educ. Psych. 2450 or equivalent, admission to Teacher Education.

3581 Teaching Developmental Reading in the Elementary School (3) Second course in sequence designed to teach the development and skills of reading in the elementary school. Prepr. Educ. Psych. 2460 or equivalent and admission to Teacher Education.

3590 History of Education in the United States (3)

3590 History of Education in the United States (3) Principles, methods, and materials. Undergraduate credit only. Prepr. Educ. Psych. 2430 or equivalent, admission to Teacher Education.

3610 Books and Related Materials for Children (3) (Same as Library and Information Science 3512)

3611-12 Field Experiences in Teaching: Elementary (I, II, III) Field experiences in which students perform tasks related to teaching and to teacher roles. Must be taken before student teaching. Prereq. or coreq. 3511—Ed Psych 2430 to be taken before or concurrently.

3612-13 Field Experiences in Teaching: Secondary (I, II, III) Field experiences in which students perform tasks related to teaching and to teacher roles. Must be taken before student teaching. Must be taken in sequence. Prereq. 3522 and 3532 and Admission to Teacher Education.

3613-33 Field Experiences in Social Practice: Professional Practice (I, II, III) For description, see 3611-33. This course and Educ. C & I 3571, 3572, 3573 are required for Teacher Education.

3618 Teaching of Speech and Drama, Grades 7-12 (3) For description, see 3653.

3620 Teaching of Foreign Languages, Grades 7-12 (3) Methods and materials. Undergraduate credit only. Prereq. or coreq. 3630 or equivalent. Graduate credit only. Prereq. Educ. Psych. 3810 or equivalent.

3624 Teaching of Modern Foreign Languages: Oral Communication Skills, Grades 7-12 (3) Methods and materials. Prereq. or coreq. 3631 and 3632 are required for certification in foreign language. Must be taken concurrently with 3630.

3626 Teaching of Modern Foreign Languages: Reading, Literature, Grammar, and Composition, Grades 7-12 (3) For description and Educ. C & I 3650, 3653. Must be taken concurrently with 3630. This course and 3630 are required for certification in foreign languages. Must be taken concurrently with 3630.

3627 Teaching of Modern Foreign Languages: Classroom Arithmetic Difficulties (3) Classroom directed observation in public schools; preparation for teaching of modern foreign languages. Must be taken before admission to student teaching. Must be taken before or concurrently; Prereq. or coreq. 3611-Ed Psych 2450 to be taken before or concurrently.

3628 Teaching of Modern Foreign Languages: Development of Understanding and Communication, Grades 7-12 (3) Development of understanding and communication in modern foreign languages. Not open to students with recent course or background in teaching of modern foreign languages. Must be taken before or concurrently; Prereq. 3611-Ed Psych 2450 to be taken before or concurrently.

3630 Teaching Language Arts in the Elementary School (3) Methods and materials in teaching writing, reading, and language. Undergraduate credit only. Must be taken prior to or concurrently with CM 3567, Prepr. Educ. Psych. 2450 or equivalent, admission to Teacher Education.

3631-12 Field Experiences in Teaching: Elementary (I, II, III) Field experiences in which students perform tasks related to teaching and to teacher roles. Must be taken before student teaching. Prereq. or coreq. 3511—Ed Psych 2430 to be taken before or concurrently. Prepr. 3522—Ed C & I 3571, 3572, 3573 and Admission to Teacher Education.

3632 Books and Related Materials for Young People (3) (Same as Library and Information Science 3512)

3632-22-23 Field Experiences in Teaching: Secondary (I, II, III) Field experiences in which students perform tasks related to teaching and to teacher roles. Must be taken before student teaching. Must be taken in sequence. Prereq. 3522 and 3532 and Admission to Teacher Education.

3633-33 Field Experiences in Social Practice: Professional Practice (I, II, III) For description, see 3611-33. This course and Educ. C & I 3571, 3572, 3573 are required for certification in foreign languages. This course and Educ. Psych. 2450 to be taken before or concurrently.

3634 Teaching of Speech and Drama, Grades 7-12 (3) For description, see 3653.

3635 Teaching of Modern Foreign Languages: Oral Communication Skills, Grades 7-12 (3) Methods and materials. Prereq. or coreq. 3631 and 3632 are required for certification in foreign language. Must be taken concurrently with 3630.

3636 Teaching of Modern Foreign Languages: Reading, Literature, Grammar, and Composition, Grades 7-12 (3) For description and Educ. C & I 3650, 3653. Must be taken concurrently with 3630. This course and 3630 are required for certification in foreign languages. Must be taken concurrently with 3630.

3637 Teaching Language Arts, Composition, and Speech, Grades 7-12 (3) For description, see 3633. Both this course and Educ. C & I 3650 are required for certification in English.

3638 Teaching Reading, Literature, and Listening, Grades 7-12 (3) For description, see 3650. Both this course and Educ. C & I 3658 are required for certification in English.

3639 Teaching Language Arts in the Elementary School (3) Methods and materials in teaching writing, reading, and language. Undergraduate credit only. Must be taken prior to or concurrently with CM 3567, Prepr. Educ. Psych. 2450 or equivalent, admission to Teacher Education.
ment of functional relationships with other cur- 
riculum areas, diagnostic procedures, and remedial work. Not open to students with recent course work or background in the teaching of reading.

4320 Language Development of Children: Birth- 
Preschool (5) In-depth view of language de- 
velopment from birth through preschool; ap- 
lication of process of language development to 
instructional programs for early and middle child- 
hood.

4326 Developing Reading Skills in Content Fields 
(6) Study of approaches and techniques for the 
reading of texts in content areas in the school 
program. Emphasis on middle school and 
secondary school programs.

4340 The Junior High School and Middle School 
(3) Teaching and learning practices in 7-12 school programs.

4342-60-70 Problems in Teaching English (3, 3, 3) 
Application filed not later than final of junior year. Students who have obtained degrees and certification in 
areas other than this. Application must be filed with 
the student teaching office at least one quarter prior to 
registration for practicum. Prereq: 3260-70-80, 3350, 
3270; Edu. Psych. 3410, appropriate special methods 
courses, minimum grade point average of 2.0. Undergraduate credit only. S/N/C.

4410 Educational Sociology (3)(Same as Sociology 
4400 Problems in Improvement of Instruction (1-3) 
Practicum in Teaching Elementary School (3) 
Practicum experience in elementary school 
classroom teaching designed for students seeking 
early elementary certification who have obtained 
grades in areas other than this. Application must be 
filed with student teaching office at least one quarter prior to 
registration for practicum. Prereq: 3260-70-80, 3350, 
3270; equivalents and admission to Teacher Edu-
cation. Only S/NC.

4452 Elementary School Teaching: Minor/ 
3720 or equivalents and admission to Teacher Edu-
cation. Only S/NC.

4654-56-76 Problems in Instructional Materials (3, 
3,3) 
4654-56-76 Problems in Teaching Foreign Lan-
guages (3, 3, 3) 
4654-60-70 Problems in Teaching Social Studies (3, 
3, 3) 
4654-60-70 Problems in Teaching Language Arts (3, 
3, 3) 
4654-65-75 Problems in General Curriculum (3,3,3) 
4654-66-76 Problems in Instructional Materials (3, 
3, 3,3) 
4677-67-77 Problems in Teaching Foreign Lan-
guages (3, 3, 3) 
4677-67-79 Problems in Teaching Conservation (3, 
3, 3) 
4820 Student Teaching in the Elementary School 
(8) Application must be taken with 4810. Undergraduate credit 
only. S/N/C.

4830 Introduction to Data Processing in Education (3) 
Analysis of current activities in field of educa-
tional data processing. Emphasis on curricu-
matic and remedial work. Not open to students with recent course work 
in the same field. Only S/NC.

4850 Student Teaching in Early Elementary School 
(K-6) Application filed not later than second quar-
ter of junior year with placement one quarter prior to 
quart of graduation. Prereq: Edu. C & I 2290, 2370, 
3200, 3270, 3280, 3290, 4450; CFS 3120, 3270; S/N/C.

4860 Programmed Learning (3) Theories of learning 
and educational technology of programmed instruction; techniques and applications of program-
ing. 2 lecture, 2 lab. Prereq: Psychology 3210. Edu. 
Psych. 3370, or consent of Instructor. (Same as Psy-
chology 4860.)

GRADUATE 
Graduate instruction in the Department of 
Elementary and Infant Education provides 
opportunities to improve the effectiveness of 
teaching service in a number of areas.

5000 Thesis 
5002 Non-Thesis Graduation Completion (3-10) 
4910 Seminar in Elementary School Language Arts 
5070 Seminar in Interdisciplinary Education (3) 
5100 History of Education (3) 
5120 Principles of Education (3) 
5140 Comparative Philosophies of Education (3) 
5145 Pragmatics in Education (3) 
5142 The Existential Student (3) 
5143 Supervised Readings in Philosophy of Educa-
tion (3-6) 
5180-90-70 Seminar (1-3, 1-3, 1-3) 
5190-95 Educational Specialist Research and 
Thesis (3, 3, 3)

5210 Seminar in International Education: Asia and 
the Pacific Basin (3) 
5220 Supervised Readings in International Education 
(3)

5230 Advanced Study and Practicum in Diagnoses 
and Remediation of Arithmetic Difficulties (3) 
5240 Creative Thinking and Expression inElemen-
tary School (5) 
5250 Secondary School Instruction (3) 
5270 The Elementary School Curriculum (3) 
5280 Teaching Language Arts in the Elementary 
School (3) 
5281 Teaching Social Studies in the Elementary 
School (3) 
5282 Teaching Science in the Elementary School (3) 
5283 Programs and Materials in Teaching Elementary 
Science (3) 
5294 Seminar in Teaching Elementary Science (3) 
5320 The Teaching of Mathematics in the Elementary 
School (3) 
5291 Program and Materials in Elementary Language Arts (3) 
5292 Seminar in Research and Theory in Teaching Mathematics in the Elementary School (3) 
5302 Psychology of Reading (3) 
5303 Methods and Materials for Teaching Critical Reading (2) 
5304 Program and Materials for Reading Instruction (3) 
5305 Trends and Issues in Teaching Reading (2) 
5306 Teaching Reading to the Linguistically Differ-
tient Learner (3) 
5307 Assessment and Correction of Classroom Language Arts Difficulties (3) 
5308 Curriculum Development and Evaluation (6) 
5309-70 Curriculum Development in the Local School (3, 3) 
5310 Practicum in Elementary Science Laboratories in 
Elementary Science (K-6) (3) 
5312 Seminar in Remedial Reading Problems (3) 
5313 Remediation of Remedial Reading Problems (3) 
5314 Developmental Reading Practicum (2) 
5336 Remedial Reading Practicum (3) 
5390 Organization and Administration of Reading Programs (3) 
5400 Problems in Improvement of Instruction (3-10) 
5410 The High School Curriculum (3) 
5500 Curriculum Laboratory for High Schools (5) 
5510 Educational Statistics (3) 
5620 Problems in Direction and Supervision of Student 
Teaching (3) 
5630 Practicum in the Individualization of Instruc-
tion (3-10) 
5640 New Trends in Elementary Education (6) 
5650-60 Curriculum Laboratory for Elementary 
Schools (3, 3) 
5670 Curriculum Laboratory for Early Childhood Edu-
cation (3) 
5680 Teacher-Parent-Community Relations (3) 
5690 Design of Instructional Media (3) 
5691 Advanced Production of Audiovisual 
5692 Evaluation of Instructional Media (3) 
5693 Administering Instructional Media Programs (2) 
5700 Utilization of Educational Television and Radio (3) 
5765 Research in Instructional Media (3)
GRADUATE

4531-53 Student Leadership Workshops (1, 1, 1) Series of small group and individualized exper-
ences. Designed for assistant professors, assistant students in leadership roles. Sections are designed
for resident assistants, student government leaders, student activities, and other student organizations.

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) Con-
structed with teacher-made classroom tests; instruc-
tional objectives, principles of test construction,
interpretation of test scores, relationship between
testing and grading.

4700 Awareness Training (1) Readings and group exploration of the principles of awareness and
the application of awareness behavior in a variety
of settings.

4760 Advanced Child Study (3) Prereq: 2430 or
consent of instructor.

4760 Psychology of the Disadvantaged Child (3) Significant behavior differences and causes: ap-
propriate intervention approaches.

4810 Psychodiagnostics Aspects of Appalachian
People (3) Explorations of psychology of people of Appalachian region through an examination of his-
tory, culture, and role of education.

4820 Psychology of the Inner-City School Child (3) Exploration of psychological, educational, and so-
cial factors affecting children in inner-city schools.

4990 Differential Psychology (3) Nature and sources of individual differences in behavioral
characteristics, and differences between racial, ethnic, socioeconomic, sex, and other groups.

5090 Diagnostic and Corrective Teaching (3) Teachers and supervisors study practical procedure for improving pupil's learning.

5090 Field Work in Psychology (1-4) Developmental Psychology (3)

5100 Advanced Psychology of Adolescence (3) Developmental Psychology (3)

5100 Educational Psychology of the Young Child (3)

5110 Seminar in Bias-Free Counseling (3) Specialized Seminar: Study of individual children, ages 5-12. Prereq:
Psychology 2500.

5120 Interpreting Published Articles: Research
Design (3) Specialized Seminar: Study of individual children, ages 5-12. Prereq:
Psychology 2500.

5130 Interpreting Published Articles: Statistics (3) Specialized Seminar: Study of individual children, ages 5-12. Prereq:
Psychology 2500.

5150 Interpreting Published Articles: Psychology (1, 1, 1) Specialized Seminar: Study of individual children, ages 5-12. Prereq:
Psychology 2500.

5150-50-60 Psychoeducational Assessment (3, 3,
3) Specialized Seminar: Study of individual children, ages 5-12. Prereq:
Psychology 2500.

5160 Legal Foundations of Public Education (3) Specialized Seminar: Study of individual children, ages 5-12. Prereq:
Psychology 2500.

5180-90-5200 Educational Specialist Research and
Thesis (3, 3, 3) Specialized Seminar: Study of individual children, ages 5-12. Prereq:
Psychology 2500.

5190-50-60 Psychoeducational and Psychological
Intervention (3) Specialized Seminar: Study of individual children, ages 5-12. Prereq:
Psychology 2500.

5239 Developmental Laboratory (1) Repeatable to
any child.

5240-58-5200 Educational Specialist Research and
Thesis (3, 3, 3) Specialized Seminar: Study of individual children, ages 5-12. Prereq:
Psychology 2500.

5250 Field Work in Psychology (1-4) Developmental Psychology (3)

5260 The College Student (3) Specialized Seminar: Study of individual children, ages 5-12. Prereq:
Psychology 2500.

5260 Intellectual Factors Affecting Children in Inner-City Schools (3) Specialized Seminar: Study of individual children, ages 5-12. Prereq:
Psychology 2500.

5270-75-76 Independent Studies in Educational
Administration and Supervision (3, 3, 3) Specialized Seminar: Study of individual children, ages 5-12. Prereq:
Psychology 2500.

5310 Advanced Reading in Psychology (3) Specialized Seminar: Study of individual children, ages 5-12. Prereq:
Psychology 2500.

5310-53 Non-Thesis Graduation Completion (3-15) Specialized Seminar: Study of individual children, ages 5-12. Prereq:
Psychology 2500.

5350 Field Experience (1) Prereq: 2430 or equivalent.

5350 Individual Skills for Campus Leaders (3) Specialized Seminar: Study of individual children, ages 5-12. Prereq:
Psychology 2500.

5356 Advanced Psychology of Adolescence (3) Specialized Seminar: Study of individual children, ages 5-12. Prereq:
Psychology 2500.

5360 Advanced Psychology of Adolescence (3) Specialized Seminar: Study of individual children, ages 5-12. Prereq:
Psychology 2500.

5360 Psychological Aspects of Adolescence (3) Specialized Seminar: Study of individual children, ages 5-12. Prereq:
Psychology 2500.

5360 Psychological Aspects of Adolescence (3) Specialized Seminar: Study of individual children, ages 5-12. Prereq:
Psychology 2500.

5360 Psychological Aspects of Adolescence (3) Specialized Seminar: Study of individual children, ages 5-12. Prereq:
Psychology 2500.

5360 Psychological Aspects of Adolescence (3) Specialized Seminar: Study of individual children, ages 5-12. Prereq:
Psychology 2500.
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 (1-4)
5840 Student Appraisal (3)
5854-57-70 Special Topics and Problems in Educational Psychology and Guidance (1-4, 1-4, 1-4)
5880 Career Development: Occupational and Educational Resources (3)
5885 Career Development: Field Experience (1-3)
5890 Counseling Theories and Techniques (3)
5897 Pre-Practicum (3)
5910-52-53 Problems in Life of Thess (3, 3, 3)
5940 Counseling Practicum (3)
5945 Group Counseling Practicum (3)
5950-60 Theory and Practice in Consultation (3, 3, 3)
5959-69-79 Practicum in School Psychology (1-1, 2, 2)
5960 Services (3, 3, 3)
5965-60-70 Systems Approaches in Psychological Ing (2, 2, 2)
5980 Organization and Administration of Counselor Programs (3)
6000 Doctoral Research and Dissertation
6040 Seminar in Educational Psychology and Guidance (1)
6099 Internship (1-6)
6110 Application of Research Design in Educational Psychology and Guidance (3)
6130 Application of Experimental Research Design in Educational Psychology and Guidance (3)
6319 Field Work in School Psychology: Level II (2)
6504-67-70 Seminar in College Student Personnel (3, 3)
6510-20 Seminar in Dissertation Proposal Writing (2, 2, 2)
6530-05-30 System Approaches in Psychological Services (3, 3, 3)
6539-60-70 Practicum in School Psychology III (3, 2, 2)
6730-40-70 Problems in Psychology and Guidance (3, 3, 3)
6810 Seminar in Counseling (3)
6810-80-90 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 (2)

School of Physical Health, Physical Education, and Recreation
Madge M. Phillips, Director

At the undergraduate level, professional preparation programs are offered in health and safety, physical education, dance, and recreation. For information on graduate programs leading to the Master of Science, the Master of Public Health, Educational programs leading to the Master of Science, Recreation and the Master of Public Health, Educational programs leading to the Master of Science, Recreation and the Doctor of Philosophy 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, safety, recreation, and dance.

Health and Safety Education


Public Health (839)
1118 Principles in Personal Health (3) To develop ability to approach health scientifically and to develop justified confidence in judging personal health.
2040 Seminar in Human Sexuality (2) Problems and responsibilities of being male and female. SINC
2050 Seminar in Drug Use and Abuse (2) Intensive look at problems related to use and abuse of drugs. SINC
2060 Foundations of Health Science (3) Inductive study of content areas relating to personal and community health problems, i.e., mood modifying products, consumer health, international health, personal health practices, reciprocal relationship involving man, disease, and environment. (Same as School Health 3000.)
2090 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 meet all 18 years of age for certification. (Same as School Health 3710.)
3190 Communicable and Noncommunicable Diseases (5) Modern concepts of disease, etiology of common communicable and chronic disease problems. Emphasis on prevention and control. Prereq: One year of biological science and one course in basic biology.
3230 Sanitation (3) History of sanitary awakening; development of administration and control of water, sewage, refuse, milk, meat and other foods, air, insects, and soil. Water supply, sewage systems, swimming pools, industrial plants, markets, restaurants, cemeteries, and public bathing places. Healthful 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.
3230 Introduction to Public Health (3) Philosophy, organization and function of health; federal, state, and local official and voluntary public health agencies. Includes epidemic field trips.
4120 Community Health Problems—Alcoholism (3) Examination of causes and problems resulting from alcoholism in the 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) Ex- ploration of causes of suicide and factors surrounding societal desire for suicide prevention. Emphasis placed on factors making alcoholism a serious public health problem. Various types of educational programs to control the disease covered.
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 and diseases of the urban and industrialized environment; epidemiologic, industrial health problems of concern to management, society, and industrial worker; emphasis on control of occupational diseases, poison, accidents, and other conditions incident 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 and public. Application of communications principles to modern health issues, 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, selection, purchasing, and financing of safety and medical services.
4110 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 have been at least 21 years of age at Prereq: 2012 or 3000. Instructor's Advanced First Aid and Emergency Care Cert.
4412 Cardiopulmonary Resuscitation (2) Theory and practice of attempting to maintain basic cardiac life support following cardiac arrest due to such conditions as heart attack, drowning, electrocution, suffocation, trauma, and other accidents. Educational and preventive aspects of controlling cardiovascular disease will be stressed. (Same as School Health 4412.)
4430 Drug Abuse Education (3) Drug abuse problem and suspected causes: pharmacology of drugs and their effects on the individual and society and methods of drug abuse education.
4910-70-20 Field Practice in Public Health (3, 3, 3) Field practice in public health under supervision of public health profession, ihc.
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.
4610-80-90 Problem in Public Health Education 1, 2, 3 Individual identification and study of current problems in public health education. Extensive reading of literature required.
GRADUATE
5020 Non-Thesis Graduation Completion (3-15)
5010-30-30 Workshop in Public Health (3-4, 3-6, 4-6)
5070-60-30 Field Practice and Seminar in Public Health (3, 3, 3-5)
5119 Environmental Health (3)
5120-30 Occupational Health and Safety (5, 5, 5)
5150 Industrial Toxicology (3)
5200 Health and Sickness (2)
5410 Epidemiology (2)
5420 Administration of Public Health (3)
5430 Vital and Medical Statistics (4)
5460 Methods and Materials in Public Health Education (4)
5450 Factors in Problem Solving for Community Health (3)
5460 The Public Health Education in Community Organization and Development (4)
5580 Functions and Roles of the Public Health Educator (3)
5650 Physical Activity and Health (2)
5740 Workshop in Public Health Education: Health Planning I (3-5)
5741 Workshop in Public Health Education: Health Planning II (3-5)
5742 Advanced Public Health Education: Health Planning III (3-5)
5730 Dental Health Education (3-5)
5735 Emergency Medical Services (3-4)
5744 Family Health Unit (3-5)
3450 School Health Instruction (3) Selection of health content in school curriculum.
3450 School Health Services (3) Development, maintenance, and protection of health of students including examination, screening, special services, communicable disease control, emergency care, and school health records.
3540 School in Community Health (3) Role of teacher in community health education; school's responsibility in promoting healthful living and the place of existing media and agencies in program. Not open to health and physical education majors.
3610 Methods in Elementary Health Instruction (3) Preparation and presentation of health topics. Teaching method is emphasized and student participation is stressed. Required for elementary teachers. Prerequisite: 3510 or Public Health 1110 or Nutrition 1230.
3620 The Teaching of Sex Education (3) Trends, content, methods, and materials.
3650 Methods in Secondary Health Instruction (3) Preparation and presentation of health topics. Teaching method is emphasized and student participation is stressed. Prerequisite: 3450.
4810-25-30 Problems in School Health Education (1,1,1) Syndromal identification and study of current problems in school health education. Extensive reading of literature required.
5000 Thesis (15)
5002 Non-Thesis Graduation Completion (3-15)
5010 Problems and Practices in School Health (3)
5202 Teaching of Sex Education and Human Sexuality (3)
5230 Instructional Curriculum in School Health Instruction (3)
5300 School Health Program Surveys (3)
5360 School Health Administration and Supervision (3)
5370-40-50 Graduate Workshop in Health Education (3-4-3)
5810-30-40 Problems in School Health Education (1,1,1)
6000 Doctoral Research and Dissertation (3-6,3-6,3-6)
6030 Critical Analysis of Writing and Research in Health Education (3)
6040 Seminar in Health Education (3,3)
6120 Health Aspects of Gerontology (3)
6200 Seminar on the Nation's Health (3)
6230 International Health (3)

Safety (990)
3520 Principles of General Safety (3) Deals with principles, practices and procedures in general safety. Covers safety practices in school traffic, recreation, industry, home, and other public areas.
4010-30-30 Problems in Safety (1-1,1,1) Individual identification and study of current problems in safety.
4410 Driver and Traffic Safety Education (3) Preparation of teacher of driver education in colleges and schools. Students are required to teach at least one module. Valid driver's license required. 3 hrs and 2 hrs.
4420 Cardiopulmonary Resuscitation (2) (Same as Public Health 3420). Prerequisite: Consent of instructor.
4430 Sports Safety (5) Accident prevention and instruction of teachers of driver education in schools and colleges. Students are required to teach at least one module. Valid driver's license required. 3 steps and 2 steps.
4450 Classroom Supervision (3) (Same as Public Health 3210). Prerequisite: Consent of instructor.

Physical Education (764)
3000 Foundations of Health Science (3) (Same as Public Health 3000).
3010 First Aid and Emergency Care (4) (Same as Public Health 3210).
3090 History of Dance and the Related Arts I (2) Dance history and the arts related to it from begin-
ing to the early 18th century. Prereq: 1002 or 1007.
3100 Social Dance (2) Instruction, practice, and teaching in basic social dance steps.
3110 Athletic Coaching of Football (2) Fundamen-
tals and coaching techniques: Prereq: Approval of in-
structor.
3120 Athletic 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 in-
structor.
3130 Athletic Coaching of Track and Field Events (2) Track space and timing 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 20th century. Prereq: 3100 and 3110.
3160 Officiating Basketball (2) Officiating appropri-
ately and understanding the rules of offi-

cing knowledge of rules and officiating duties.
3170 Weight Control and Physical Activity (3) Theoretical knowledge of principles and practices of weight control and related physical activity.
3180 Track and Field (2) Methods and practical ex-
perience in various events of track and field. Special emphasis on teaching techniques, demonstration, progression, and analysis.
3200 Athletic Coaching of Baseball (2) Individual and team fundamentals for high school and college coach: Prereq: Consent of instructor.
3210 History and Principles of Physical Education (2) Principles from basic aspects of anatomy, bio-
technology, Biology, chemistry, physics, physiology, and sociology applied to health, physical edu-
cation and sport.
3220 Physical Fitness Activities (2) Teaching of con-
temporary wellness activities and weights training with emphasis on physical fitness concepts including muscular development of the body.
3230 Team Sports (2) Instruction, practice, and stu-
dent teaching in selected team sports.
3240 Athletic Training Techniques (2) Theory and practice in the prevention and care of basic athletic injuries.
3260 Practicum for Physical Education Majors (5) Observation and initial teaching, coaching, and leadership experiences in physical education practice classes leading to a semester-long supervised training period. Prereq: Successful completion of an academic year of professional preparation. May be repeated. Maximum credit 18 hrs. TONE.
3300 Applied Anatomy and Kinesiology (2) Bones, joints, muscles, and related systems of the body in move-

mments: reaction of joints and muscular mechanism to bodily development and efficiency.
3330 Stunts and Tumbling (2) Instruction and prac-
tice: student teaching and injury prevention stressed with focus upon safety techniques.
3400 Applied Physical Education Laboratory I (1) Practical experience, including student teaching, supple-
menting 4110.
3410 Physical Education in the Elementary School (3) Movement experiences appropriate for elemen-
tary- and middle-school children planning and teaching a de-
velopmental program.
3420 Practicum in Physical Education Laboratory I (1) Practicum experience, including student teaching, supple-
menting 4110.
3560 Human Growth and Motor Development (3) Those factors affecting human move-

ment performance, especially that of children, and consider-
ation of factors employed to modify that performance. Prereq: 3160.
3565 Psycho-Social Bases of Human Movement Performance (3) Factors affecting human move-

ment performance, especially that of children, and consider-
ation of factors employed to modify that performance. Prereq: 3160.
3560 Human Growth and Motor Development (3) Structures and functional changes in man from birth to old age, and relationship of changes to physical performance and skill development.
3565 Psycho-Social Bases of Human Movement Performance (3) Fundamental factors in the modification of human movement, especially in children with an emphasis on motor development and their role as a product of interaction of biological, per-

ceptional, and psycho-social variables. Prereq:

3560-5460-55.
3610-20 Individual and Dual Sports (2,2) Instruc-
tion, student teaching, and practice: organization of adult and youth teams, skill development in schools, clubs, or community recreation cen-
ters.
3620 Teaching Strategies and Program Implementa-
tion in Elementary Physical Education (3) Under-
standing and employing teaching strategies appro-
priate to elementary physical education: planning of program content and implementation. Prereq: 3560.
3630 Basic Movement Sequences for Children (3) Movement patterns and skills which are appro-

tal to movement activity, with emphasis upon de-
examination and presenting sequential learning tasks and creative activity experiences. Prereq or coreq: 3560.
3630 Practicum in Developmental Movement for Early Childhood (3) Experiences in designing and presenting developmental movement tasks to pre-

school children. Prereq: or coreq: 3560.
3640 Structured Movement Activities in Ele-

m entary Physical Education (4) Self-testing, games and sports, and dance activities included in elementary physical education; emphasis on planning and presenting sequential learning experiences in presentation of basic physical education content. Prereq: 3560.
3720 Philosophy of Physical Education and Sport (3) Introduction to the central role of philosophy in physical education and sport. Special emphasis on examining the ontological status of physical education and sport.
3910 Principles and Problems of Coaching (3) Examination of practical problems and situations which prepare students to make judgments and decisions in coaching an environment. Prereq: Approval of instructor.
4000 Intermediate Advanced Ballet Technique (2) Emphasis on basic technique, male technique, and performance: May be repeated: Maximum credit 6 hrs. Prereq: 3630. Available to dance majors and minors with consent of instructor.
4005 Advanced Ballet Technique (2) Emphasis on technique and partnering. May be re-

peated: Maximum credit 6 hrs. Prereq: 4000. Available to dance majors and minors with consent of instructor.
4010 Advanced Modern Technique (2) Develop-

ment, integration, and synthesis of previous dance vocabulary, emphasis on advanced practice and principles. May be repeated: Maximum credit 6 hrs. Prereq: 3630. Available to dance majors and minors with consent of instructor.
4020 Practicum in Dance Production (2) Prereq:

Consent of instructor.
4700 Stagecraft for Dance Production (2) Equip-

ment, light design, properties, sets, and stage techni-
ques.
4110 Adapted Physical Education (2) Classification of physical students who require modified programs in physical education for public schools and colleges. Prereq required or special physical education classes.
4120 Administration of Physical Education (3) Surveyed topics in organization and administra-

tion of physical education in the elementary, middle, and high schools. Emphasis placed on human relations ap-
proach to problem solving in professional environment.
4140 Measurement and Evaluation in Physical Education (3) Emphasizes measurement and evaluation in physical education. Administration and collection and analysis of data and the use of physical fitness, sports skills, and knowledge.
4150 Creative Rhythms for Children (2) Techniques and materials for grades 1-6: hr 1-2

4160 Athletic Coaching Field Experience (2) Practi-

cal experience in coaching and related responsibilities.

Must be repeated. Maximum credit 4 hrs. Prereq: Consent of instructor.
4230 Program Planning in Physical Education (3) Curriculum building, course instruction, and lec-
ture planning for public schools and colleges.
4310 Folk and Square Dance (3) Materials and methods for public schools, colleges, and recre-

ation centers.
4320 Tap Dance (2) Instruction, practice, and stu-
dent teaching.
4330-40-50 Specialization Study in Physical Educa-
tion (1-3, 1-2, 1-5) Prereq: Consent of instructor.
4410 Wrestling (2) Theoretical and practical work for professional teaching, emphasis on safety pro-
cedures.
4430 Women's Gymnastics (2) Development of skills on balance beam, uneven parallel bars, and floor exercise. Special emphasis placed on safety, progress-
ions, and teaching techniques. Prereq: Consent of instructor.
4450 Men's Gymnastics (2) Development of skills on pommel horse, parallel bars, and long horse vault-

ing. Special emphasis placed on safety, progress-
ions, and teaching techniques. Prereq: Consent of instructor.
4460 The Coaching and Judging of Women's Gym-
nastics (2) Appreciation of techniques used in the coaching and judging of women's gymnastics as they relate to the United States Gymnastics Federation. National tests and ratings will be given. Both men and women are encouraged to take this course.
4470 Men's Gymnastics (2) Development of skills on still rings, horizontal bar, trampoline, and exhibi-
tion gymnastics: Special emphasis placed on safety, progressions, and teaching techniques. Prereq: Consent of instructor.
4480 The Coaching and Judging of Women's Gym-
nastics (2) Appreciation of techniques used in the coaching and judging of women's gymnastics as they relate to the United States Gymnastics Federation. National tests and ratings will be given. Both men and women are encouraged to take this course.
4500 Methods of Teaching Dance (2) Individual work with analysis and criticism: Prereq: Senior standing and approval of instructor.
4680 Motor Behavior: A Theoretical Perspective (4) Examines human behavior from an information processing perspective and applies current re-
search to support theoretical base. Prereq: Senior or graduate standing or consent of instructor.
4690 Motor Behavior Laboratory (3) Provides a broad 
glimpse in methodology and instrument-

ation for assessing factors related to an affecting motor learning/performance. Prereq: consent PE 4880 or PE 4140 or consent of instructor.
4690 PE 5002 and PE 5030 or consent of instructor.
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College of Education
provides all students a program of physical education that ensures services. Each hour's credit requires supervised practice in an approved agency offering leisure services. This may be repeated for a maximum of 9 hours with consent of the instructor.

3020 Outdoor Recreation Skills and Techniques II (3) Instruction in safe participation in outdoor recreation activities such as backpacking, rock climbing, and canoeing. Prerequisites: Recreation (1-9) Comprehensive study in a selected area of recreation. May be repeated for a maximum of 9 hours with consent of the instructor. Prerequisite: Consent of instructor.

1100 Orientation to Recreation Profession (3) Overview of types, functions, and interpersonal relationships of delivery systems for recreation and park services.

3100 Recreation Leadership Procedures (3) Principles and practice of leadership; theories of play; philosophy of leisure and recreation; counseling; 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 programs. May be repeated for a maximum of 9 hours with consent of the instructor. Prerequisite: Consent of instructor.

3710 Camp Counseling (3) History and philosophy of camping movement; counseling and leadership program development.

3880 Social Recreation (3) Principles and practice of social recreation suitable for all age groups and appropriate to a variety of settings. Content includes methods of conducting leisure-oriented recreation programs and interaction activities for special events and programs.

4000 Practicum in Recreation (1) Full-time practice in an approved recreation agency. Emphasis on supervisory and administrative responsibilities. Prerequisite: 1000, 2000, 3000, senior standing. S/NC.

4130 Recreation Administration (3) Introduction to recreation administration, including planning, personnel management, facilities and services, program services, finances, and public relations. Prerequisite: 3140, 3200, 3800 or consent of instructor.

4300 Survey of Recreation for Special Populations (3) Responsibility of recreation profession to minority groups whose leisure opportunities and needs may require special services. Prerequisite: 3140, 3200, 3800 or consent of instructor.

4310 Camp Administration (3) Program planning and organization, personnel management, camp operation, and training for supervisors and administrators of organized camping.

4500 Specialized Study in a Selected Area of Recreation (1) Advanced study in a selected area of the broad field of recreation. For recreation students only. May be taken for a maximum of 6 hours with consent of the division. Prerequisite: Consent of instructor.

GRADUATE

5000 Thesis (3)

5002 Non-Thesis Graduation Completion (3-15)

5130 Interpretation of Leisure (3)

5140 Leisure Service Delivery Systems (3)

5150 Current Issues in Recreation (3)

5340 Therapeutic Recreation (3) Provisions of Recreation Services for the Ill or Disabled (3)

5280 Leisure and Health (3)

5343 Administration of Recreation Funds (3)
The undergraduate programs in the Department of Special Education and Rehabilitation provide the general preparation and 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 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 advisor in the chosen area.

General Special Education: 3530, 3535, 4110, 4120, 4130, 4140, 4150, 4160, 4170, 4180, 4190, 4230, 4300, 4350, 4400, 4550. (Same as Audiology and Speech Pathology 3535, 4110, 4120, 4130, 4150, 4160, 4170, 4180, 4190, 4230, 4300, 4350, 4400, 4550. (Same as Audiology and Speech Pathology 4030) for students not majoring in speech and hearing.

Speech and Hearing: 3531, 3532, 3533, 3534, 3535, 4300, 4320, 4330, 4340, 4350, 4351, 4352, 4353, 4354, 4355, 4356, 4400, 4500, 4550, 4600, 4610, 4620, 4630, 4650.

Rehabilitation Counselor Education: 5100, 5110, 5120, 5130, 5140, 5150, 5160, 5170, 5180, 5190, 5200, 5210, 5220, 5230, 5240, 5250, 5260, 5270, 5280, 5290.

Child Development: 3510, 3520, 3530, 3540, 3550, 3560, 3570, 3580, 3590, 3600, 3610, 3620, 3630, 3640, 3650, 3660, 3670, 3680, 3690, 3700, 3710, 3720.

Training (3) Students observe, tutor, and perform teacher-related tasks in non-special education programs. (Same as Audiology and Speech Pathology 3535).
4308 Curriculum Construction in Business Education (3) Aims, principles, practices, and problems involved in the construction of a curriculum for various types of educational institutions in which business subjects are taught.

4140 20-30 Problems in Business Education (3, 3, 3) Current business education problems, viewpoints of leaders in field; special attention to problems of administration.

4161 Problems in Business Education (1%) GRADUATE

5000 Thesis

5002 Non-Thesis Graduation Completion (3-15)

5011 Problems in Thesis of (3, 3, 3)

5110 Graduate Seminar: Current Problems (3)

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

5119 Graduate Seminar: Tests and Measurements (3)

5130 Graduate Seminar: Guidance (3)

5400 Organization and Operation of Area Vocational Technical Schools (3)

5410 30-30 Practicum in Business Education (2, 3, 3)

5450 Evaluation of Research in Business Education (3)

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

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

5614 Methods and Materials for Vocational Office Education (3)

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

5624 Problems in Business Education: Clerical Mechanics (3)

5651-25-35 Problems in Business Education: General Business (3, 3, 3)

5659 Organization and Management of Vocational Office Education Program (3)

5698 Problems in Business Education: Administration (3)

5699 30-30 Current Issues in Business Education (3, 3, 3)

5210-30 Advanced Studies in Business Education (1, 3, 3, 3)

4100 Higher Education for Business (3)

Distributive Education (273)

Professor: G. A. Wagner (Chairman), Ph.D. Wisconsin.

Associate Professor: H. E. Nutter (Emeritus), M.A. New York.

Associate Professor: H. R. Smith, Ph.D. Ohio State.

Associate Professor: B. T. Swenson, Ph.D. Minneapolis.

Professor: J. W. J. Todd, Ph.D. Illinois.

Associate Professor: H. E. Nutter, Ph.D. California.

Professor: J. H. O. Mullins, Ph.D. Illinois.

Associate Professor: J. W. J. Todd, Ph.D. Illinois.

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Professor: J. H. O. Mullins, Ph.D. Illinois.

Associate Professor: J. W. J. Todd, Ph.D. Illinois.
5620 Wage Earning Programs In Home Economics
5610 Supervision of Home Economics in the Public
in Secondary Schools (3)
5600 Furniture and Cabinet Construction (3) Com-
prehensive study of cases and coursework construction
with emphasis placed upon furniture and built-ins.
Prepar: 1861.
5520 The Teaching of Home Economics in College
5910-20 Seminar in Home Economics Education (3,
5710-20-30 Special Problems for Non-Thesis Stu-
dents (3, 3, 3)
5260 Basic and Applied Electricity (3) Operation
and fundamental techniques of welding. Undergraduate
credit only.
5250 Welding, Brazing, Cutting, and Related Pro-
cesses (3) Various types of welding equipment and
methods. Undergraduate credit only.
5240 Allied Basic and Applied Electrical (3) Operation
and characteristics of electrical systems and de-
duction of demonstration apparatus and various electrical projects involving function of dif-
cerent types of circuits.
5230 General Metals (3) Basic course dealing with
principles, equipment, materials, products, and or-
ganization of metal-working industries. Involves
metalurgy, machining, foundry, framing, roofs, interior and exterior
construction, including location and evacuation,
portance of safety and using hand tools and basic machinery.
5161 General Woodworking (3) Basic course deal-
with processes, tools, equipment, products, and or-
ganization of woodworking industries. Involves
manual labor, sawing, framing, roofs, and fabrication.
5151 Machine Tool Processes (3) Introductory
processes. Undergraduate credit only.
5141 General Plastics (3) Characteristics of ther-
mosetics and thermo-setting materials, methods of
denmination, and resin conversion to finished
product.
5130 Manipulative Skills in Occupations (15) Prior
department approval for registration. Applicants
must show evidence of bonafide occupational expe-
ience with State Plan requirements. Occupational experiences
must be in a recognized trade area. SNC.
3020 Advanced General Metals (3) Provides expe-
cienced in areas of hot and cold forming of metals,
radiography, preparing checking sheets and individual jobsheets
and other destructive and non-destructive testing
methods.
3010 Related Science, Mathematics, and Technol-
gy in Occupations (15) Prior department approval for
registration. Applicants must show evidence of bonafide occupational experience
with State Plan requirements. Occupational experience
must be in a recognized trade area. SNC.
3000 Philosophy and rationale for use of crafts,in-
clusion of mechanical and graphic art services
and trade area. S/NC.
3941 Technical Writing (3) Development of writing
and junior college industrial vocational and techni-
cal instruction. Undergraduate credit only.
3931-32-33 Physical Testing Technology (3, 3, 3)
Type of destructive and non-destructive testing
methods. Undergraduate credit only.
3920 Welding, Brazing, Cutting, and Related Pro-
cesses (3) Various types of welding equipment and
methods. Undergraduate credit only.
3910-11-12 Seminar in Industrial Education (3, 3, 3) Methods
and materialsof teaching in trade,industrial,and/or technical pro-
tions and Personal Qualifications (15) Prior de-
partment approval for registration. Applicants must show evidence of bonafide occupational experience
compatible with State Plan requirements. Occupational experience
must be in a recognized trade area. SNC.
3900 Knowledge of Related Subjects in Occupa-
pation and Personal Qualifications (15) Prior de-
part ment approval for registration. Applicants must show evidence of bonafide occupational experience
compatible with State Plan requirements. Occupational experience
must be in a recognized trade area. SNC.
3820-81 Machining of Metals (3, 3) Introduction to
machining processes, basic equipment, and safe
practices in machining.
3810 History and Philosophy of Industrial Educa-
tion (3) Historical and philosophical foundations of
industrial education.
3620-30-31 Part-time Programs in Cooperative In-
dustrial Education (3, 3, 3) Philosophy, organization, methods, and
materialson teaching in area.
3610 Development and Utilization of Advisory
Committees (3) Philosophy and rationale
for use of craft advisers in craft, organized, and
other occupational groups.
3600 Advanced General Metals (3) Advanced labora-
tory experience in tune-up, overhaul, transmission, and
transmission of power with internal combustion
engines. Maintenance and repair of small engines is
stress.
3540-51-61 Electronics Technology (3, 3, 3) Basic
principles and application of electronics. Under-
graduate credit only.
3530 Architectural Graphics (3) Introduction to
drawings in architecture. Emphasis placed on
circuit tracing, installation, interpretation and utilization.
3520 Industrial Electricity and Equipment Control
(3) Basic techniques and application of industrial
electric equipment both single and polyphase.
3510 Engineering Seminar (3) Laboratory experi-
ence in areas of hot and cold forming of metals,
metalworking, and technicians in metalworking. Undergraduate
credit only.
3500 Machine Tool Processes (3) Introductory
processes. Undergraduate credit only.
3490 Visual Communications in Industrial Arts (3)
Methods of developing and transmitting ideas and
information as related to industry and society. Con-
tent, curriculum, and techniques of industrial arts.
3480 Directed Teaching (3) Observation and
supervised teaching in at least two types.
3470 Manufacturing Processes (3) The manufactur-
ing processes of industry and their relationship to
craft and trade areas. Undergraduate credit only.
3460 Construction Process (3) Construction
processes of industry and their relationship to
craft and trade areas. Undergraduate credit only.
3450 Tool and Machine Design (3, 3, 3) Tool
and machine design, calculations, and designing procedures.
Undergraduate credit only.
3440 Graphic Rhetoric Introduction Processes (3) Graphic arts in sketching and duplicating tech-
niques and other forms of graphic communication.
3430-70-75 Tool and Machine Design (3, 3, 3) Tool
and machine design, calculations, lists and blueprints, and
designing procedures. Undergraduate credit only.
3420 Technical Laboratory Equipment Maintenance (3) Understanding of preventive main-
tenance, maintenance, and calibration of instru-
ments and power equipment used in industrial edu-
cation shops.
3150-21-70 Problems in Industrial Education (3, 3, 3)
3140 Directed Teaching (3) Observation of all types of trade and industrial specialists; preparation of lesson plans and supervised teaching in at least two types.
Prepar: Senior standing in industrial education. Pre-
req: 3130. Undergraduate credit only.
3130-11-12 Seminar In Industrial Education (3, 3, 3) Industrial educational concepts, current trends, problems, and other topics associated with the field of indus-
trial education.
3120-21-22 New Developments in Industrial Edu-
cation (3, 3, 3) Developments, proving problems, and
new developments in teaching methods.
3110 Directed Teaching (3) Observation and
supervised teaching in at least two types.
Prepar: Senior standing in industrial education. Pre-
req: 3100. Undergraduate credit only.
Course Construction in Industrial Arts (3) Advanced work in the selection and arrangement of course content. Emphasis upon instructional objectives, project selection and informational assignments and evaluation. Prereq: Consent of instructor.

**GRADUATE**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
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<tbody>
<tr>
<td>5000</td>
<td>Thesis</td>
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<tr>
<td>5110-20-30</td>
<td>Administration and Supervision of Industrial Education (3, 3, 3)</td>
</tr>
<tr>
<td>5140</td>
<td>Organization and Operation of Area Vocational-Technical Schools (3)</td>
</tr>
<tr>
<td>5210-20-30</td>
<td>Special Problems in Industrial Education (3, 3, 3)</td>
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<tr>
<td>5210</td>
<td>Method of Research in Industrial Education (3)</td>
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<td>5410</td>
<td>Improving Teachers in Service (3)</td>
</tr>
<tr>
<td>5420</td>
<td>Advisory Committees and Apprentice Training (3)</td>
</tr>
<tr>
<td>5430</td>
<td>Vocational School Administration and Management (3)</td>
</tr>
<tr>
<td>5440</td>
<td>Advanced Methods of Teaching Skills and Technical Information (3)</td>
</tr>
<tr>
<td>5510-20-30</td>
<td>Seminar in Industrial Technical Education (3, 3, 3)</td>
</tr>
<tr>
<td>5540</td>
<td>New Developments in Industrial Technical Education (3)</td>
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</tbody>
</table>
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 view their profession in Tennessee; but to that time the engineering programs were established in 1926. The University of Tennessee Computing Center.

The college has ten major undergraduate programs. Aerospace, chemical, civil, electrical, industrial, mechanical, metallurgical, nuclear engineering, engineering physics, and 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, Young, 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.

Ferris 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 engineering department and it contains laboratories and equipment for monitoring, counting, and investigating various nuclear phenomena; it also houses subcritical reactors.

Nathan W. Dougherty Engineering Building. This building, the most recent and largest of the engineering buildings, houses the Departments of Chemical, Metallurgical, Engineering, engineering physics, and engineering science.

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and Polymer Engineering, and Mechanical and Aerospace Engineering. In addition to classroom and instructional laboratories, it provides modern facilities for various types of research.

Bryce Hall. This building is used by the Department of Civil Engineering and the Engineering Experiment Station.

Tau Beta Pi
National Headquarters

The college is honored to have the National Headquarters of Tau Beta Pi, the National Engineering Honor Society, housed on our campus. This honor was earned in part through the untiring efforts of R.C. "Red" Newshe, who served as secretary-treasurer for the organization from 1905 to 1947. The suite of offices, located in Dougherty Hall, is occupied by Mr. R.H. Nagel, secretary-treasurer, and his staff.

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. Dexter C. Jameson, 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 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 quarters alternating with full-time work- quarters—usually seven, a minimum of five—. 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 background for professional employment and for life in general than can be provided by a conventional academic program alone. This experience in an industrial and professional environment contributes to the student’s maturity, increases the scope of acquaintances and contacts, 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 academic program, but yet is of great significance in total education and effectiveness.

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 to a co-op employer. Each quarter in the program begins at the end of the second or third quarter of the freshman year and continues 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.

Students in the Cooperative Engineering Program are classified as follows in terms of quarter hours credit of completed courses:

- Freshman
- Sophomore
- Junior
- Senior

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.

Binary Program

A binary program in engineering is available. The college has agreements with a number of liberal arts colleges to conduct a five-year program, three years of which will be given at the liberal arts college and the last two years at The University of Tennessee in engineering. At the end of the fifth year, that college will award a baccalaureate degree in one of the branches of engineering. Institutions cooperating with The University of Tennessee in offering this Liberal Arts-Engineering 3-2 Binary Plan include:

- Belmont College, Nashville, Tennessee
- Bethel College, McKenzie, Tennessee
- Carson-Newman College, Jefferson City, Tennessee
- David Lipscomb College, Nashville, Tennessee
- East Tennessee State University, Johnson City, Tennessee
- King College, Bristol, Tennessee
- Knox College, Knoxvile, Tennessee
- Maryville College, Maryville, Tennessee
- Middle Tennessee State University, Murfreesboro, Tennessee
- Southeastern University, Memphis, Tennessee
- Tennessee Wesleyan College, Athens, Tennessee
- Union University, Jackson, Tennessee
- Notes: Questions about courses to be taken in preparation for transfer to The University of Tennessee may be directed to the dean of engineering.

Graduate Program

GENERAL
Graduate programs leading to the degree of Master of Science are offered in all areas of study. The degree of Doctor of Philosophy is offered in eight major subjects: aerospace engineering, chemical engineering, civil engineering, mechanical engineering, metallurgical engineering, nuclear engineering, and polymer engineering. A Master of Engineering degree focusing on engineering design and professional practice is offered in aerospace, civil, electrical, environmental, industrial, mechanical, and nuclear engineering. Information concerning graduate programs is given in the Graduate Catalog.

MAJOR OF SCIENCE PROGRAM
IN ENGINEERING ADMINISTRATION
A program leading to the degree of Master of Science with a major in engineering administration is offered. This is an engineering program, directed toward preparing individuals for time management positions in construction, design, development, manufacturing, etc., where both technical and non-technical factors exert significant influence on the success of a given activity. Policy direction and administrative aspects of the program are provided by an Engineering Administration Committee, consisting of representatives from participating departments in the College of Engineering and Business Administration, and a chairman appointed by the dean of engineering. Further information is provided in the Graduate Catalog.

Graduate Program at the UT Space Institute

At The University of Tennessee Space Institute near Tullahoma, graduate-level courses are offered in engineering fields such as aerospace, electrical, and mechanical engineering, and in mathematics and physics. Current programs lead to the M.S. and Ph.D. degrees. Many members of the faculty of the Space Institute are also members of the faculty of the College at The University of Tennessee, Knoxville.

Engineering Experiment Station

The management of the Engineering Experiment Station is vested in the president of the University, the dean of engineering, the director, and the associate director. An advisory committee consisting of the heads of the departments of the college and the heads of the several scientific fields may assist in determining policy and procedures. The council of the college are available for consultation and advice in technical matters.

The station is organized to conduct research relating to engineering practice and to collect technical data for the purpose of developing knowledge of the state’s resources and industries insofar as funds available will permit. Inquiries from interested parties are welcomed.

The station is also available to any person or company requiring technical work. Upon request, unpublished results of current studies are made available to interested parties.

Curricula in Engineering

Since 1936 engineering programs at institutions of higher learning have been accredited by the Engineering Accreditation Commission of the American Society of Engineering Education. The accrediting organization is under the sponsorship of the National Association of Schools of Engineering and Technology (ABET). Accredited engineering curricula at UTK include aerospace, agricultural, chemical, civil, electrical, engineering
COURSE LOAD
The maximum number of hours which can be taken by an undergraduate without special permission is 18 hours. The dean of engineering must give permission to take 20 hours or more.

DROP DEADLINE
All students (whether engineering majors or not) enroll in undergraduate courses taught within the College of Engineering, may, on their own initiative, withdraw from any course within six calendar days from the first day of class (through the day preceding the add deadline for the campus). Withdrawal from any course for any reason after the sixth day must be in accord with official late drop procedures (see page 25).

GPA COMPUTATION
All grades are to be counted in computing the grade point average, except up to 12 quarter hours of credit earned for courses taken by Satisfactory/No Credit (S/NC) grading do not count in computing the grade point average, except up to 12 quarter hours of credit earned for courses taken by Satisfactory/No Credit (S/NC) grading. Such courses must be used for the calculation of the grade point average, except up to 12 quarter hours of credit earned for courses taken by Satisfactory/No Credit (S/NC) grading. Such courses must be used for the calculation of the grade point average, except up to 12 quarter hours of credit earned for courses taken by Satisfactory/No Credit (S/NC) grading.

Correspondence Courses
A student should check with his or her major department to see what restrictions there are, if any, on the use of correspondence course credit to meet the minimum degree requirements. Approval of department head or adviser and Dean is required to register.

Humanities and Social Studies Electives
The college assumes an obligation to include in each of the engineering curricula those courses whereby students gain greater insight into their interaction with society, both personally and professionally. For this purpose, a student in each engineering curriculum is devoted to humanities and social sciences studies. Broadly stated, these electives serve a three-fold need: 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; its culture, behavior patterns, history, and government; and to provide a basis for the appreciation and ability to deal with complex interactions between technology and society in the contemporary world.

Engineering students 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 the interests in the many areas of the humanities and social sciences. Each student should be provided with sufficient depth in terms of courses to permit a reasonable level of comprehension of the selected area. In order to increase the effectiveness of this interest and to meet the specific guidelines, the Humanities and Social Studies Electives Committee of the College of Engineering provides a list of approved courses in the form of degree requirements. Courses in the form of degree requirements are to be selected by the committee with revisions as course offerings and needs change. They are recommended as satisfying the non-technical (humanistic-social) elective requirement in the various curricula. The structure and permissible courses of the non-technical elective content of each engineering curriculum are established by the major engineering departments. Therefore, individual departments may delete courses from the respective lists, require certain courses, or require selection of courses from specific subgroups. Students should consult their department for any restrictions.

It is recognized that individual students may desire to take courses not on the approved list. Those students who desire to take courses not on the approved list should discuss their interests and objectives with their academic adviser prior to registering for electives. Such courses are to be used to satisfy degree requirements. Also the catalog may state that elective courses may be taken by 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.

In determining whether a course not on the list can be approved, comments from our accrediting agency are important.

Subjects such as accounting, industrial management, finance, personnel administration, and ROTC studies . . .

normally do not fulfill the objectives desired of the humanities and social science content. In any course it is the subject matter to be evaluated rather than the teacher or the department offering the course. Skills courses are acceptable if a substantial amount of material relating to cultural values is involved as contrasted to routine exercises to enhance the student's performance.

ELECTIVE OPTIONS

In HUMANITIES AND SOCIAL STUDIES

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

IA. Government and Political Science

Economics 3340
Geography 3610
History 3579, 4130-20-30, 4370, 4380
Political Science 2510-00, 2545-46, 2555, 3555, 3710-20, 3790-90, 3961-09-34, 3960, 4050, 4055-36, 4050-40, 4545-46, 4650-66
Sociology 3030, 4530, 4560
IB. Economics

Accounting 2110, 2130-20-30, 3110-12, 3130, 3210-11, 3320, 3340, 3341, 3410-20, 4110
Geography 2110-20, 2340
Geology 2310
IC. Sociology and Political Science

American Studies 3000, 3600, 3650
Psychology 1520, 3120, 3220, 3320, 3321, 3322
Rural Sociology 3420
Social Sciences 3200
Population 3200-35, 3300, 3310, 3320, 3410, 3610, 3630, 4330, 4560
ID. Psychology

Psychology 3000
History 3060-70, 3270
Philosophy 3230, 3111-21-31, 3141-42, 3460
Religious Studies 2610, 3560, 3610-20, 3611, 3740

Area II. Society-Its Culture, History, and Literature

IIA. Arts and Letters (No more than 8 quarter hours may be taken in the performing arts-voice, instrumentation, band, chorus, etc.)

Art History 2715, 2715-16, 2725-26, 2750, 2750-68
English 2600, 2610, 2640-26-30-40
Music 1120-20-30, 1340, 2010-20-30, 3050, 4120, 4210, 4230, 4241, 4370, 4545-66, 4640
Philosophy 2410, 3000
Theatre 2053-54

IIB. Culture

American Studies 3010
Anthropology 3410
Black Studies 2000, 2500, 3560-60, 4330
English 2640-60, 3030, 4721-31-41
French 2200, 2210, 2220, 2230
Geography 3430, 3450, 3680, 3910-20-30-40
History 1950-60, 2550, 3670, 3680, 4290, 4470-50-60
Italian 2610-20
Music 1210-20-30, 1340, 2310-20-30-40, 3350
Philosophy 1510-20, 3311-12, 3720
Political Science 3601-02-03-04
Religious Studies 3510-20, 3560
Spanish 2610-20
Speech 4911-21
Theatre 3826-63

III. History

Art 3735-36, 3745-46
Geography 4040
Religious Studies 2611, 3121-31

IIID. Literature

Aero. Engr. 3040 .................. 3
Aero. Engr. 2040 ..................... 1
Aero. Engr. 3511 ..................... -

American History Requirement.

The Voluntary ROTC Program.

Aerospace Engineering

Before entering the third quarter of the junior year, the student, with the written approval of the advisor, must select a program of technical electives.

Area III. Technology and Society

IA. Human Habitat
Botany 3090
Economics 4040
Geography 3500-30, 3600, 3910, 4075
Political Science 4040
Psychology 4900
Sociology 1510-20, 3130, 3410-20, 3810, 4020, 4110, 4320

III. Technology Assessment

Geography 3480, 4075
Geology 2310
Philosophy 3720, 4710
Psychology 4900

IIIIC. Communication

Journalism 3110, 3710-20, 4410
Philosophy 2510-20

IIID. Resources

Economics 4280
Forestry 3770
Geography 2110-20-30, 3490
Geology 2310
University Studies 2010, 4110

Hours Credit

1 1 1 Math 1840-50-60 ...................... 4
2 2 2 Math 2840-50-60 ...................... 4
3 3 3 Chemistry 1110-30 ...................... 4
3 3 3 Chemistry 2110-20-30 .................. 4
5 5 5 Physics 2310-20-30 ................... 3
5 5 5 Physics 3110-20-30 ................... 4
5 5 5 Basic Engineering 1410 ............... -
5 5 5 Basic Engineering 1310-20-30 ......... 4
5 5 5 Basic Engineering 3110 ............... -
5 5 5 Basic Engineering 3140-50-60 ......... 4
5 5 5 Basic Engineering 3440-4450 .......... 3
5 5 5 Basic Engineering 3910-20-30 .......... 4
5 5 5 Basic Engineering 3910 ............... -

The various engineering curricula. The numbers in the columns indicate the number of quarter hours of credit for each course. Columns represent the three principal curriculums of the academic year—fall, winter, and spring. This is not a schedule, and courses are given in quarters other than those indicated here. This listing is a guide, not a rigid schedule. Individual course prerequisites should be strictly adhered to, even if all courses are not taken as indicated. Although the requirements for each degree can be completed in four academic years (five for the cooperative program), the quality of the learning experience is much more important than the speed with which the curriculum is completed.

American History Requirement.

The Voluntary ROTC Program.

American History Requirement.

The Voluntary ROTC Program.

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### Agricultural Engineering

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*2For basic courses in mathematics, statistics, natural science, or engineering approved by the department.

### Mechanical Engineering

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*2For basic courses in mathematics, statistics, natural science, or engineering approved by the department.

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### Metallurgical Engineering

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*2For basic courses in mathematics, statistics, natural science, or engineering approved by the department.
TOTAL : 201 hours

Not required in the cooperative program.
4. 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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TOTAL: 198 hours
## 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

*Humanities/social studies electives, minimum of 19 hours required.
*Technical electives: upper-division courses in engineering, mathematics, or physical science as approved by the department.
# Cooperative Curriculum in Metallurgical Engineering

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

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* A minimum of one-half (12 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 Civil Engineering

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

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**TOTAL: 201 hours**

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**TOTAL: 201 hours**

*Humanities/social studies courses approved by the department.

*Mechanical engineering 2220 or 2231 may be substituted.

*Technical electives must be approved by the student's adviser and the primary and one of the two secondary areas of study must come from the department's list of approved courses for 15 credits and 6 credits respectively.

*Math/science courses approved by the department.
### Cooperative Curriculum in Electrical Engineering

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

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| TOTAL: 203-206 hours |

| FIFTH YEAR | See Senior Year Areas of interest, page 128. |

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

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| TOTAL: 203-206 hours |

| FIFTH YEAR | See Senior Year Areas of interest, page 128. |
Cooperative Curriculum in Engineering Physics

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TOTAL: 199 hours

Students Working Summer and Winter Quarters—Group B

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TOTAL: 199 hours

*To be taken from the College of Liberal Arts tracts of Language, Literature and Arts, or History and Society, with at least 16 hours from courses approved for Language, Literature and Arts.

**To be taken in College of Engineering.

***Physics 3710 can be substituted for non-tech. elect. 3.

**To be taken from the College of Engineering.

†To be taken from Physics 3510-20-30, 3610-20-30, 4510-20-30, 4540-50, or Astronomy 4100-20-30.
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

*Humanities/social studies courses approved by the department.
*Elective courses in the College of Engineering approved by the department.
*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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### Students Working Summer and Winter Quarters—Group B

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**TOTAL: 208 hours**
### Cooperative Curriculum in Mechanical Engineering

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

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

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**TOTAL:** 203 hours

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- **Humanities/social studies electives:** Minimum of 19 hours required.
- **Mechanical engineering electives:** Elective courses in mechanical or aerospace engineering not otherwise required.
- **Technical electives:** Upper-division courses in engineering, mathematics, or physics 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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**TOTAL: 200 hours**

---

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

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**TOTAL: 200 hours**

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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 Nuclear Engineering

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

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**TOTAL: 198 hours**

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

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**TOTAL: 198 hours**
Chemical, Metallurgical, and Polymer Engineering

Professors:
H.F. Daniels, Head; D. Eng., Yale; P.E. D.C. Bogus, Ph.D. Delaware; E. Brody, Ph.D. Tennessee ; E.S. Clark, Ph.D. California; (Barkley); G.O. Dunbar, Ph.D. Texas; L.M. Crawford, Ph.D. Michigan; J.F. Fellers, Ph.D. Akron; C.G. Franzor, Jr., D. Eng. Johns Hopkins; H. Kim, Ph.D. Wisconsin; M.H. Mersel, Ph.D. California; S.J. Pettit, Ph.D. Pennsylvania; D. Pluta, Ph.D. Delaware; C. Thomas, Ph.D. California; G.D. Wigrall, Ph.D. Sheffield; G.D. Wigrall, Ph.D. Sheffield; J.W. Prados, Vice President for Academic Affairs, Ph.D. Tennessee; J.E. Spruiell, Ph.D. Tennessee.

Associate Professors:

Associate Professors:
W.J. Becker, Ph.D. Illinois; D.B. Brown, Ph.D. Houston; J.B. Meschter, Ph.D. Pennsylvania.

Lecturers:
U.D. Wrigley, Ph.D. Sheffield University.

Department of Chemical Engineering

1410 History of Technology (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 economic factors over structures of historical periods. Open to all students.

4200 Technology Forecasting and Assessment (4) Procedures and programs in forecasting of consequences of existing and new technologies; assessment of and decisions on use of these technologies. Emphasis on historical circumstances of positions 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. Emphasis on utilization and distinction. Open to all students.

Chemical, Metallurgical, and Polymer Engineering

1310 Basic Thermodynamics (4) Introduction to thermodynamics, fluid statics, and mechanics. Buoyancy, forces on submerged surfaces; Bernoulli’s equation; first law of thermodynamics; thermal systems for problems. BASIC language. Prereq: Math 1410 Engineering Computations (2) Familiarization with computer application to engineering problems. Prereq: Math 1410; coreq: Math 1850. 3 hrs and 1 lab.

1310 Basic Thermodynamics (4) Introduction to thermodynamics, fluid statics, and mechanics. Buoyancy, forces on submerged surfaces; Bernoulli’s equation; first law of thermodynamics; thermal systems for problems. BASIC language. Prereq: Math 1410 Engineering Computations (2) Familiarization with computer application to engineering problems. Prereq: Math 1410; coreq: Math 1850. 3 hrs and 1 lab.

1310 Basic Thermodynamics (4) Introduction to thermodynamics, fluid statics, and mechanics. Buoyancy, forces on submerged surfaces; Bernoulli’s equation; first law of thermodynamics; thermal systems for problems. BASIC language. Prereq: Math 1410 Engineering Computations (2) Familiarization with computer application to engineering problems. Prereq: Math 1410; coreq: Math 1850. 3 hrs and 1 lab.

1310 Basic Thermodynamics (4) Introduction to thermodynamics, fluid statics, and mechanics. Buoyancy, forces on submerged surfaces; Bernoulli’s equation; first law of thermodynamics; thermal systems for problems. BASIC language. Prereq: Math 1410 Engineering Computations (2) Familiarization with computer application to engineering problems. Prereq: Math 1410; coreq: Math 1850. 3 hrs and 1 lab.

1310 Basic Thermodynamics (4) Introduction to thermodynamics, fluid statics, and mechanics. Buoyancy, forces on submerged surfaces; Bernoulli’s equation; first law of thermodynamics; thermal systems for problems. BASIC language. Prereq: Math 1410 Engineering Computations (2) Familiarization with computer application to engineering problems. Prereq: Math 1410; coreq: Math 1850. 3 hrs and 1 lab.

1310 Basic Thermodynamics (4) Introduction to thermodynamics, fluid statics, and mechanics. Buoyancy, forces on submerged surfaces; Bernoulli’s equation; first law of thermodynamics; thermal systems for problems. BASIC language. Prereq: Math 1410 Engineering Computations (2) Familiarization with computer application to engineering problems. Prereq: Math 1410; coreq: Math 1850. 3 hrs and 1 lab.

1310 Basic Thermodynamics (4) Introduction to thermodynamics, fluid statics, and mechanics. Buoyancy, forces on submerged surfaces; Bernoulli’s equation; first law of thermodynamics; thermal systems for problems. BASIC language. Prereq: Math 1410 Engineering Computations (2) Familiarization with computer application to engineering problems. Prereq: Math 1410; coreq: Math 1850. 3 hrs and 1 lab.

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1310 Basic Thermodynamics (4) Introduction to thermodynamics, fluid statics, and mechanics. Buoyancy, forces on submerged surfaces; Bernoulli’s equation; first law of thermodynamics; thermal systems for problems. BASIC language. Prereq: Math 1410 Engineering Computations (2) Familiarization with computer application to engineering problems. Prereq: Math 1410; coreq: Math 1850. 3 hrs and 1 lab.

1310 Basic Thermodynamics (4) Introduction to thermodynamics, fluid statics, and mechanics. Buoyancy, forces on submerged surfaces; Bernoulli’s equation; first law of thermodynamics; thermal systems for problems. BASIC language. Prereq: Math 1410 Engineering Computations (2) Familiarization with computer application to engineering problems. Prereq: Math 1410; coreq: Math 1850. 3 hrs and 1 lab.

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1310 Basic Thermodynamics (4) Introduction to thermodynamics, fluid statics, and mechanics. Buoyancy, forces on submerged surfaces; Bernoulli’s equation; first law of thermodynamics; thermal systems for problems. BASIC language. Prereq: Math 1410 Engineering Computations (2) Familiarization with computer application to engineering problems. Prereq: Math 1410; coreq: Math 1850. 3 hrs and 1 lab.

1310 Basic Thermodynamics (4) Introduction to thermodynamics, fluid statics, and mechanics. Buoyancy, forces on submerged surfaces; Bernoulli’s equation; first law of thermodynamics; thermal systems for problems. BASIC language. Prereq: Math 1410 Engineering Computations (2) Familiarization with computer application to engineering problems. Prereq: Math 1410; coreq: Math 1850. 3 hrs and 1 lab.

1310 Basic Thermodynamics (4) Introduction to thermodynamics, fluid statics, and mechanics. Buoyancy, forces on submerged surfaces; Bernoulli’s equation; first law of thermodynamics; thermal systems for problems. BASIC language. Prereq: Math 1410 Engineering Computations (2) Familiarization with computer application to engineering problems. Prereq: Math 1410; coreq: Math 1850. 3 hrs and 1 lab.

1310 Basic Thermodynamics (4) Introduction to thermodynamics, fluid statics, and mechanics. Buoyancy, forces on submerged surfaces; Bernoulli’s equation; first law of thermodynamics; thermal systems for problems. BASIC language. Prereq: Math 1410 Engineering Computations (2) Familiarization with computer application to engineering problems. Prereq: Math 1410; coreq: Math 1850. 3 hrs and 1 lab.

1310 Basic Thermodynamics (4) Introduction to thermodynamics, fluid statics, and mechanics. Buoyancy, forces on submerged surfaces; Bernoulli’s equation; first law of thermodynamics; thermal systems for problems. BASIC language. Prereq: Math 1410 Engineering Computations (2) Familiarization with computer application to engineering problems. Prereq: Math 1410; coreq: Math 1850. 3 hrs and 1 lab.

1310 Basic Thermodynamics (4) Introduction to thermodynamics, fluid statics, and mechanics. Buoyancy, forces on submerged surfaces; Bernoulli’s equation; first law of thermodynamics; thermal systems for problems. BASIC language. Prereq: Math 1410 Engineering Computations (2) Familiarization with computer application to engineering problems. Prereq: Math 1410; coreq: Math 1850. 3 hrs and 1 lab.
3250 Special Problems (3) Investigation of chemical engineering problems.


3430 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 in 1 lab.

3440 Staged Processes (3) Analytical and graphical methods to stage-staged separatory operations. Prereq: Chem Engr. 3405.

3460 Diffusion Processes (2) Diffusion simulations, mass transfer by convection, mass transfer in fixed and fluidized beds; applications include adsorption, ion exchange, crystallization.


3810 Electron Microscopy (1) Presents the science of electron microscopy and an introduction to the electron microscope and its applications to scientific problems. Prereq: Physics 2010-20. 3 hrs in 1 lab.

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3170 Engineering Materials VII (3) Extension of 2110 with emphasis on materials of significance in nuclear engineering, reactor construction materials, nuclear fuel materials, and interaction of radiation with solids to produce changes in engineering properties. Suggested for nuclear and mechanical engineers.

3170 Engineering Materials VIII (3) Extension of 2110 to biomedical applications of materials, engineering materials in biomedical applications, metals, polymers, and ceramics; prosthetic devices; dental applications; corrosion (problems); failure analysis, fracture. Prereq: 2110 or equivalent.


3220 Diffusion and Annealing (3) Introduction to solid state kinetics; point defects, solid solutions, diffusion equations and mechanisms, annealing of cold worked structures. Prereq: 3040.

3330 Phase Transformations (3) Thermodynamic and structural factors governing binary equilibrium. Ternary systems. Kinetics and morphology of phase transformations in simple and complex systems. Prereq: 3210 or 3 hrs and 1 lab.


3320 Materials Behavior and Chemical Process Equipment Design (3) Mechanical, metallurgical, and chemical considerations in design of chemical processing equipment. Prereq: Chem. Engr. 2020 or equivalent. 3 hrs and 1 lab.

3710 Metallurgical Applications in Manufacturing Processes (3) Effects of metallurgical processing on mechanical/thermal properties for finished and semi-finished articles; casting, powder metallurgy, plastic forming, joining, heat treatment. Prereq: 3210 or equivalent.

4010-20 Thesis (3,3,3) Investigation and report on an engineering project. Prereq: 3230 Project Laboratory (3,3).

4250 Project Laboratory (3) Group or individual investigation of problems related to metallurgical engineering or material science. May be repeated for credit. 3 hrs and 1 lab.

4230 Project Laboratory (3) Group or individual investigation of problems related to metallurgical engineering or material science. May be repeated for credit. 3 hrs and 1 lab.

4910 Applied Polymer Science (3) First course in polymer science and engineering. Emphasis on quantitative aspects. Prereq: Senior standing in engineering or science. Not for graduate credit by polymer engineering majors.

4920 Principles of Fiber Textile Engineering (3) Chemical and crystalline structure of important fibers; mechanical and physical properties of man-made fibers; drawing and texturing; 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 operation of machinery used and structure and properties of fabricated parts. Operations to include extrusion, injection molding including structural foam, thermoforming, blow molding, rotational molding, etc. Prereq: Senior standing in engineering or science.

GRADUATE

5000 Thesis (5)

5010 Graduate Seminar (1)

5050 Engineering Analysis (3)

5100 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 (3,3)

5320-30 Advanced X-Ray Diffraction (3,3,3)

5350-50 Applied Properties of Solids (3,3)

5450-50 Electron Microscopy I and II (3,3)

5610-20 Radiation Effects on Materials (3,3)

5789 Corrosion (3)

5910-20-30 Special Topics in Metallurgy (3,3,3)

5940-50 Metallurgy of Deformation and Fracture (3,3)

5940-50-60 Metallurgy of Deformation and Fracture (3,3,6)

5910-20-30 Thermodynamic Analysis (3,3,3)

6000 Physical Properties of Polymer Structures (3,3)

6010-20-30 Selected Topics in Polymer Science (3,3,3)

6230 Advanced Mechanical Behavior of Polymers (3,3)

6240 Advanced Industrial Polymer Behavior (3,3)

6250-60 Recent Advances in Polymer Science and Engineering (3,3)

6830 Seminar in Anisotropic Properties of Crystals (3)

Polymer Engineering (605)

4220-40 Project Laboratory (3) Laboratory investigation of polymer engineering problems. Written report required for each quarter.

4910 Applied Polymer Science (3) First course in polymer science and engineering. Emphasis on the basic properties of polymers, physics, polymer solutions, and polymer structure and properties. Kinetics and mechanical properties are discussed. Prereq: Senior standing in polymer engineering or science. Not for graduate credit by polymer engineering majors.

4920 Polymer Processing (3) Rheological properties of polymer melts and solutions and their use in the manufacture of fibers, films, and molded products, and operations of fiber, plastics, and rubber industries: dimensional analysis and scale-up, flow through dies and pipes, wave extrusion, spinning of fibers, injection molding. Prereq: Senior standing in engineering or science.
Solution of civil engineering problems through the use of digital computers. Prereq: Basic Engr. 1410.

3080 Surveying Practice (3) Route surveying procedures. Two 3-hr. labs. Coreq: 2960.

3600 Transportation Planning (3) Emphasis on transportation problems and perspectives, both rural and urban; use of the planning process to develop existing travel patterns, modeling of demand, proposing alternatives and their evaluation, and plan implementation. Prereq: Junior standing.

3610 Transportation Engineering (3) Introductory course on design, construction, maintenance, and operation of various transportation modes, their guidelines and terminals. Prereq: Junior standing.


4110 Concrete Design (3) Reinforced concrete beams and floors. Prereq: 3710 or 3170.


4220 Foundations and Substructures (3) Evaluation, planning, and design of foundations and substructures. Prereq: 3710.

4240 Legal and Ethical Aspects of Engineering (3) Legal principles underlying engineering work, ethics, professional responsibilities. Prereq: Consent of instructor.


4270 Deformations and Statically Indeterminate Structures (3) Deformations of beams and frames. Two 3-hr. lecture and 1 lab. Prereq: 3710.

4360 Computer Utilization (3) Computer use, economic justification, and extent of use by industry. Two 3-hr. lecture and 1 lab. Prereq: Consent of instructor.

4390 Computer Utilization (3) Computer use, economic justification, and extent of use by industry. Two 3-hr. lecture and 1 lab. Prereq: Consent of instructor.

5000 Thesis

5002 Non-Thesis Graduation Completion (3-15)

5000 Thesis
6910-20-30 Special Topics in Civil Engineering (3,3,3)
6890 Planning Models for Transportation Systems (3)
6880 Planning Models for Transportation Systems I (3)
6830 Traffic Flow Theory (3)
6610 Behavior of Steel Bridges and Buildings (3)
5910-20 Special Topics (3,3,3)
5690 Traffic Accident Reconstruction (3)
5870 Public Transit Planning (3)
5860 Urban Transportation Planning (3)
5850 Functional Design of City Streets and Urban Freeways (3)
5805 Urban Systems: Engineering and Management I (3)
5840 Geometric Design (3)
5600 Functional Design of City Streets and Urban Freeways (3)
5805 Urban Systems: Engineering and Management I (3)
5840 Geometric Design (3)
5430-40-50 Construction Management 1, 11, 111 (3,3,3)
5420 Structural Model Analysis (3)
5320-30 Engineering Practice Applied to Administration of Engineering Projects (3,3)
5310 Engineering Practice (3)
5250 Advanced Properties of Materials: Bituminous Substances and Mixes (3)
5270 Planning and Transportation (3)
5240 Advanced Properties of Materials: Cement and Concrete (3)
5290 Advanced Properties of Materials: Bituminous Substances and Mixes (3)
5000 Pavement Design (3)
4510 Elements of Water and Wastewater Treatment Systems (3) Introduction to theory and design of water transportation and distribution systems and wastewater collection systems. Prereq: 3120 and 3330.
4510 Elements of Water and Wastewater Treatment Systems (3) Introduction to theory and design of water transportation and distribution systems and wastewater collection systems. Prereq: 3120 and 3330.
4410 Urban Water Management (3) Introduction to urban water modeling; evaluation of optimum urban water policies; formulation of demand constraints and analysis of decision-making process; management of storm water for benefit. Prereq: 3330.
4310 Water Resources Engineering Development (3) Multivariate analysis of water resources development; sheltering project and single- and multi-purpose projects; special topics in new developments in water resources engineering. Prereq: 3330 or consent of instructor.
4220 Water Resources Engineering Development (3) Multivariate analysis of water resources development; sheltering project and single- and multi-purpose projects; special topics in new developments in water resources engineering. Prereq: 3330 or consent of instructor.
4200 Hydrologic Design (3) Application of the concepts and regression analysis to hydrologic design to determine water resources systems. Unsteady surface runoff and streamflow modeling; urban peak runoff design using kinematic wave theory; evaluation of effects of land use changes on stream flow quantity and quality. Prereq: 3330.
3510 Elements of Water and Wastewater Treatment Systems (3) Design of membrane systems; treatment, removal of environmental contaminants. Prereq: Chemistry 1130 and senior standing.
3500 Urban Water Management (3) Introduction to urban water modeling; evaluation of optimum urban water policies; formulation of demand constraints and analysis of decision-making process; management of storm water for benefit. Prereq: 3330.
3410 Planning and Air Pollution Control (3) Air pollution control; federal and state regulations; adverse effects on receptors; engineering approaches for air pollution control. Pre-req: Senior standing. 
3400 Environmental Engineering and Natural Systems Behavior (3)
3410 Water Quality Management (3)
3400 Environmental Management of Water Quality (3)
3360 Microbiology for Sanitary Engineers (3)
3360 Advanced Water and Wastewater Treatment Systems (3) Introduction to theory and design of water transportation and distribution systems and wastewater collection systems. Prereq: 3120 and 3330.
3350 Statewide Passenger Transportation Plan-
The Bachelor of Science in Electrical Engineering is planned to provide a foundation in both the basic sciences and specialized areas of modern engineering. The curriculum also contains a suitable amount of cultural work to enhance 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, electromagnetics and communications, electronics and instrumentation, energy conversion and power systems, plasma and electro-optics engineering, and systems and networks. All of these areas except the bioelectric engineering option are continued through the M.S. and Ph.D. programs. The senior year curriculum is sufficiently flexible to allow a student to take several courses outside of the chosen area of specialization.

Sophomore and junior course work is offered in the following categories. The junior and the senior work is scheduled so that the student may enter at the beginning of either year. 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 lecture work, the department has both digital and analog computers. The students may be assigned to work on projects 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. Mag- netically coupled circuits. Transient analysis of cir- cuits containing more than one storage element using classical methods. Steady-state analysis of networks containing sinusoidal sources of more than one frequency. Coreq: 2010, Math 2860 3 credits. 3 hrs including biweekly lab.


3050 Basic Electrical Engineering-Electronics I (4) Principles of digital and analog electronic circuitry and devices, with emphasis on signal processing, logicsystems applications, signal con-version methods, rectangular wave guides. Prereq: 3040. 3 hrs including biweekly lab.

3060 Energy Conversion (3) Magnetic circuits, transformers, and circuits with one storage element. Thermoelectric energy conversion with emphasis on importance of conversion characteristics. Frequency response of induction motors and d. c. machines. Coreq: 3040, 3050, 3060 3 credits. 3 hrs including biweekly lab.

3150 Basic Electrical Engineering-Circuits and Fields (3) For non-electrical engineering majors. Coreq: Math 2300 3 hrs including biweekly lab.

3160 Basic Electrical Engineering-Electronics (3) For non-electrical engineering majors. Coreq: Math 2300 3 hrs including biweekly lab.

3170 Basic Engineering-Electromagnetics (3) For non-electrical engineering majors. Coreq: Math 2300 3 hrs including biweekly lab.

3180 Logic Design of Digital Systems (3) Introduction to digital algebra and design of combinational circuits. Present gate and flip-flop characteristics. Design of clocked sequential circuits and other sys- tems containing memory. Introduction to micro- processor architecture and system components to in- clude basic structure and function of Arithmetic, Central Processing Unit, and Memory. Introduction to the design and analysis of combinational circuits and register transfer operation. Use of hardware description languages to design microprocessor systems. Coreq: Computer Science 3150. 3 hrs including biweekly lab.

3190 Plasma (3) Engineering applications of physi- cal processes, plasma effects and devices. Topics may be chosen from electromagnetic waves, gyrotrons, solar sources, laser operation and applications (electri- cal- and MHD-controlled beam generation); and other techniques of advanced power production. 3 hrs including biweekly lab. Coreq: Physics 2310- 2310.

3210 Linear Systems Analysis (3) Steady-state and transient response, log-frequency, gage-plane, and pole-zero, phase-plane diagram transformation; signal flow graphs; analog systems, properties of sec- ond-order systems; introduction to feedback theory, stability criteria. Coreq: 3100 and 3160 cor: 3100. 3 hrs including occasional labs.

3250 Basic Electronics I (3) Basic physical law fundament- als of electricity and electronics. Use of operational amplifiers for signal processing, logicsystems applications, analog-digital conversion; operational amplifiers, power generator, acoustics, rectifiers, semiconduc- tors, power supplies; theory of operation of field-effect transistors and amplifiers in simple circuits. Coreq: 3100. 3 hrs including project laboratory.

3250 Basic Electronics II (3) Physical operation of bipolar transistors and vacuum tubes with applica- tions in basic amplifiers, integrated circuit funda- mentals. Coreq: 3100 3 hrs including project labora- tory.

4000 Direct Electrical Energy Conversion (3) Basic laws of thermodynamics. Production of electrical energy by thermonic conversion; thermoelectric effects, photoelectric, solar cells, and fuel cells. Laboratory demon- strations. Coreq: 3100. 3 hrs including biweekly lab.

4090 Microwave Circuits and Electronics (3) Circuits represented by wave scattering, diffractions, guided waves, microwave and antennas. Microstrip, waveguides, packaged components, microwave components, amplifiers, power generator, acoustics, rectifiers, semiconductors, power supplies; theory of operation of field-effect transistors and amplifiers in simple circuits. Coreq: 3100. 3 hrs including occasional labs.

4100 Digital Communications Systems I (Princi- ples of pulse and digital communication systems. Sampling theorem, pulse amplitude, duration, and processing time in digital communication, code- ling, and pulse code modulation. Generated digital signals and carrier-modulation with digital waveforms. Delta, adaptive delta, delta-sigma, and pulse code modulation. Coreq: Math 3100. 3 hrs including biweekly lab.

4191 Introduction to Artificial Intelligence (3) Same as Computer Science 4191.

4250 Elements of Network Synthesis (3) Basic elements of network synthesis. Introduction to computer synthesis techniques. Variable resistor, variable capacitor, variable inductor, variable transformer. Basic digitalswitching circuits. Introduction to minicom- puters containing memory. Introduction to minicomputer architecture and system components to inclu- de basic structure and function of Arithmetic, Central Processing Unit, and Memory. Introduction to the design and analysis of combinational circuits and register transfer operation. Use of hardware description languages to design microprocessor systems. Coreq: Computer Science 3150. 3 hrs including biweekly lab.

4260 Basic Electronics II (3) Basic physical law fundament- als of electricity and electronics. Use of operational amplifiers for signal processing, logicsystems applications, analog-digital conversion; operational amplifiers, power generator, acoustics, rectifiers, semiconductors, power supplies; theory of operation of field-effect transistors and amplifiers in simple circuits. Coreq: 3100. 3 hrs including project laboratory.

4270 Introduction to Feedback System Design (3) Introduction to feedback control systems. Design of control systems. Use of computer-aided design techniques. Emphasis on steady-state error and constant errors. No lab. Coreq: 3100. 3 hrs including occasional labs.
examples such as active filters, amplifiers, at
4600 Analog Signal Processing Circuits for Elec
toriums. Prereq: Senior standing.
recordings, film recording, acoustics of studios, au
tionosphere. Wave reflections from earth. Prereq:
4540 Antennas and Propagation (3) Dipole and
processing, holographic interferometry. Systems (e.g. laser light scattering, optical data
storing media (e.g. photographic
noise concepts and practical engineering data for
111 (3) Macroscopic plasma equations, particle orbits, interactions, oscilations, and waves. Prereq: 3180.
4630 Digital System Organization and Design (3) Design of synchronous and asynchronous
synchronous modes of operation, synchronous-asynchronous time sequencing, and microprogramming of control fun-
names, analog switches, A/D and D/A converters, logic gates, flip-flops, registers, counters.
minicomputer and microprocessor architectures
4620 Sequential Machine and Digital System Theory (3) Design aspects of pulse-code,
modes, level-mode sequential circuits. Theory and
4610 Analog-Digital Systems (3) Principles of analog computing components. Applied to analog
computing to include problem setup and solving, dividers and
4600 Introduction to Switching Theory and Design (3) Basic structure and design of digital com-
4590 Advanced Electromagnetic Devices (3) Analysis and design of discrete data control sys-
systems. Prereq: Either 3100 and Computer Science
4580 Digital Image Processing (3) Principal
enumerical techniques, interrupt structures, peripheral devices, syn-
4570 Digital Signal Processing (3) Time domain opera-
1470 Digital Signal Processing (3) Time domain opera-
4560 Linear Antennas and Antenna Arrays (3)
Engineering Science and Mechanics

**Engineering Administration**

*Graduate School*

**Engineering Science and Mechanics**

**Professors:**
- W. T. Stepper (Head), Ph.D. Northeastern; H. B. Allen (Emeritus), M.S. Tennessee; V. Akin, Ph.D. Virginia Polytechnic Institute; J. C. Karafiol, Ph.D. Georgia Institute of Technology; K. J. Hornsby, Ph.D. Columbia State; H. Forrester, Ph.D. Iowa State; G. H. Kearsley, Ph.D. Indiana University; R. W. Lee, Ph.D. Illinois Institute of Technology; J. E. Miller, Ph.D. Michigan State; R. B. Reuss, Ph.D. Illinois Institute of Technology; J. R. Raines, Ph.D. University of Tennessee; D. C. Scott, Ph.D. Illinois; L. J. Shoore, M.S. Kansas State; J. E. Snow, Ph.D. Illinois; D. G. Thomas, Ph.D. Ohio State; F. E. Wetherell

**Associate Professors:**
- L. Adler, Ph.D. Tennessee; R. R. Alms, Ph.D. Michigan; J. E. Caruthers*, Ph.D. Georgia Institute of Technology; P. J. D. Lemieux, Ph.D. Virginia; A. S. Matthews, Ph.D. Illinois; D. J. O'Leary, Ph.D. Tennessee; T. T. Morris, Ph.D. Georgia; W. E. Scott, Ph.D. Illinois; J. A. Reeder, Ph.D. University of Tennessee; J. D. Shubert, Ph.D. Colorado; J. A. Jenkins, Ph.D. Missouri.

**Assistant Professors:**
- R. Adler, Ph.D. Tennessee; P. McMillan, Ph.D. Iowa; J. E. Caruthers*, Ph.D. Georgia Institute of Technology; P. J. D. Lemieux, Ph.D. Virginia; A. S. Matthews, Ph.D. Illinois; D. J. O'Leary, Ph.D. Tennessee; T. T. Morris, Ph.D. Georgia; W. E. Scott, Ph.D. Illinois; J. A. Reeder, Ph.D. University of Tennessee; J. D. Shubert, Ph.D. Colorado; J. A. Jenkins, Ph.D. Missouri.

**BACHELOR OF SCIENCE PROGRAM**

The curriculum in engineering science will provide students with a broad engineering education with breadth in 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 includes a strong emphasis on engineering principles and basic science.

In the first two years students in the engineering science program study engineering science, engineering mathematics, and engineering mechanics. 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 accomplished in other programs. Examples of special interest elective groups presently available in the engineering science program are biomedical engineering, engineering analysis and synthesis, and materials 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 the design of 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 develop computer assisted 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 courses that will meet the requirements of the Graduate School.

In the engineering analysis and synthesis elective group affords a concentration on the application of such mathematical techniques as numerical analysis and simulation 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 skills involved in engineering efforts aimed at solving environmental problems and developing techniques 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 scientific and engineering materials and properties. The engineering materials elective group provides the student an opportunity to acquire this background.

The basic engineering sciences curriculum provides an opportunity to study significant blocks of the engineering sciences area 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 process systems 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 course of study. Before the end of the sophomore year, students in the engineering science program are required to develop, in concert with a faculty advisor, a statement of objectives and a course plan for the upper-division years. This course plan must be filed with the Office of Admissions and Records before the end of the semester for one of the 96 semester hours can be registered for courses, and before a student's second year in the College of Engineering.

**Masters of Science and Doctor of Philosophy**

Graduate programs leading to the degrees of Master of Science and Doctor of Philosophy in engineering science are available to graduates of the bachelor of science degree program. The degree options 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.

In the first two years students in the engineering science program study engineering science, engineering mathematics, and engineering mechanics. The engineering science option is 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.

The flexibility and interdisciplinary aspects of the program options are intended to be of particular interest to prospective students currently employed in research, development, or design activities and whose undergraduate education is either full-time or part-time; lie at one of the interfaces between science and engineering, or can best be met by interdisciplinary study in engineering. The department's course
Engineering Science and Mechanics (335)

2705 Elementary Statics and Dynamics (3) Basic concepts and principles of mechanics; statics and kinetics; pressure; pressure vessels, shafting; determinate, indeterminate systems. Prereq: College Physics (Mechanics); coreq: Math 1850 or equivalent.

2710 Statics (3) Statical analysis of objects and systems, with emphasis on the stresses and strains induced; friction; particle dynamics, applications for transfer students. Prereq: College Physics (Mechanics); coreq: Math 1850 or equivalent.

2720 Dynamics (3) Absolute and relative kinematics of rigid bodies; kinetic of rigid bodies using Newton’s laws of motion and in applied mechanics. Prereq: Math 2840.

3010 Seminar (1) Discussions of engineering pro- fessionalism. Field trips and career planning. SYC.

3110-20 Fluid Mechanics (3,3) Basic laws of fluids, effects of viscosity and compressibility, empirical analysis. Navier-Stokes equations; boundary-layer concepts; potential flow. Must be taken in sequence. 3 hrs in lab and 3120 and 3130. Prereq: 2720 or 3760. Math 2840; coreq: for 3120: Math 2850 or equivalent.

3110-20 Mechanics of Materials (3,3) Concepts of stress and strain; stress analysis of elements; strain; torsion; bending. Prereq: Math 2840 or equivalent.

4100 Introduction to Biomechanical Engineering (4) An introduction to the fields of biomechanical engineering and provides basic terminology on the methodology for further courses in this area. Prereq: Math 2840, 2720 or 3700, 3410, Math 2850.

5120 Introduction to Clinical Engineering (3) Engineering applications in the clinical environment. Prereq: Math 2840 or equivalent.

5130 Materials of Engineering (3) Mechanical properties of materials; engineering materials; behavior of materials under load. 3 hrs. Prereq: 3110 or 3130. Math 2840.

5200 Materials Behavior and Chemical Process Equipment Design (3) (Same as Mat. Eng. 5200) Static and dynamic behavior of materials; fatigue; creep; fracture mechanics; heat treatment; friction; wear; chemical processes; heat exchangers; pumps, fans; chemical process equipment. Prereq: Math 2840.

4010 Project in Design and Development (4) Investiga- tion, design, and report of an engineering sci- ence project. Prereq: Senior standing and a grade of C or better in 3111, 3910, and 3111.

4011 Project in Design and Development (3) Investiga- tion, design, and report of an engineering sci- ence project. Prereq: Senior standing and a grade of C or better in 3111, 3910, and 3111.

4430 Orthopedic Biomechanics (3) Introduction to engineering principles and applications in orthopedics and rehabilitation. Topics include statics, kinetics, biomechanics and application of engineering principles to the design of objects, engineering materials, and biological materi- als. Prereq: Consent of Instructor. For non- engineering majors.


4520 Biomedical Fluid Mechanics (3) Discusses objectives, review foundations, and present developments in biomedical fluid mechanics. Prop- erties of human blood and blood vessels, dielectric nants of cardiac performance, analysis and meas- urement of flow and pressure in arteries, interaction of blood flow with normal and diseased vessel walls, mechanical properties of cardiovascular tissue, and applications to cardiovascular disease. Prereq: 4530 or 4540.

4530 Biomechanics (3) Discusses objectives, review foundations, and present developments in biomechanical properties of living tissues, bio- mechanical injury and prosthesis, material com- patibility of prosthetic devices, and biomechanical problems related to impact. Prereq. 3111 or 4565 or con- sent of instructor.


5120 Introduction to Clinical Engineering (3) Engineering applications in the clinical environment. Prereq: Math 2840.

5000 Thesis (6) Research for Master’s degree. Subject to approval of Professor W. M. Bugg (Head); Physics staff as 5430 Thermal Stresses (3)

5300 Theory of Linear Viscoelasticity (3) Theory of linear viscoelasticity, stress-strain relations, and relaxation functions. Prereq: 5000 or consent of instructor. Must be taken in sequence. Credit may be repeated for credit once.


5360 Theory of Plasticity (3) Prereq: 5180.

5610 Heat Transfer (3) Prereq: 5000 or consent of instructor. Must be taken in sequence. 3 hrs or 2 hrs and 1 lab. Prereq: 3111 and Met. Engr. 3110. Coreq: Math 2840.

6140 Advanced Finite Element Methods in Fluid Mechanics (3) Prereq: 5180 or consent of instructor.

6160 Advanced Finite Element Methods in Fluid Dynamics (3) Prereq: 5180 or consent of instructor.

6250-45 Advanced Topics in Fluid Mechanics and Convective Transfer (3, 3) Prereq: 4510 or consent of instructor.

6310 Advanced Fluids (3, 3) Prereq: 5000 or consent of instructor.

6370 Advanced Vibrations (3) Prereq: 5710 or consent of instructor.

6710 Fundamentals of Vibration Theory (3) Prereq: Consent of instructor.

6800 Non-Linear Viscoelasticity (3) Prereq: 5000 or consent of instructor.

6810 Energy Methods (3) Prereq: 5000 or consent of instructor.

6910 Special Topics in Engineering Mechanics (3) Prereq: 5000 or consent of instructor.

6940-50 Advanced Topics in Biomechanics (3) Prereq: 4500 or consent of instructor.

6950-59 Special Topics in Clinical Engineering (3) Prereq: 5000 or consent of instructor.

4910-20 Special Engineering Science Topics (3, 3) Prereq: 4510 or consent of instructor.

5910 Special Topics in Engineering Mechanics (3) Prereq: 5000 or consent of instructor.

5400 Principles of Non-destructive Testing (3) (Same as Phys. 4820.)

5500 Astrophysics (3) Prereq: 5120 or consent of instructor.

5630 Advanced Vibrations (3) Prereq: 5710 or consent of instructor.

6490 Finite Element Software, Theory, and Practice (3) Prereq: 5180 or consent of instructor. Must be taken in sequence. Credit may be repeated for credit once.


6790 Advanced Dynamics (3, 3) Prereq: 5710 or consent of instructor.

6850 Nonlinear Dynamics (3) Prereq: 5000 or consent of instructor. Must be taken in sequence. Credit may be repeated for credit once.

6910 Special Topics in Engineering Mechanics (3) Prereq: 5000 or consent of instructor.

Engineering Physics

Professor W. M. Bugg (Head); Physics staff as 5910 Special Topics in Engineering Mechanics (3) Prereq: 5000 or consent of instructor.

6940-50 Advanced Topics in Biomechanics (3) Prereq: 4500 or consent of instructor.

PhD Thesis (5000)
Industrial Engineering (556)
J. N. Snider (Head), Ph.D., Ohio State, P.E.;
H. F. Emering (Emeritus), S.B., Massachusetts Institute of Technology, H. A. Lyday, M.S., Georgia Institute of Technology.

1. Faculty
J. C. Hungerford, M.S., Ohio State; Technology; W. A. Lyday, M.S., Tennessee.
H. P. Emerson (Emeritus), S.B., Massachusetts Institute of Technology; D. C. Doulet, M.S., Tennessee, P.E.; M. K. Goodman, M.S., Tennessee, P.E.; D. H. Hutchinson, Ph.D., Georgia Institute of Technology, E. L. DePorter, Ph.D., VPI &

2. Undergraduate Curriculum
The undergraduate curriculum in industrial engineering provides a strong background in both fundamental engineering principles and the analytic methods necessary for solving the multi-faceted problems associated with the production, maintenance, and delivery of goods and services. In particular, this curriculum emphasizes the knowledge and skills necessary to design integrated systems of people, materials, equipment, and energy wherever they are found, such as the overall system functions at an optimal level and such that the needs of the human components of the system are adequately met.

This curriculum, which is built upon a strong background in mathematics and statistics, includes fundamental course work in all of the engineering sciences, introductory economics and accounting, training in fundamental human factors which influence engineering design, the economic analysis of alternative design choices, quality control techniques, manufacturing processes, production and inventory systems design, and management development. The technical and non-technical electives further allow the students to specialize in an area(s) which meet particular needs.

The broad base in engineering, combined with training in applying engineering methodology to traditionally non-engineering problem areas as provided through the industrial engineering curriculum, results in superior job performance by industrial engineers in an unlimited range of fields.

3. Recruitment and Placement
Graduates are employed in distribution, banking, health care delivery, computer software development, manufacturing, aerospace systems, research and development, and government as well as in the traditional area of manufacturing.

Masters of Science Program
The graduate program in industrial engineering contains a basic "core" of 18 hours of course work covering topics in industrial engineering at the graduate level. The remaining 18 hours in the thesis program are based upon the educational objectives of the student and determined with the approval of the student's advisor. A minor is usually taken in an area related to industrial engineering, and the student must complete his program to the open courses of graduate credits in all fields of engineering.

A non-thesis program of 45 hours of course work plus a 3-hour project is also available and open to graduates in engineering. The core courses (5280, 5360, 5520, 5700, 5710, 5720) comprise 18 hours of the total and are identical to the basic courses in the program for thesis students. An option is selected from manufacturing, health systems, operations research, human factors, or industrial administration. Each option requires 12 hours of non-engineering electives to support the selected option. The project requires the design of a procedure or operating system based essentially upon the selected option and clearly applicable as a solution to a problem in actual professional practice. The student is examined on the project and related course work.

4. Industrial Engineering (301) Seminar (1) Introduction to the industrial engineering profession; its history, and current trends. Plant trips and lectures by the faculty. Preparatory standing.


7. Textile Industry Systems (3) History, basic concepts, and technical aspects of the industry; the application of industrial engineering technology to the design of the production environment. Preparatory: Junior standing

8. Reliability and Maintenance Analysis (3) Analytical methods applied to problems arising in the design and implementation of maintenance systems. Prerequisites: 1410, 2320.

9. Reliability and Maintainability Analysis (3) Analytical methods applied to problems arising in the design and implementation of maintenance systems. Prerequisites: 1410, 2320.

10. Introduction to Operations Research I (3) Introduction to mathematical programming includes linear and mixed-integer programming, with emphasis on the simplex method, the transportation problem, and the assignment problem; and dynamic programming. Preparatory: Computer Science 1100.

11. Introduction to Operations Research II (3) Introduction to mathematical programming includes classical optimization theory, linear programming, (with emphasis on the simplex method, the transportation problem, and the assignment problem); and dynamic programming. Preparatory: Computer Science 1100.


14. Work Measurement and Design (3) Human capabilities and limitations which must be reflected in work place. Various work measurement tech- niques; tool, equipment, and vehicle design; and design in industrial computer-communication systems. Preparatory: Junior standing in College of Engineering, or consent of instructor.

15. Work Measurement and Design (3) Use of work measurement techniques for process improvement. Preparatory: 3430, 3440.


17. Production Systems Planning and Control II (3) Theory and application of master scheduling, material requirements planning systems, and simulation. Preparatory: 3430, 3440.

18. Forecasting Methods in Industrial Engineering (3) Application of technological forecasting techniques to industrial engineering problems; includes average moving and exponential smoothing, linear and polynomial regression models, autoregressive time-series analysis, Delphi methods, and other selected industrial forecasting methods. Preparatory: 3430, 3440.


20. Production Systems Planning and Control (3) Production systems planning and control; materials requirements planning systems, and simulation. Preparatory: 3430, 3440.

21. Forecasting Methods in Industrial Engineering (3) Application of technological predictive techniques to industrial engineering problems; includes average moving and exponential smoothing, linear and polynomial regression models, autoregressive time-series analysis, Delphi methods, and other selected industrial forecasting methods. Preparatory: 3430, 3440.

22. Production Systems Planning and Control II (3) Theory and application of master scheduling, material requirements planning systems, and simulation. Preparatory: 3430, 3440.

23. Forecasting Methods in Industrial Engineering (3) Application of technological predictive techniques to industrial engineering problems; includes average moving and exponential smoothing, linear and polynomial regression models, autoregressive time-series analysis, Delphi methods, and other selected industrial forecasting methods. Preparatory: 3430, 3440.


25. Production Systems Planning and Control II (3) Theory and application of master scheduling, material requirements planning systems, and simulation. Preparatory: 3430, 3440.

26. Forecasting Methods in Industrial Engineering (3) Application of technological predictive techniques to industrial engineering problems; includes average moving and exponential smoothing, linear and polynomial regression models, autoregressive time-series analysis, Delphi methods, and other selected industrial forecasting methods. Preparatory: 3430, 3440.

27. Production Systems Planning and Control II (3) Theory and application of master scheduling, material requirements planning systems, and simulation. Preparatory: 3430, 3440.

28. Forecasting Methods in Industrial Engineering (3) Application of technological predictive techniques to industrial engineering problems; includes average moving and exponential smoothing, linear and polynomial regression models, autoregressive time-series analysis, Delphi methods, and other selected industrial forecasting methods. Preparatory: 3430, 3440.


30. Production Systems Planning and Control II (3) Theory and application of master scheduling, material requirements planning systems, and simulation. Preparatory: 3430, 3440.

31. Seminar (1) Discussions, lectures, and trips to study various educational systems in the field of industrial engineering.

32. Engineering Economy (3) Methods and techniques in decision making. Analysis of capital investments, including cash flow, payback period, internal rate of return on investment, sensitivity analysis, cost analysis, and financing.


34. Production Systems Planning and Control (3) Theory and application of master scheduling, material requirements planning systems, and simulation. Preparatory: 3430, 3440.

35. Forecasting Methods in Industrial Engineering (3) Application of technological predictive techniques to industrial engineering problems; includes average moving and exponential smoothing, linear and polynomial regression models, autoregressive time-series analysis, Delphi methods, and other selected industrial forecasting methods. Preparatory: 3430, 3440.