

Science Education (Environmental Education) Concentration - Track 1 (Non-Thesis Option)

	Hours Credit
¹ Core.....	12
² Concentration.....	15
³ Related Studies.....	6
Total 33	

¹Curriculum, Educational Research, and Evaluation 580; Theory and Practice in Teacher Education 517; 6 hours determined by student and advisor.
²Science Education 506, 509, 510; 6 hours determined by student and advisor.
³Determined by student and advisor.

Special Education Concentration (Thesis Option) - Track 1

	Hours Credit
¹ Core.....	9
² Concentration.....	15
Thesis: Theory and Practice in Teacher Education 500 (Thesis).....	6
³ Total 30	

¹Special Education 587 or Theory and Practice in Teacher Education 517; Special Education 586, 590.
²Select (with major advisor) from: affective motivational disorder (6-9); general special education (6-9); elementary education (6-9); reading education (6-9); cognitive education (6-9); gifted education (6-9); modified programs (6-12); comprehensive programs (6-12). Others by committee approval.
³Coursework (24 hours); thesis (6 hours).

Special Education Concentration (Non- Thesis Option) - Track 1

	Hours Credit
¹ Core.....	9
² Concentration.....	27
³ Total 36	

¹Special Education 587 or Theory and Practice in Teacher Education 517; Special Education 586, 590.
²Select (with major advisor) from: affective motivational disorder (6-9); general special education (6-9); elementary education (6-9); reading education (6-9); cognitive education (6-9); gifted education (6-9); modified programs (6-12); comprehensive programs (6-12). Others by committee approval.
³Problem courses in lieu of thesis (30 hours); additional problem courses (6 hours); oral exams over problems courses.

TRACK 2: INITIAL LICENSURE PROGRAMS

The Track 2 master’s is intended for individuals desiring to earn teacher licensure. Applicants to this program must first be admitted to teacher education and complete the equivalent of an undergraduate minor in either elementary, middle school, or secondary education. Post-baccalaureate students interested in seeking licensure in art education, special education, or in other fields that require students to earn an undergraduate major would be expected to complete an equivalent undergraduate program of study. Please refer to the catalog for complete details. Individuals are encouraged to contact the College’s Student Services Center, A332 Claxton Complex, for a diagnostic interview and to develop a tentative course of study and time line.

REQUIREMENTS

Track 2 Common Course Requirements

Master’s Track 2 programs are 36 credit hour (non-thesis); 42 credit hour (thesis). Students, regardless of teaching area (e.g., elementary, secondary, etc.), complete a common, teacher licensure, core of 24 credit hours during the professional year (see below):

Professional Year Courses (24 hours)

Education 574 (2), 575 (12), 591 (4), and Specialty Studies (6).

Additional Course Requirements (12 hours)

In addition to the above common core of courses, students must complete an additional 12 credit hours of coursework that is unique to their particular teacher preparation field:

- **Art Education:** Art Education 510, 520, 530, 540.
- **Early Childhood Special Education:** Special Education 554; Elementary Education 566, 567; Special Education 568.
- **Education of the Deaf and Hard of Hearing:** Research elective (3); non-specified electives (9).
- **Elementary Teaching:** Theory and Practice in Teacher Education 517; nine hours of educational electives (chosen from at least three areas): historical, philosophical, or social foundations, instructional technology, reading education, language arts education, science education, social science education, elementary education, middle school curriculum.
- **Modified and Comprehensive Special Education:** Special Education 553, 590; six hours of electives (see advisor).
- **Secondary Teaching:** Theory and Practice in Teacher Education 517; Curriculum, Educational Research and Evaluation 534 or 541 or 558, or an elective in the history of sociology or philosophy of education; six hours of specialty area electives (see faculty advisor).

SPECIALIST IN EDUCATION

Educational Administration Major

The department offers a Specialist in Education degree with a major in educational administration. This degree is designed for those students who already possess a master’s degree. This degree may be used for the school administrator licensure.

ADMISSION

Applicants must complete all applications forms by March 15. These include the Office of Graduate Admissions application and for those interested in licensure, the Educational Specialist in Educational Administration application. A current GRE score is required for admission and a grade point average (GPA) of 2.7 or higher for undergraduate work or GPA of 3.2 or higher for prior graduate work is required. Three rating forms must be provided with recommendations from three present or former employers that identify a candidate’s strengths, weaknesses, and leadership potential.

REQUIREMENTS

The EdS with a major in educational administration requires a minimum of 45 hours of study. A final comprehensive examination is required as is a culminating research paper or thesis depending on the program.

	Hours Credit
Core Requirements (513, 515, 548, 553)	12
Specialization (523, 554, 583, 590, 596).....	15
Research (516, * 592, **Elective).....	9
Internship	6
580	3
<hr/> Total 45	

*A thesis option is available with approval of advisor.
 **Elective from outside the Educational Administration area chosen in consultation with advisor.

Teacher Education Major

The specialist in education with a major in teacher education encompasses concentrations in

- Elementary education
- English education
- Foreign language/ESL education
- Mathematics education
- Reading education
- Science education
- Social science education
- Special education

These concentrations require completion of a minimum of 30 hours of coursework beyond the master’s, including six hours in core courses, 18 hours in specialized courses, and six hours to be determined by the student’s committee. Both thesis and non-thesis options are available.

REQUIREMENTS

A master’s degree is required for admission; most programs in Theory and Practice in Teacher Education also require a minimum of three years of professional experience. The total EdS program involves a minimum of four semesters of study with no fewer than 60 semester hours of graduate credit beyond the baccalaureate, including research/thesis hours.

Education courses at the 400-level required for licensure are not eligible. At least 2/3 of semester hours accumulated in master’s and all of the last 30 semester hours of coursework must be in 500- or 600-level courses. The EdS thesis must be approved by the student’s committee prior to submission to the Office of Graduate Studies for final approval and acceptance. The student must register for thesis hours during this time.

	Hours Credit
¹ Core Area	6
² Concentration Specialty Area Methods	12
³ Research	6
⁴ Related Studies.....	6
<hr/> Total (Thesis and Non-Thesis) 30	

¹Must include one course from two of the following areas outside the concentration: curriculum or leadership anthropological, historical, philosophical or social foundations; human growth and development; pre-K-14 teaching methodology; instructional technology.
²Theory and Practice in Teacher Education 593, 594, 595.
³Theory and Practice in Teacher Education 518 or 500 (thesis).
⁴Must be related to focus of degree and must be outside specialty area education program, e.g., English, reading, speech, drama, communication, instructional technology, math, science, social sciences.

DOCTOR OF PHILOSOPHY

Education Major

Faculty from the department participate in the delivery of the PhD with a major in education. Concentrations and specializations are available in the following areas.

- Early childhood education (early childhood special education)
- Educational administration and supervision
- Literacy, language, and ESL education (literacy, language education, ESL education)
- Teacher education (elementary education, mathematics education, science education, social science education)

Information on admission appears at the beginning of the College of Education, Health, and Human Sciences section of this catalog.

EDUCATION MAJOR

Early Childhood Education; Literacy, Language, and ESL Education; and Teacher Education Concentrations

Students in these three concentrations share a common set of course requirements with credits required as shown below. Doctoral committees may require students to take additional hours to fulfill degree requirements.

	Hours Credit
*Research Area	15
**Core Requirements.....	8
Concentration/Specialization	15
Cognate	6
Dissertation	24

Note: Please refer to the academic department for additional information on course requirements in each of these areas.
 *Must include Theory and Practice in Teacher Education 640 (3)
 **Seminar in Primary Concentration (3); Theory and Practice in Teacher Education 604, 605, 617.

Educational Administration and Supervision Concentration

The PhD with a major in education is offered with a concentration in educational administration and supervision. The mission of the educational administration and supervision program is to develop leaders committed to the cultivation of integrity, intelligence, identity, and imagination in promoting educational policy and practice.

- Integrity involves cultivating an acute sense of right and wrong and possessing the courage and conviction to act upon moral principles.
- Intelligence involves recognizing and employing a variety of talents in aligning philosophy, theory, principles, and practice.
- Identity involves cultivating a conscious awareness and appreciation of personal values and attributes, developing quality interpersonal relationships, and appreciating the interdependence fostered through community.
- Imagination involves expanding the limits of conventional wisdom by creating new ideas and by actively seeking diverse perspectives.

ADMISSION

Students must submit the University of Tennessee, Knoxville, Graduate Application for Admission and the Educational Administration and Supervision Program Application for Graduate Study. Applicants must submit current (taken within the past 5 years) GRE scores that equal or exceed the minimums expected for applicants to the PhD with a major in Education. Three letters of reference from those who know of the candidate's leadership record and promise are required. An overall GPA of 3.3 in previous graduate study is required for admission to doctoral study and an interview with the faculty may be required. Admissions decisions are made on a holistic basis to discern the candidate's promise for doctoral study and to ascertain the match of the candidate's educational goals with the resources and goals of the department.

REQUIREMENTS

The doctoral program involves approximately 51 semester hours beyond the master's degree, completion of a comprehensive examination, completion of the residency requirement, and submission and defense of the doctoral dissertation. Core educational experiences in leadership and organizational theory, educational history/philosophy, ethics, and policy/research will be required of all doctoral students. Core experiences are complemented by focused study in specializations (urban administration, research, administrative licensure, etc.) via selected courses in the college, in cognate work in departments outside the college, and in readings/independent studies/internship course experiences.

An overall GPA 3.5 on all doctoral work is required to sit for the comprehensive examination. Admission to candidacy requires successful completion of a written and oral comprehensive examination as required by Graduate Studies.

	Hours Credit
Core Requirements*	15
Research**	15
Specialization	15
Cognate	6
Leadership Forum	12
Dissertation	24

Total 87

*Educational Administration 605, 629, 670, 680, 690.

**Educational Administration 614, 615, 616, 617, 690.

Graduate Certificate in Urban Education

The Department of Theory and Practice in Teacher Education offers a graduate certificate in urban education for experienced urban teachers. A cohort group is competitively selected each year. Participants complete a 12-credit, four-course program of study over a two-year period. First-year courses are Theory and Practice in Teacher Education 595 and 540. Second-year courses are Theory and Practice in Teacher Education 595 and 550.

Prereq: 431 or consent of instructor.



College of Engineering

Way Kuo, Dean and University Distinguished Professor
Wayne T. Davis, Associate Dean for Research and Technology
Luther R. Wilhelm, Associate Dean for Academic Affairs
Masood Parang, Associate Dean for Student Affairs

http://www.engr.utk.edu/coe/graduate/new_index.html

Departments

Chemical Engineering
Civil and Environmental Engineering
Electrical and Computer Engineering
Industrial and Information Engineering
Materials Science and Engineering
Mechanical, Aerospace, and Biomedical Engineering
Nuclear Engineering

Facilities for Research and Service

Measurement and Control Engineering Center
Center of Excellence for Materials Processing
Maintenance and Reliability Center

The college had its beginnings in the university when surveying was introduced into the curriculum in 1838. The first two professional degrees, Civil Engineer and Mining Engineer, were established in 1879 at the same time that the Board of Trustees authorized the establishment of a graduate school. Known as Mechanic Arts originally, Engineering became a college in 1904.

The purpose of the College of Engineering is to educate men and women to the high levels of research, technical competence, and social understanding that will enable them to fulfill their responsibilities as professional engineers.

Graduate programs of the College of Engineering provide opportunities for advanced study leading to the Master of Science and the Doctor of Philosophy degrees. For a listing, consult majors and degrees available on the Majors and Degree Programs chart.

Dual MS-MBA

The College of Business Administration and the College of Engineering offer an integrated program leading to the conferral of the Master of Business Administration degree with a major in business administration (concentration in operations management) and the Master of Science degree in one of the following engineering majors: aerospace, biomedical, chemical, computer, electrical, engineering science, industrial, materials science, mechanical, and nuclear engineering (refer to each major for specific information and requirements).

The establishment of the dual degree program addresses the critical need for personnel trained in both engineering and management who can integrate an increasingly complex body of knowledge for rapid introduction of new products to the marketplace. The objective of the dual degree program is to prepare graduates to take a leading management role in companies that must react quickly to a dynamic market where forces of competition require rapid changes via short cycles in design, manufacturing, and product development. Since the development of a commercial product is a central part of the program, this program is also for students who wish to become an entrepreneur.

ADMISSION

Applications are accepted for fall semester only. Applicants for the MS-MBA program must make separate application to, and be competitively and independently accepted by, the Office of Graduate and International Admissions for the Master of Business Administration degree program and the office of Associate Dean for Student Affairs at the College of Engineering.

Students will initially apply for the MBA program, indicating on their application the intent to pursue the dual MS-MBA program and the appropriate engineering major (refer to the MBA program for separate instructions). Students accepted for both the MBA and the MS with a major in one of the participating engineering majors will be assigned to Dual Program Committee advisors, who will be responsible for course approval and supervision of the students' progress through the dual program.

Applications by U.S. citizens and permanent residents received after the MBA application deadline (March 1) will be considered as space allows. Additional information is required and different application dates are established by the Office of Graduate Admissions for international students.

REQUIREMENTS

All engineering students enrolled in the program must complete common coursework designed to provide them with an integrated, multidisciplinary teamwork experience. The MBA curriculum in product development and manufacturing consists of 30 hours of common course work in the College of Business Administration and 12 hours of common coursework in the College of Engineering. Engineering common coursework includes a culminating three-hour integrated project course requiring a comprehensive report, and a final examination as required by the Dual Program Committee, to be taken during the first session of summer following the second year.

During the second year dual degree candidates will take courses in their engineering major. The coursework for each option is designed to provide students with a concentration in their major and advanced skills to accomplish their teamwork assignments.

The dual degree candidate must satisfy the curriculum and graduation requirements of both the engineering major being pursued and the College of Business Administration. Students withdrawing from the dual degree program before completing both degrees will not receive credit toward graduation in either degree program for courses taken in the other degree program, except as such courses qualify for credit without regard to the dual degree program. The MS and the MBA degrees will be awarded upon successful completion of the requirements of the dual degree program.

Approval Dual Credit

A maximum of 15 semester hours of the Engineering courses may be counted toward the MBA degree program.

College Requirements for the Doctor of Philosophy Degree

Detailed minimum university requirements for the various doctoral degrees are listed on pages 34-36 of this catalog. Most departments have additional specific requirements listed in their portion of the catalog listings. The college of Engineering has the following specific requirements that must be met for all doctoral degree programs in the college.

- A minimum of 72 hours of graduate credit (coursework plus research and dissertation)
- A minimum of 24 hours Doctoral Research and Dissertation
- A minimum of 36 hours of graduate coursework hours. Departments, programs and/or dissertation committees may impose a higher minimum.

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, chemical engineering, electrical engineering, engineering science, industrial engineering including engineering management, materials science and engineering, mechanical engineering, and mathematics and physics. All programs lead to the Master of Science degree. Also, PhD programs are available in many of these fields. Information may be obtained from the Registrar, The University of Tennessee Space Institute, Tullahoma, Tennessee 37388.

Department of CHEMICAL ENGINEERING

<http://www.che.utk.edu/>

John R. Collier, Head

Paul D. Frymier, Graduate Liaison

Professors

Bienkowski, P.R., PhDPurdue
Collier, J.R., PhDCase Institute of Technology
Counce, R.M., PhDTennessee
Moore, C.F. (Distinguished Service Professor), PhD, PELouisiana State
Sheth, Atul C. (UTSI), PhDNorthwestern

Associate Professors

Bruns, D.D., PhDHouston
Edwards, B.J., PhDDelaware
Frymier, P.D., PhDVirginia
Keffer, D.J., PhDMinnesota
Petrovan, S. (Research) PhDIasi Tech
Wang, T.W., PhDMassachusetts Institute of Technology
Weber, F.E., PhDMinnesota

Adjunct Faculty

Arnold, J.S., PhDTennessee
Steele, W.V., PhDQueens (Belfast)

Emeriti Faculty

Holmes, J.M., PhDTennessee
Prados, J.W., PhD, PETennessee

MAJOR

Chemical Engineering.....MS, PhD

DEGREES

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

CORE GRADUATE CLASSES IN CHEMICAL ENGINEERING

A graduate degree in chemical engineering requires the mastery of the core fundamentals of the discipline. These fundamentals are represented by five core courses: 505, 531, 547, 548, and 551. Both the master's (thesis and non-thesis) and doctoral degrees in chemical engineering require the successful completion of these core courses.

ADDITIONAL COURSEWORK

In addition to the core classes, supplementary coursework appropriate for each graduate degree will be needed. The coursework beyond the core courses is determined in consultation with the student's advisor and dissertation or thesis

committee and must be approved by the committee and the department head.

MASTER OF SCIENCE

Chemical Engineering Major

REQUIREMENTS

Thesis Option

The standard master's program includes a thesis and leads to the Master of Science. Minimum departmental requirements are as follows:

- A total of at least 21 semester hours in graduate level courses (excluding 500 and 501) in chemical engineering and related areas beyond the baccalaureate. These courses must include the five core courses (see above).
- Research and a thesis to give at least 9 hours of credit in 500.
- Active participation in graduate seminars in the department. Resident students must register for 501 every semester it is offered.
- A final oral examination covering the thesis and related fields and graduate coursework.

Non-Thesis Option

Under certain conditions, a candidate may apply for a non-thesis program. To be eligible, a candidate must show evidence of significant professional experience after the baccalaureate degree; at least five years of industrial experience or research publications would be examples of such evidence. The departmental faculty will consider each application individually. Upon acceptance, the requirements for completion of the non-thesis option are as follows:

- A total of at least 33 hours in graduate courses in chemical engineering and related areas beyond the baccalaureate. These courses must include the 5 core courses (see above).
- Completion of a critical review of the literature and other sources in an area related to chemical engineering (Chemical Engineering 580).
- A written comprehensive examination over the major field and an oral examination covering the review paper and related areas.

DOCTOR OF PHILOSOPHY

Chemical Engineering Major

REQUIREMENTS

Students may apply directly to the PhD program either with or without having completed a master's thesis. Students proceeding directly to the PhD program from a baccalaureate degree should submit evidence of outstanding performance in a rigorous undergraduate program and the ability to perform independent research at the doctoral level.

A total of 72 credit hours beyond the bachelor's degree are required for the PhD degree. These consist of coursework hours and research and dissertation credit hours (Chemical Engineering 600). Specifically, the department requirements consist of the satisfactory completion of

- A minimum of 36 semester hours in graduate level courses (excluding 600) in chemical engineering and related fields beyond the baccalaureate. These courses must include the five core courses (see above) and at least 6 hours of courses at the 600 level from the University of Tennessee, Knoxville.
- The comprehensive examination, consisting of a written part and an oral part. The written part covers the core fundamentals of the program. The defense of the dissertation proposal constitutes the oral portion of the exam.
- A minimum of 24 credit hours of research and dissertation credit in Chemical Engineering 600. Registration must be continuous from the time research begins (see the Continuous Registration requirement in the Graduate Program Requirements).
- Successful oral defense of the dissertation before the student's dissertation committee.
- Active participation in graduate seminars conducted by the department. Resident students must register for 501 every semester offered.

Curriculum For Dual MS-MBA Chemical Engineering Major

August—First Year

Business Administration 511 MBA Core I3

Fall—First Year

Business Administration 512 MBA Core II.....15
Mechanical Engineering 5041

Spring

Business Administration 513 MBA Core III 9
Mechanical Engineering 506 2
Mechanical Engineering 508 3

Summer

—Internship —
Chemical Engineering 509 1

Fall—Second Year

Chemical Engineering 5091
—Departmental/Engineering Courses* 9

Spring

—MBA Hub Course Elective 3
Chemical Engineering 5091
— Departmental/Engineering Courses*9

Summer (first session)

Chemical Engineering 5943

Total 60

*The departmental courses include the five required departmental core courses.

Graduate Certificate in Maintenance and Reliability Engineering

The College of Engineering offers a graduate certificate in maintenance and reliability engineering. The program is designed primarily for part-time students in that several of the courses are available through distance education.

The 12-credit certificate is earned by completing 483 and 484, which are cross-listed among all participating departments in the College of Engineering, plus two elective courses selected from a list of courses provided by the participating departments. Currently, the available elective courses are Chemical Engineering 561, Industrial Engineering 516 and 591,

Mechanical Engineering 534 and 599, and Nuclear Engineering 579 and 585. The selection of elective courses is determined through an advising conference with each individual student, and is based on the student's personal interests, academic background, and work experience. Applicants must meet the minimum criteria established by the Graduate Council.

Department of CIVIL AND ENVIRONMENTAL ENGINEERING

<http://www.engr.utk.edu/civil/>

Gregory D. Reed, Head
Richard M. Bennett, Graduate Liaison

Professors

Bennett, R.M., PhD, PEIllinois
Burdette, E.G. (Fred N. Peebles Professor), PhD, PEIllinois
Chatterjee, A., PhD, PENorth Carolina State
Davis, W.T. (Associate Dean), PhDTennessee
Deatherage, J.H., PhD, PETennessee
Drumm, E.C. (Research Fellow), PhD, PEArizona
Penamadu, D. (Research Fellow), PhDGeorgia Tech
Reed, G.D., PhD, PEArkansas
Robinson, R.B. (Fisher Professor), PhD, PEIowa State
Urbanik, T. (Goodrich Chair), PhD, PETexas A&M
Wegmann, J., PhDNorthwestern

Associate Professors

Cox, C.D., PhD, PEPenn State
Han, L.D., PhDCalifornia (Berkeley)
Miller, T.L., PhD, PETennessee
Richards, S.H., PhD, PETennessee
Robinson, K.G., PhDVirginia Tech

Assistant Professors

Chu, K.H., PhD, PECalifornia (Berkeley)
Gentry, R., PhD, PEMemphis
Huang, B. (Research Fellow), PhD, PELouisiana State
Schwartz, J., PhD, PEIllinois

Emeriti Faculty

Goodpasture, D.W., PhD, PEIllinois
Tschantz, B.A., ScD, PENew Mexico State

MAJORS

Civil EngineeringMS, PhD
Environmental EngineeringMS

DEGREES

The Department of Civil and Environmental Engineering offers degrees leading to the Master of Science and Doctor of Philosophy with a major in civil engineering concentrating in construction engineering, environmental engineering, geotechnical/materials engineering, public works engineering, structural engineering, and transportation engineering; to the Master of Science in environmental engineering with concentrations in water quality, water resources, air quality, mixed waste management, waste management, and environmental risk assessment.

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

Master of Science

The Master of Science programs in civil engineering and environmental engineering are offered to graduates of recognized undergraduate curricula. Both degree programs have thesis and non-thesis options. It is the policy of the department that students supported by university-related financial aid complete an integrated project, which is defined as a Thesis (Civil Engineering/Environmental Engineering 500) or Special Problem (Civil Engineering/Environmental Engineering 590). The appointment letter may specify which of the two options must be selected.

Civil Engineering Major

Departmental requirements provide that for a major in civil engineering, the bachelor's degree must be in civil engineering, or certain undergraduate prerequisite courses must be taken before Admission to Candidacy. The Department of Civil and Environmental Engineering offers both thesis and non-thesis options for the Master of Science with a major in civil engineering. Either option must be approved by the student's major professor.

Thesis Option

A minimum of 30 semester hours of approved graduate courses, including 6 hours of thesis, is required.

Non-Thesis Option

A minimum of 33 semester hours of approved graduate courses, is required, which may include a 3-hour special problems course to be completed under the direction of the student's major professor.

Environmental Engineering Major

For a Master of Science with a major in environmental engineering, normally a bachelor's degree in a field of engineering is required. For a student who does not have an engineering background, the following minimum prerequisite courses will be required: Engineering Fundamentals 151, 152; Statistics 251; Civil Engineering 380, 390, and 395 or 416; Mathematics 141, 142, 231, 241; Chemistry 120, 130. In general, these must be completed with a B average before courses for graduate credit can be taken. The Department of Civil and Environmental Engineering offers both thesis and non-thesis options for the Master of Science with a major in environmental engineering. Either option must be approved by the student's major professor.

Thesis Option

A minimum of 30 semester hours of approved graduate courses, including 6 hours of thesis and a minimum of 15 semester hours of approved environmental engineering coursework, is required. A minor may be selected but is not required.

Non-Thesis Option

A minimum of 33 semester hours of approved graduate courses is required, which may include a 3-hour special problems course to be completed under the direction of the student's major professor. The major shall include a minimum of 18 semester hours of approved environmental engineering coursework including a minimum of 9 semester hours of

advanced engineering design courses selected from a list provided by the student's committee. A minor may be selected but is not necessarily required.

DOCTOR OF PHILOSOPHY

Civil Engineering Major

A graduate program leading to the Doctor of Philosophy is offered with a major in civil engineering. Specific departmental requirements for the PhD include

- A minimum of 72 semester hours beyond the bachelor's degree, exclusive of credit for the MS thesis. Of this number, a minimum of 24 semester hours in 600 Doctoral Research and Dissertation will be required. It is expected that the research work will be in journal publication form prior to approval of the dissertation.
- A minimum of 18 semester hours of graduate courses in civil engineering or environmental engineering, exclusive of thesis or dissertation credit, at least 6 hours of which must be 600-level courses.
- Additional coursework in civil engineering, environmental engineering, or related scientific and engineering fields, amounting to a minimum of 18 semester hours, subject to approval by the student's faculty committee. These related fields will normally include such disciplines as mechanics, chemistry, mathematics, microbiology, physics, and other engineering fields. A minimum of 6 semester hours of mathematics will be required beyond the civil engineering undergraduate requirements.
- At the discretion of the student's dissertation committee and depending on the student's background, more than 36 hours of courses may be required.
- A maximum of 24 course credits from the master's degree may be used to satisfy the course requirements for the PhD.
- One foreign language if the student's faculty committee feels that a reading knowledge of a foreign language is crucial to the student's research efforts.
- Upon completion of at least one-half of all coursework, each student must pass a comprehensive examination.

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

Environmental Policy Minor

The department participates in a program designed to give graduate students an opportunity to develop an interdisciplinary specialization in environmental policy. See Department of Economics for program description.

Department of ELECTRICAL AND COMPUTER ENGINEERING

<http://www.ece.utk.edu/>

Samir El-Ghazaly, Head

Jack S. Lawler, Graduate Liaison

Professors

Abidi, M., PhD	Tennessee
Birdwell, J.D., PhD	Massachusetts Institute of Technology
Bomar, B.W. (UTSI), PhD	Tennessee
Bouldin, D.W., PhD	Vanderbilt
El-Ghazaly, S.M., PhD	Texas (Austin)
Kuo, W., PhD (Dean and University Distinguished Professor).....	Kansas State
Pace, M.O., PhD.....	Georgia Tech
Lawler, J.S., PhD	Michigan State
Pujol, S.A. (UTSI), PhD	Vanderbilt
Roberts, M.J., PhD	Tennessee

Associate Professors

Crilly, P.B., PhD	New Mexico State
Fathy, A., PhD	Polytechnic Institute Of New York
Islam, S.K., PhD	Connecticut
Koch, D.B., PhD	Missouri (Rolla)
Kong, S.G., PhD	UCLA
Smith, L.M. (UTSI), PhD	Tennessee

Assistant Professors

Blalock, B.J., PhD	Georgia Tech
Chiasson, J.N., PhD	Minnesota
Djouadi, S. M., PhD	McGill (Canada)
Elhanany, I., PhD	Ben-Gurion (Israel)
Ferdjallah, M., PhD	Texas (Austin)
Howlader, M.M.K., PhD	Virginia Tech
Peterson, G.D., DSc	Washington University
Qi, H., PhD	North Carolina State
Tolbert, L.M., PhD	Georgia Tech
Wu, J., PhD	Notre Dame

Emeriti Faculty

Alexeff, I., PhD, PE	Wisconsin
Gonzalez, R.C., PhD	Florida
Green, W.L., PhD	Texas A&M
Roth, J.R., PhD	Cornell

MAJOR

Computer Engineering	MS, PhD
Electrical Engineering.....	MS, PhD

DEGREES

The Department of Electrical and Computer Engineering offers graduate programs leading to the Master of Science and Doctor of Philosophy with a major in electrical engineering or computer engineering. Graduate students are able to conduct research in a wide variety of areas of electrical engineering including communications, electromagnetics, robotics, intelligent control, mixed-signal electronics, microelectronics, plasma engineering, power electronics and systems, and electric power systems. Research areas in computer engineering include computer architecture, networks, image processing, computer vision, VLSI system design, embedded systems, data fusion, data visualization, data structures and information systems.

The Departmental Graduate Committee is responsible for administering, promoting, and advancing the general well-being of the graduate program. Departmental actions regarding a graduate student may be appealed in writing, first to the departmental graduate committee and then to the department faculty.

The requirements outlined below apply to graduate degrees in both electrical engineering and computer engineering. The research project emphasis and/or the specific courses taken will determine the actual degree awarded.

Master of Science

Computer Engineering Major • Electrical Engineering Major

Graduate work leading to the Master of Science with a major in electrical engineering or computer engineering may be completed during three semesters of full-time study, or two to three years of part-time study.

ADMISSION

Applicants for admission to the MS program are expected to have completed a bachelor's degree in electrical engineering or computer engineering with an average of at least 3.0 out of 4.0, both overall and in the senior year. In addition, all applicants are required to submit scores from the General Graduate Record Exam (GRE). Applicants whose native language is not English, including those who have earned degrees at U.S. institutions must score at least 213 on the computer-based TOEFL exam or 550 on the written exam to be considered for admission to the program.

Applicants who hold the bachelor's degree in other fields of engineering, computer science, mathematics, or the physical sciences are also expected to have a minimum cumulative grade-point average of 3.0 and a minimum senior year average of 3.0 in that field. The department will require that selected undergraduate courses be taken as determined by the applicant's prior education and experience. The student will be admitted under non-degree status until the required undergraduate courses are successfully completed with a 3.0 average.

REQUIREMENTS

Students may choose between a thesis option, a non-thesis course-only option, and a non-thesis project option MS program. All students must file a Master's Program Plan with the departmental graduate committee specifying which option they have selected, a semester-by-semester schedule of the courses they intend to take, and the members of the student's master's committee. Students may change between options one time by filing an amended Master's Program Plan and with approval of the departmental graduate committee. A student who receives financial support under a research assistantship is enrolled in the thesis option by default. Students who have held a research assistantship will require approval from the departmental graduate committee to change to one of the non-thesis options. Candidates for the MS with a major in computer engineering are required to take at least two courses from the ECE 55x series as part of their curriculum.

Thesis Option

Specific requirements of the thesis option are a minimum of 30 semester hours including

- Six semester hours of mathematics at the 400 level* or above selected from a list approved by the graduate committee, or 6 semester hours of ECE courses at the 500 level or above, or 6 semester hours of non-ECE courses approved by the student's master's committee and the graduate committee.

- An additional 18 semester hours of 400-level* or above work in electrical and computer engineering, with at least 6 hours of 500-level or 600-level work in each of two areas of electrical and computer engineering.
- Master's thesis, totaling 6 semester hours.
- A final oral examination covering the thesis and related coursework.

Non-Thesis Courses Only Option

Specific requirements of the non-thesis courses only option are a minimum of 30 semester hours including

- Six semester hours of mathematics at the 400 level* or above selected from a list approved by the graduate committee, or 6 semester hours of ECE courses at the 500 level or above, or 6 semester hours of non-ECE courses approved by the student's master's committee and the graduate committee.
- An additional 24 semester hours of 400-level* or above work in electrical engineering or computer engineering, with 18 of the hours at the 500-level or 600-level. Of the 18 hours required at the graduate level, at least 6 hours of work in each of two areas of electrical engineering or computer engineering and an additional 6 hours outside of the two areas.
- A final comprehensive written examination. This examination will be given in January and August.

Non-Thesis Project Option

Specific requirements of the non-thesis project option are a minimum of 30 semester hours including

- Six semester hours of mathematics at the 400 level* or above selected from a list approved by the graduate committee, or 6 semester hours of ECE courses at the 500 level or above, or 6 semester hours of non-ECE courses approved by the student's master's committee and the graduate committee.
- An additional 21 semester hours of 400-level* or above work in electrical engineering or computer engineering, with 15 of the hours at the 500-level or 600-level. Of the 15 hours required at the graduate level, at least 6 hours of work in each of two areas of electrical engineering or computer engineering and an additional 3 hours of work outside of the two areas.
- ECE 501 (Project in Lieu of Thesis) with a minimum grade of B. This course will be administered by the student's master's committee. A written project proposal describing what the student will do in the course must be submitted in advance for the graduate committee's approval. A written final report and oral presentation is required and one copy of the final draft must be submitted to the graduate committee.
- A final written and oral examination covering the project and related coursework.

*NOTE: At least two thirds of the minimum required hours must be taken in courses numbered at or above the 500 level.

DUAL MS-MBA

Curriculum For Dual MS-MBA Computer Engineering Major - Electrical Engineering Major

August—First Year

Business Administration 511 MBA Core I.....3

Fall—First Year

Business Administration 512 MBA Core II.....15
Mechanical Engineering 5041

Spring

Business Administration 513 MBA Core III9
Mechanical Engineering 5062
Mechanical Engineering 5083

Summer

— Internship —
Electrical and Computer Engineering 509.....1

Fall—Second Year

Electrical and Computer Engineering 509.....1
— Departmental/Engineering Courses9

Spring

— MBA Hub Course Elective3
Electrical and Computer Engineering 509.....1
— Departmental/Engineering Courses9
Electrical and Computer Engineering 594.....3

Total 60

DOCTOR OF PHILOSOPHY

Computer Engineering Major - Electrical Engineering Major

The PhD is offered with a major in computer engineering or electrical engineering. Exceptional students holding the bachelor's degree may be admitted to the doctoral program without first obtaining a master's degree. Candidates holding the MS must satisfy requirements 2 through 7 below while candidates holding only the BS must satisfy requirements 1 through 7.

Applicants are required to submit scores from the General Graduate Record Exam (GRE). A TOEFL score of 550 on the written exam or 213 on the computer exam is required for non-native speakers of English, including those who have earned degrees at U.S. institutions. Specific departmental requirements for the PhD include

1. For students holding only a BS, a minimum of 48 course hours is required. The first 24 course hours should satisfy:
 - a. Six semester hours of mathematics at the 400 level or above selected from a list approved by the graduate committee, or 6 semester hours of ECE courses at the 500 level or above, or 6 semester hours of non-ECE courses approved by the student's master's committee and the graduate committee.
 - b. An additional 18 semester hours of 400-level or above work in electrical and computer engineering, with at least 6 hours of 500-level or 600-level work in each of two areas of electrical and computer engineering.

In addition, the student must satisfy requirements 2 through 7 below.

2. For students holding an MS, a minimum of 24 semester hours of coursework excluding research and dissertation credit or seminar courses must be taken at the University of Tennessee, Knoxville. These hours must include:
 - a. A minimum of 12 semester hours in electrical and computer engineering at the 500 and 600 levels.
 - b. A minimum of 9 semester hours of 600-level coursework. At least 3 hours of this work must be in an area other than the student's major area.
 - c. A minimum of 6 hours of mathematics at the 500 level or above and approved by the departmental graduate committee.
3. Satisfactory performance on a qualifying examination. Separate qualifying examinations are offered for electrical engineering and for computer engineering. The qualifying examination is prepared by the Electrical and Computer Engineering faculty and consists of two 4-hour written examinations covering courses required in the undergraduate electrical and computer engineering curriculum through the junior level. The qualifying examination is offered twice each year (January and August), and a student is to take it the first time it is offered after the student enrolls in the program. A student who fails the qualifying examination must take and pass the examination the next time it is offered to remain in the program. A minimum of 12 hours of coursework must be completed after the student has taken the qualifying examination the first time.
4. Satisfactory performance on a comprehensive examination. The comprehensive examination is administered by the student's committee; the exam results are reported to the graduate committee for approval; and the exam is filed in the department. The comprehensive exam is given when the student is ready to apply for admission to candidacy. The comprehensive examination consists of both written and oral parts. The written part consists of at least two sections: a complete review of the literature in the student's dissertation topic, and a review of the major tools to be used in the dissertation work. The student's committee may require additional written sections. The student must demonstrate a mastery of the dissertation area, ability to think analytically and creatively, skill in using academic resources, and ability to complete the dissertation satisfactorily. The oral part of the comprehensive examination consists primarily of a professional presentation of a proposal for dissertation work and its defense. The committee may cover additional topics in the oral part.
5. Participation in departmental seminars.
6. A minimum of 24 hours of doctoral dissertation.
7. Successful public defense of the dissertation by the student.

Department of INDUSTRIAL AND INFORMATION ENGINEERING

<http://www.engr.utk.edu/ie/>

Adedeji B. Badiru, Head

Denise F. Jackson, Graduate Liaison

Professors

Badiru, A.B., PhD, PECentral Florida
Ding, F., PhDNorth Carolina State
Garrison, G.W. (UTSI), PhD.....North Carolina State
Kuo, W. (Dean and University Distinguished Professor),PhDKansas State

Associate Professors

Aikens III, C.H., PhDTennessee
Hailey, M.L. (UTSI), PhD, PETexas Tech
Jackson, D.F., PhD, PETennessee
Sawhney, R.S., PhDTennessee

Assistant Professors

Ford, R.E., PhD Tennessee
Jeong, M., PhD.....Georgia Tech
Kim, D., PhD..... Florida
Kong, D., PhDPenn State

Research Faculty and Staff

Halstead, P.D., BSState University of New York

MAJOR

Industrial Engineering MS, MS-MBA, PhD

DEGREES

The Department of Industrial and Information Engineering offers graduate degrees leading to the Master of Science and a Doctor of Philosophy with a major in industrial engineering.* These degrees offer concentrations in traditional industrial engineering, information engineering, engineering management, human factors engineering, manufacturing systems engineering, and product development and manufacturing (available only in the dual MS/MBA program).

The Departmental Graduate Committee is responsible for administering, promoting, and advancing the general well being of the graduate program. Departmental actions regarding a graduate student may be appealed in writing, first to the departmental graduate committee and then to the departmental faculty.

ADMISSION

Applicants must first submit a formal Graduate Application for Admission. In addition to the minimum requirements of the Graduate Council, the Department of Industrial and Information Engineering requires

- three rating forms or letters of reference
- GRE scores
- essay (two double-spaced pages—contact department for current topic)

The graduate committee in the department sets any prerequisite courses or other measures that apply to the particular situation of the applicant. The department and the Office of Graduate Admissions must be notified of any change in the entering date after admission has been granted.

MASTER OF SCIENCE

Industrial Engineering Major

Students who enroll in the Master of Science program may select a concentration in industrial engineering, information engineering, engineering management, human factor engineering, manufacturing systems engineering or product development and manufacturing. Each of these concentrations, with the exception of the product development and manufacturing, allows a student to select either a thesis or non-thesis option. Students who select the manufacturing systems engineering concentration of the dual degree program must select the non-thesis option. The thesis option requires 27 hours of coursework and six hours thesis. The non-thesis option requires 30 hours of coursework and a 3-hour design project; the engineering management concentration requires an additional three hours.

Industrial Engineering Concentration

Depending upon a student's background and career objectives, graduate work in industrial engineering enables the student to select an area of specialization from operations research, human factors engineering, information systems engineering, maintenance and reliability engineering, or general industrial engineering.

Information Engineering Concentration

Information engineering is concerned with the specification, design, implementation and management of data- and knowledge-intensive information systems. The engineering of large-scale information systems requires knowledge and practical experience in areas such as database management systems, data modeling, information optimization, knowledge acquisition, data/knowledge representation, software systems engineering, and network design and management.

Engineering Management Concentration

The engineering management concentration has an additional admission requirement of two years relevant experience as a practicing engineer or scientist. This concentration is fully supported off-campus utilizing electronic media for videotaping and interactive distance teaching methods.

Human Factors Engineering Concentration

Human factors engineering is concerned with ways of designing jobs, machines, operations, and work environments so they are compatible with human capacities and limitations. The human factors practitioner, operating within an industrial or service environment, is called upon both to apply existing human performance knowledge to the design or modification of work and workplaces and also to generate new experimental data required for system design and evaluation.

Manufacturing Systems Engineering Concentration

Under the manufacturing systems engineering concentration, students learn strategies for improving product quality, implementing various production strategies, analysis of production planning and scheduling systems, and supplier and distribution integration. Dual degree students can select manufacturing systems engineering as an option.

Product Development and Manufacturing Concentration

The product development and manufacturing concentration is a non-thesis option, available only to students taking the dual MS-MBA program.

DUAL MS-MBA

Curriculum for Dual MS-MBA Industrial Engineering Major • Manufacturing Systems Engineering or Product Development and Manufacturing

August—First Year

Business Administration 511 MBA Core I 3

Fall—First Year

Business Administration 512 MBA Core II 15

Industrial Engineering 504 1

Spring

Business Administration 513 MBA Core III 9

Industrial Engineering 506 2

Industrial Engineering 508 3

Summer

Internship —

Industrial Engineering 509 1

Fall—Second Year

Industrial Engineering 509 1

Industrial Engineering Core Courses 9

Spring

MBA Hub Course Elective 3

Industrial Engineering 509 1

Industrial Engineering Concentration Courses 9

Summer (first session)

Industrial Engineering 594 3

Total 60

DOCTOR OF PHILOSOPHY

Industrial Engineering Major

ADMISSION

Admission to the PhD program requires an undergraduate degree and academic background that meets the admission criteria for the master's program in industrial engineering or a Master's degree in industrial engineering (or a closely related field), and previous academic performance that clearly demonstrates the capacity to do original research and technical investigative work and the potential for a successful scholarly career. If admitted, prerequisites (if required) will be established by the graduate committee based on the student's academic background. All students are required to take the Graduate Record Examinations (GRE), and submit three letters of reference and a personal statement about their professional goals. International students are also required to take the Test of English as a Foreign Language (TOEFL).

REQUIREMENTS

The total program of study requires a minimum of 72 graduate hours beyond the bachelor's degree, exclusive of credit for the master's thesis. This includes a minimum of 48 graduate hours of coursework beyond the bachelor's degree and 24 hours of doctoral research and dissertation work. For a master's program completed at another institution or in another field, the requirement may exceed the 48 hours of coursework (other than research and dissertation) dependent on the previous program of study.

Graduate Certificate in Engineering Management

The Industrial and Information Engineering Department of the College of Engineering offers a graduate certificate in engineering management. The program is designed for professionals who work in an engineering organization and are interested in improving their technical management skills and knowledge. The program consists of four graduate courses that are available through distance education.

The 12-semester hour graduate certificate is earned by completing the following four regularly offered courses: Engineering Management 533, 534, 536, and 539.

Graduate credit will be awarded for any course successfully completed with an average of B or better. The credits may be utilized toward a graduate degree later if the student meets all other degree requirements.

Applicants must meet the minimum admission requirements and be admitted to the University of Tennessee, Knoxville Graduate School. The only academic prerequisite for the certificate program is a bachelor's degree from a recognized university or college.

Graduate Certificate in Maintenance and Reliability Engineering

The College of Engineering offers a graduate certificate in maintenance and reliability engineering. The program is designed primarily for part-time students in that several of the courses are available through distance education. The 12-credit certificate is earned by completing 483 and 484, which are cross-listed among all participating departments in the College of Engineering, plus two elective courses selected from a list of courses provided by the participating departments. Currently, the available elective courses are Industrial Engineering 516 and 591, Mechanical Engineering 534 and 599, and Nuclear Engineering 579 and 585. The selection of elective courses is determined through an advising conference with each individual student, and is based on the student's personal interests, academic background, and work experience. Applicants must meet the minimum criteria established by the Graduate Council.

Department of MATERIALS SCIENCE AND ENGINEERING

<http://www.engr.utk.edu/mse/>

Raymond A. Buchanan, Head and Graduate Liaison

Professors

Benson, R.S., PhD	Florida State
Bhat, G.S., PhD	GeorgiaTech
Bresee, R.R., PhD	Florida State
Buchanan, R.A, PhD, PE	Vanderbilt
Collier, B.J., PhD	Tennessee
Dahotre, N.B., PhD	Michigan State
Egami, T., PhD	Pennsylvania
George, E.P., PhD	Pennsylvania
Hansen, M.G., PhD	Wisconsin
Joy, D.C., DPhil	Oxford (UK)
Liaw, P.K., PhD	Northwestern
Lowndes, D.H., PhD	Colorado
Lundin, C.D., PhD	Rensselaer Polytechnic Institute
McHargue, C.J., PhD	Kentucky
Nieh, T.G., PhD	Stanford
Pedraza, A.J., PhD	LaPlata (Argentina)
Pharr, G.M., PhD, PE	Stanford
Simpson, M.L., PhD	Tennessee
Spruiell, J.E., PhD	Tennessee
Wadsworth, L.C., PhD	North Carolina State

Associate Professors

Kit, K., PhD	Delaware
Meek, T.T., PhD	Ohio State

Assistant Professors

Choo, H., PhD	Illinois Institute of Technology
Hu, B., PhD	Chinese Academy of Sciences
Keppens, V., PhD	Katholieke Universiteit Leuven (Belgium)
Rack, P.D., PhD	Florida
Rawn, C.J., PhD	Arizona

Emeriti Faculty

Brooks, C.R., PhD	Tennessee
Fellers, J.F., PhD	Akron
Stansbury, E.E., PhD	Cincinnati

MAJORS

Materials Science and Engineering	MS, PhD
Polymer Engineering	MS, PhD

DEGREES

Graduate programs are offered leading to the degrees of Master of Science and Doctor of Philosophy with a major in materials science and engineering or polymer engineering. Both the materials science and engineering and polymer engineering programs are flexible and interdisciplinary in nature. Students may be admitted from a wide range of disciplines; these include physics, chemistry, chemical engineering, mechanical engineering, electrical engineering, materials engineering, and engineering science programs.

Areas of concentration within the materials science and engineering degree program include metallurgy, polymers, textiles, and materials. Specializations include, but are not limited to: ceramics; composites; electronic materials; physical metallurgy; materials processing; welding metallurgy and materials joining; corrosion science and engineering; biomedical materials; nonwovens science and technology; and mechanical and physical behaviors of materials.

Areas of concentration within the polymer engineering degree program are polymer processing, polymer science, and textile science. Specialty areas include rheology; polymer morphology; mechanical, physical, and chemical behaviors of polymers; composite materials; and nonwovens science and technology.

ADMISSION

Applicants for admission to the MS and PhD programs in materials science and engineering and polymer engineering, are expected to have completed a bachelor's degree in an area of engineering or science with a grade-point-average of at least 3.0 out of 4.0 both overall and in the senior year. In addition, all applicants are required to submit scores from the General Graduate Record Examination (GRE). Applicants whose native language is not English must score at least 213 on the computer-based TOEFL examination or 550 on the written examination to be considered for admission to the programs.

MASTER OF SCIENCE

Materials Science and Engineering Major • Polymer Engineering Major

Thesis Option

A total of 30 hours is required for the MS in either materials science and engineering or polymer engineering. Additional requirements include

- A major consisting of 12 hours of graduate courses in materials science and engineering or polymer engineering. The materials science and engineering major must include 511, 512, 515, and 516 for the metallurgy concentration; 511, 512, 540, and 541 for the polymers concentration; 511, 512, 540, 552, and 553 for the textiles concentration; and 511, 512, and two graduate specialization courses approved by the student's faculty committee for the materials concentration. The polymer engineering major must include 540, 541, 543, 546, 549, and 550 for the polymer processing and polymer science concentrations; and 540, 541 or 543, 549, 550, 552, and 553 for the textile science concentration; exceptions are given if similar material has been covered in prior coursework.
- Additional courses up to 12 hours total in related areas.
- Master's thesis 500, totaling 6 to 12 hours.
- Satisfactory performance on a comprehensive oral examination administered by the faculty committee.

All resident students are required to participate in the graduate seminar in materials science and engineering or polymer engineering, as appropriate, during each semester in which it is offered. Three hours of Materials Science and Engineering 503 or 504 may be counted toward degree requirements.

Non-Thesis Option

Any candidate may apply for a non-thesis option. Upon acceptance, a supervisory committee of three will be appointed. At least two members of the committee will be from the faculty in the major area, either materials science and engineering or polymer engineering. The requirements for completion of the non-thesis option are

- Completion of a total of 30 hours of graduate coursework. At least 18 of those hours must be in the department, and up to 12 hours may be in related areas. Three hours of Materials Science and Engineering 503 or 504

may be counted toward degree requirements. The materials science and engineering major and the polymer engineering major must include the same courses required for the thesis option. The faculty committee must approve the candidate's degree program.

- Satisfactory completion of a culminating experience Materials Science and Engineering 580 (Critical Review) as this course shall include a comprehensive examination administered by the faculty committee.

DUAL MS-MBA

Curriculum For Dual MS-MBA Materials Science and Engineering Major

August—First Year

Business Administration 511 MBA Core I 3

Fall—First Year

Business Administration 512 MBA Core II 15

¹Mechanical Engineering 504 1

Spring

Business Administration 513 MBA Core III 9

¹Mechanical Engineering 506 2

¹Mechanical Engineering 508 3

Summer

— Internship —

Materials Science and Engineering 509 1

Fall—Second Year

Materials Science and Engineering 509 1

— ²Departmental/Engineering Courses 9

Spring

— MBA Hub Course Elective 3

Materials Science and Engineering 509 1

— ²Departmental/Engineering Courses 9

³Materials Science and Engineering 594 3

Total 60

¹Approved related-area courses for the MSE non-thesis Master of Science requirements

²Departmental/Engineering Courses must fulfill MSE non-thesis Masters of Science requirements

³MSE 594 is an approved substitute for MSE 580 for the dual degree program

DOCTOR OF PHILOSOPHY

Materials Science and Engineering Major • Polymer Engineering Major

After one year in residence and with the approval of the faculty, a student may proceed directly to the doctoral program without completion of a master's degree.

REQUIREMENTS

Departmental requirements for completion of the doctoral degree are:

- For students proceeding directly to the PhD from the baccalaureate degree, a minimum of 72 graduate credit hours is required. These hours must include 42 graduate course credit hours with at least six hours of 600-level courses and 30 hours of dissertation. Six hours of Materials Science and Engineering 503 or 504 may be counted toward degree requirements. At least 24 credit hours must be courses taught in the department. The

materials science and engineering major and the polymer engineering major must include the courses required for the master's program. In addition, for students in the textile science concentration of the polymer engineering major, the courses must include 541 and 543.

- For students having a thesis-based master's degree from UT in materials science and engineering or polymer engineering, or a master's degree from another university in materials science and engineering, polymer engineering, or metallurgical engineering, a minimum of 48 graduate credit hours is required. These hours must include 18 graduate course credit hours with at least six hours of 600-level courses and 30 hours of dissertation. Three hours of Materials Science and Engineering 503 or 504 may be counted toward degree requirements. At least 12 credit hours must be courses in the department.
- For students having a non-thesis master's degree from UT in materials science and engineering or polymer engineering, a minimum of 48 graduate credit hours is required. These must include 15 graduate course credit hours with at least six hours of 600-level courses and 33 hours of dissertation. Three hours of Materials Science and Engineering 503 or 504 may be counted toward degree requirements. At least 12 credit hours must be courses in the department.
- Active participation in graduate seminars conducted by the department.

Department of MECHANICAL, AEROSPACE, AND BIOMEDICAL ENGINEERING

<http://www.engr.utk.edu/maes/>

William Hamel Interim Head

Gary V. Smith, Graduate Liaison

Professors

Arimilli, R.V., PhD.....	Virginia Tech
Baker, A.J., PhD, PE	New York
Dareing, D.W., PhD, PE	Illinois
Frankel, J.I., PhD	Virginia Tech
Hamel, W.R., PhD	Tennessee
Jendrucko, R.J., PhD, PE	Virginia
Johnson, W.S., PhD, PE	Clemson
Keyhani, M., PhD	Ohio State
Kihm, K.D., PhD.....	Stanford
Komistek, R.D., PhD	Memphis
Landes, J.D., PhD, PE	Lehigh
Milligan, M.W., PhD PE	Tennessee
Parang, M. (Associate Dean), PhD, PE	Oklahoma
Parsons, J.R., PhD, PE	North Carolina State
Smith, G.V., PhD, PE	Penn State
Soliman, O., PhD, PE	Tennessee
Speckhart, F.H., PhD, PE	Georgia Tech
Wasserman, J.F., PhD, PE	Cincinnati
Weitsman, Y.J. (Distinguished Professor), PhD	Rensselaer Polytechnic Institute

Associate Professors

Boulet, J.A.M., PhD	Stanford
Chellaboina, V.S., PhD.....	Georgia Tech
Freeman, J.S., PhD	Wisconsin
Karsa, M., PhD	Ecole Polytechnique (Canada)

Lumsdaine, A., PhD	Michigan
Lyne, J.E., MD, PhD	North Carolina State
Madhukar, MS, PhD	Drexel
Nguyen, K., PhD	Colorado
Pionke, C.D., PhD, PE	Georgia Tech

Assistant Professors

Bond, R.E., PhD	West Virginia
English, A., PhD	Harvard-Massachusetts Institute of Technology
Mahfouz, M.R., PhD	Colorado School of Mines

Emeriti Faculty

Carley, T.G., PhD, PE	Illinois
Forrester, J.H., PhD, PE	Iowa State
Hodgson, I., PhD, PE	Georgia Tech
Mathews, A., PhD, PE	Illinois
Shannon, T.E., PhD, PE	Tennessee
Snyder, W.T., PhD	Northwestern

MAJOR

Aerospace Engineering	MS, MS-MBA, PhD
Biomedical Engineering	MS, MS-MBA, PhD
Engineering Science	MS, MS-MBA, PhD
Mechanical Engineering	MS, MS-MBA, PhD

DEGREES

Graduate programs leading to the degrees of Master of Science and Doctor of Philosophy are available with majors in mechanical engineering, aerospace engineering, and engineering science. Changing from one of these programs to another requires departmental approval. Each applicant is advised as to any prerequisite courses before entering a program. A dual MS-MBA program with a concentration in product development and manufacturing is also available with a major in mechanical engineering or in engineering science.

In mechanical engineering, program concentrations include dynamics, control, and robotics; energy conversion and utilization; gas dynamics; heat transfer and fluid mechanics; machine design; power generation; product development and manufacturing (MS only); propulsion; space engineering; stress analysis; and thermodynamics.

In aerospace engineering, program concentrations include aeroacoustics; aerodynamics and performance; energy conversion and utilization; flight and aerospace mechanics; gas dynamics; heat transfer and fluid mechanics; propulsion; space engineering; structures and stress analysis; and thermodynamics.

In biomedical engineering, program concentrations include musculoskeletal biomechanics; biofluid mechanics; biomaterials; bioimaging; and cell and tissue engineering.

In engineering science, program concentrations include applied artificial intelligence, biomedical engineering, computational mechanics, fluid mechanics, mechanics of composite materials, solid mechanics, industrial engineering (PhD only), product development and manufacturing (MS only), optical engineering (UTSI only). In each of these concentrations, interdisciplinary programs are arranged to meet individual needs or interests. The flexibility and interdisciplinary aspect of the program concentrations are intended to be of particular interest to prospective students currently employed in research, development, or design activities and whose interests in continuing education (either full-time or part-time) lie at one of the interfaces between science and engineering or can best be met by interdisciplinary study in engineering. The program's course offerings and research activities are also intended to meet the needs of students who seek preparation for employment in engineering areas requiring specialization in mechanics or in related interdisciplinary studies such as bio-mechanics.

In mechanical engineering or aerospace engineering, entrance into the Master of Science program is available to qualified graduates of recognized undergraduate curricula in mechanical or aerospace engineering and to qualified graduates of other curricula who satisfy the necessary prerequisites. A program application is required in addition to the Graduate Application for Admission. Admission into the doctoral program will be granted to those applicants who have demonstrated superior achievement in their engineering backgrounds. The general GRE is required of all applicants for admission.

In Biomedical Engineering, entrance into the graduate program is available to graduates of recognized curricula in engineering, mathematics, or one of the physical sciences who satisfy the necessary prerequisites. A program application is required in addition to the Graduate Application for Admission. The names and addresses of three references must be included with the program application. The general GRE is required of all applicants for admission.

In engineering science, entrance into the graduate program is available to graduates of recognized curricula in engineering, mathematics, or one of the physical or biological sciences. A program application is required in addition to the Graduate Application for Admission. The names and addresses of four references must be included with the program application. The general GRE is required of all applicants for admission.

Each student must satisfactorily complete a program of study that has been approved by his/her advisory committee and complies with the requirements of the Graduate Council. In engineering science, the student's major professor may be selected from a department other than the Department of Mechanical, Aerospace, and Biomedical Engineering; however, at least one member of the student's graduate advisory committee must be on the faculty of the Department of Mechanical, Aerospace, and Biomedical Engineering.

GRADUATE CREDIT FOR UNDERGRADUATE COURSES

Students majoring in mechanical engineering or aerospace engineering may not normally use more than one 400-level engineering course to meet their advanced degree requirements. Undergraduate courses that are required for the bachelor's degree in mechanical engineering may not be taken for graduate credit by graduate students in mechanical engineering. Undergraduate courses that are required for the bachelor's degree in aerospace engineering may not be taken for graduate credit by graduate students in aerospace engineering. For students majoring in engineering science, 400-level courses in engineering may be used for graduate credit at the discretion of the advising committee. However, at least two-thirds of minimum required credit hours in a master's degree program must be at or above the 500-level. With the approval of the student's major department, a student whose major is outside the Department of Mechanical, Aerospace, and Biomedical Engineering may take senior (400-level) courses in the department for graduate credit. Such students should consult with instructors regarding prerequisites for undergraduate courses.

MASTER OF SCIENCE

Aerospace Engineering Major • Biomedical Engineering Major • Engineering Science Major • Mechanical Engineering Major

REQUIREMENTS

In aerospace engineering, mechanical engineering, biomedical engineering, and engineering science, two MS options are offered. Option I requires a thesis and is the normal program for graduate students. Option II does not require a thesis and provides graduate students, including co-op and other off-campus students, the opportunity to focus their programs in special areas through extended coursework.

Aerospace Engineering Major • Mechanical Engineering Major

Credit requirements for these two options in Mechanical Engineering and Aerospace Engineering are:

	Hours Required	
	Option I	Option II
Coursework total	.24	0
• Courses in program (500-level or above)		
Option I – 12 hours minimum		
Option II – 18 hours minimum		
• Mathematics (400-level or above)		
6 hours minimum		
• 590 Selected Engineering Problems		
Option II – 6 hours maximum		
Thesis	.6	n/a
Total	30	30

Biomedical Engineering Major

Credit requirements for these two options in biomedical engineering are:

	Hours Required	
	Option I	Option II
Coursework total	.24	.30
• Engineering courses		
Option I – 12 hours minimum		
Option II – 15 hours minimum		
• Mathematics (400-level or above)		
6 hours minimum		
• Related courses		
Option I – 6 hours		
Option II – 9 hours		
(590 Selected Engineering Problems		
- 6 hours maximum. May include		
additional courses in mathematics,		
computer science, or the physical and		
life sciences, as well as engineering courses.)		
Thesis	.6	n/a
Total	30	30

Engineering Science Major

Credit requirements for these two options in engineering science are:

	Hours Required	
	Option I	Option II
Coursework total	.24	.30
• Engineering courses		
Option I – 12 hours minimum		

- Option II – 15 hours minimum
(Major concentration may include but is not restricted to courses offered by the department)
- Mathematics (400-level or above)
6 hours minimum
- Related courses
Option I – 6 hours maximum
Option II – 9 hours maximum
(May include additional courses in mathematics, computer science, or the physical and life sciences, as well as engineering courses.)
- Selected Engineering Problems
Option II – 6 hours

Thesis	.6	n/a
Total	30	30

For all program options, other 500-level engineering courses that are approved by the student's master's committee and the graduate programs committee may be substituted for the mathematics courses. All program options require participation in the departmental graduate seminars program, and passing a final examination on all work submitted for the degree. The final examinations in Option II will cover all coursework. The thesis option, Option I, requires submission and defense of a written thesis that demonstrates the ability to conduct and report an independent investigation.

DUAL MS-MBA

Curriculum for Dual MS-MBA Degree • Aerospace Engineering Major

August—First Year

Business Administration 511 MBA Core I	3
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Fall—First Year

Business Administration 512 MBA Core II	15
Mechanical Engineering 504	1

Spring

Business Administration 513 MBA Core III	9
Mechanical Engineering 506	2
Mechanical Engineering 508	3

Summer

— Internship	—
Aerospace Engineering 509	1

Fall—Second Year

Aerospace Engineering 509	1
—Departmental/ Engineering Courses	9

Spring

— MBA Hub Course Elective	3
Mechanical Engineering 509	1
—Departmental/ Engineering Courses	9

Summer (first session)

Mechanical Engineering 594	3
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Total 60

Curriculum for Dual MS-MBA Degree • Biomedical Engineering Major

August—First Year

Business Administration 511 MBA Core I	3
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Fall—First Year

Business Administration 512 MBA Core II	15
Mechanical Engineering 504	1

Spring	
Business Administration 513 MBA Core III	9
Mechanical Engineering 506	2
Mechanical Engineering 508	3
Summer	
— Internship	—
Biomedical Engineering 509	1
Fall—Second Year	
Biomedical Engineering 509	1
—Departmental/ Engineering Courses	9
Spring	
— MBA Hub Course Elective	3
Mechanical Engineering 509	1
—Departmental/ Engineering Courses	9
Summer (first session)	
Mechanical Engineering 594	3
<hr/> Total 60	

**Curriculum for Dual MS-MBA Degree •
Mechanical Engineering Major**

August—First Year	
Business Administration 511 MBA Core I	3
Fall—First Year	
Business Administration 512 MBA Core II	15
Mechanical Engineering 504	1
Spring	
Business Administration 513 MBA Core III	9
Mechanical Engineering 506	2
Mechanical Engineering 508	3
Summer	
—Internship	—
Mechanical Engineering 509	1
Fall—Second Year	
Mechanical Engineering 509	1
Mechanical Engineering 551	3
Mechanical Engineering 537	3
Mechanical Engineering 527	3
Spring	
—MBA Hub Course Elective	3
Mechanical Engineering 505	3
Mechanical Engineering 509	1
Mechanical Engineering 510	3
—Math/Engineering Elective (select with advisor).....	3
Summer (first session)	
Mechanical Engineering 594	3
<hr/> Total 60	

**Curriculum for Dual MS-MBA Degree •
Engineering Science Major**

August—First Year	
Business Administration 511 MBA Core I	3
Fall—First Year	
Business Administration 512 MBA Core II	15
Mechanical Engineering 504	1

Spring	
Business Administration 513 MBA Core III	9
Mechanical Engineering 506	2
Mechanical Engineering 508	3
Summer	
— Internship	—
Mechanical Engineering 509	1
Fall—Second Year	
Mechanical Engineering 509	1
— Engineering Courses	9
Spring	
— MBA Hub Course Elective	3
Mechanical Engineering 509	1
— Engineering Courses	9
Summer (first session)	
Mechanical Engineering 594	3
<hr/> Total 60	

Dual degree candidates enrolled in engineering science are required to take 18 hours of graduate level engineering courses during the second year of the program. This program requires a coursework plan, approved by the Dual Program Committee, including a concentration such that the student can accomplish his/her teamwork assignments.

DOCTOR OF PHILOSOPHY

Aerospace Engineering Major • Biomedical Engineering Major • Engineering Science Major • Mechanical Engineering Major

REQUIREMENTS

All students must complete a minimum of 72 semester hours beyond the bachelor’s degree, exclusive of credit for the master’s thesis. These shall include a minimum of 24 semester hours in Doctoral Research and Dissertation and a minimum of 48 semester hours in other courses.

In mechanical engineering, aerospace engineering, or biomedical engineering, the courses must include

- A minimum of 12 semester hours of graduate credit in mathematics in courses numbered 400 or above with a minimum of 6 semester hours numbered 500 or above.
- A minimum of 24 semester hours in the department in courses numbered 500 and above, with at least 12 of these semester hours in the major. A minimum of 9 semester hours of courses is required at the 600 level. These are exclusive of thesis, problems, or dissertation credit. The student’s advisory committee can approve a student’s petition to replace one 600-level course with one or more 500-level course(s) that are more appropriate.
- In engineering science, the courses must include
- A minimum of 24 semester hours in engineering graduate courses, exclusive of thesis and dissertation credit. These courses will normally be numbered 500 and above, with at least 9 semester hours of 600-level courses, which constitute one or two areas of concentration selected by the student. The number of courses in this group to be taken will depend on the program selected by the student and the approval of his/her advisory committee.
- A minimum of 12 semester hours in mathematics or computer science in courses numbered 400 and above, exclusive of a first course in ordinary differential equations.

- Additional requirements for all students include
- Registration and participation in the graduate seminar in the major program.
- Meet all departmental examination requirements, which include passing a written and oral comprehensive examination.
- Presentation of a dissertation proposal to the student's advisory committee and approval of that proposal by that committee.
- Successful defense of the dissertation.

Graduate Certificate in Computational Fluid Dynamics

The College of Engineering offers a graduate certificate in computational fluid dynamics (CFD). The program is designed primarily for the part-time student interested in gaining dexterity in this subject by taking a course sequence through distance education. All course work is permanently archived at the College of Engineering Computational Fluid Dynamics Laboratory Web site, hence available on demand on a totally flexible schedule.

The 12-hour certificate is earned by completing the three courses, Engineering Science 551, 552, and 581 (CFD Laboratory), which are extensively cross-listed among departments in the College of Engineering. The certificate is completed with one elective three-hour course from an approved list. Those currently approved are Chemical Engineering 507 and Electrical and Computer Engineering 599 (Computer Fire Modeling). A wider selection of courses will be added when they become available.

The sole academic prerequisite for the certificate program is a bachelor's degree in engineering. Applicants must meet the minimum admission requirements of the University of Tennessee, Knoxville, Graduate School and become admitted thereto.

Graduate Certificate in Maintenance and Reliability Engineering

The College of Engineering offers a graduate certificate in maintenance and reliability engineering. The program is designed primarily for part-time students in that several of the courses are available through distance education.

The 12-credit certificate is earned by completing 483 and 484, which are cross-listed among all participating departments in the College of Engineering, plus two elective courses selected from a list of courses provided by the participating departments. Currently, the available elective courses are Industrial Engineering 516 and 591, Mechanical Engineering 534 and 599, and Nuclear Engineering 579 and 585. The selection of elective courses is determined through an advising conference with each individual student, and is based on the student's personal interests, academic background, and work experience. Applicants must meet the minimum criteria established by the Graduate Council.

Department of NUCLEAR ENGINEERING

<http://www.engr.utk.edu/nuclear/>

H. L. Dodds, Head and Graduate Liaison

Professors

Dodds, H.L. (IBM Professor), PhD, PETennessee
 Fontana, M.H. (Research), PhD, PEPurdue
 Groer, P.G., PhDVienna (Austria)
 Grossbeck, M.L. (Research), PhDIllinois
 Mihalczko, J.T. (Research), PhDTennessee
 Miller, L.F., PhD, PETexas A&M
 Mynatt, F.R. (Research), PhDTennessee
 Pettengill, H.J. (Research), PhD.....Michigan
 Ruggles, A.E., PhDRensselaer Polytechnic Institute
 Townsend, L.W., PhDIdaho
 Upadhyaya, B.R., PhD, PECalifornia (San Diego)

Associate Professors

Hines, J.W., MBA, PhDOhio State
 Pevey, R.E., MBAEmory
 PhD, PETennessee
 Scott, T.H., PhD, PE.....Florida

Assistant Professors

Gribok, A.V. (Research), PhDIPPE (Russia)
 Moussa, H.M. (Research), PhDTennessee
 Stephan, A.C. (Research), PhDTennessee

Adjunct Faculty

DeHart, M.D., PhDTexas A&M
 Gehin, J.C., PhDMassachusetts Institute of Technology
 Icenhour, A.S., PhDTennessee
 Nichols, T.L., MDTennessee
 Ramsey, C.R., PhDTennessee

Emeriti Faculty

Kerlin, T.W., PhDTennessee
 Uhrig, R.E. (Distinguished Professor), PhD, PEIowa State

MAJOR

Nuclear EngineeringMS, PhD

DEGREES

The Department of Nuclear Engineering offers programs leading to the Master of Science and Doctor of Philosophy degrees. Students may elect a traditional nuclear engineering program focusing on fission energy or fusion energy, or a radiological engineering concentration, which prepares students for careers in the radiation safety field (health physics). Both programs are designed for graduates of accredited undergraduate programs in engineering, physics, chemistry, biology, or mathematics.

All entering students must have, as a minimum, competency in mathematics through ordinary differential equations, competency in atomic and nuclear physics, and competency consistent with an introductory course in nuclear engineering. If such competencies do not exist, the student must take appropriate courses for undergraduate credit. In addition, students without a BS in nuclear engineering, or the equivalent, must take 431 (Radiation Protection) and 470 (Nuclear Reactor Theory I), both of which may be taken for graduate credit. The department head is the contact for all interested students, both those with nuclear engineering degrees and those from other disciplines.

Graduate Credit for Undergraduate Courses

400-level courses in nuclear engineering may be used for graduate credit. However, at least two-thirds of the minimum required hours in the MS must be taken in courses numbered 500 or above.

MASTER OF SCIENCE

Nuclear Engineering Major

A graduate program leading to the Master of Science degree is available to graduates of recognized undergraduate curricula as described above. Each applicant will be advised as to the necessary prerequisite courses before he/she enters the program.

REQUIREMENTS

The minimum requirements for the MS in nuclear engineering are

- a major consisting of 12 hours of graduate courses in nuclear engineering which must include at least one of the following sequences: 511, 512; 521, 522; 551, 552; 571, 572; 581, 582
- a minor consisting of six hours of elective courses in mathematics, statistics or computer science
- six hours in either nuclear engineering or a related field
- one of the following three options for a culminating experience
 - a. a thesis project (six hours of 500)
 - b. two to four engineering practice projects (six hours of 598)
 - c. one engineering practice project (three hours of 598) plus six hours of additional nuclear engineering coursework

Thus, options a and b result in a minimum total of 30 hours and option c results in a minimum total of 33 hours. The determination of which option a student may undertake is made by the student's graduate committee and is based on the student's personal interests, academic background, and work experience, as well as the nature of projects currently available in the department.

A thesis project requires the student to conduct independent, in-depth research. An engineering practice project is similar to a thesis project but smaller in scope, and can be research, design, product development, special operations, or a critical review of published literature in a specific technical area. The student must submit a brief written proposal for each project undertaken, either thesis or engineering practice, which must be approved by the student's graduate committee. The final report for an engineering practice project is normally prepared in thesis format (i.e., according to the *UT Knoxville Guide to the Preparation of Theses and Dissertations*); however, another formal report format may be used if approved by the student's graduate committee. The student must also register for the appropriate number of hours of either 500 or 598, as specified by the student's major professor, during each semester that work is performed on a thesis or engineering practice project. Finally, the student must pass an oral examination on all work presented for the degree—all coursework and all projects.

The MS in nuclear engineering is also available to

distance students via selected courses that are delivered synchronously over the Web to the student's computer. More detailed information about this distance program is located at <http://www.anywhere.tennessee.edu/ne/default.htm>.

DUAL MS-MBA

The College of Business Administration and the College of Engineering offer an integrated program in product development and manufacturing leading to the conferral of the Master of Business Administration degree and the Master of Science degree with a major in nuclear engineering. The establishment of the dual program addresses the critical need for personnel trained in both engineering and management who can integrate an increasingly complex body of knowledge for rapid introduction of new products to the marketplace. The objective of the dual degree program is to prepare graduates to take a leading management role in companies that must react quickly to a dynamic market where forces of competition require rapid changes in design and manufacturing and a short product development cycle.

ADMISSION

Applications are accepted for fall semester only. Applicants for the MS-MBA program must make separate application to, and be competitively and independently accepted by the Office of Graduate Admissions for the Master of Business Administration program and the Master of Science program with a major in nuclear engineering, and by the Dual Program Committee.

Students will initially apply for the MBA program, indicating on their application the intent to pursue the dual MS-MBA program and the appropriate engineering major (refer to the MBA program for separate instructions). Students accepted for both the MBA and the MS with a major in nuclear engineering program will be assigned to a Dual Program Committee advisor (a faculty member in nuclear engineering) who will be responsible for course approval and overall supervision of the students' progress through the dual program.

Applications by United States citizens and permanent residents received after the MBA application deadline (March 1) will be considered as space allows. Additional information is required and different application dates are established by The Graduate School for international students.

REQUIREMENTS

All engineering students enrolled in the product development and manufacturing program must complete common coursework designed to provide them with an integrated, multidisciplinary teamwork experience. The MBA curriculum in product development and manufacturing consists of 33 hours of common coursework in the College of Business Administration and 15 hours of common coursework in the College of Engineering. Engineering common coursework includes a culminating 3-hour integrated project course requiring a comprehensive report, and a final examination as required by the Dual Program Committee, to be taken during the first session of summer following the second year.

During the second year, dual degree candidates will also take courses in their engineering major. The coursework is designed to provide students with a concentration in their major and advanced skills to accomplish their teamwork assignments. Dual degree candidates enrolled in nuclear engineering are required to take 18 hours of graduate-level nuclear engineering

courses during the second year of the program, which must be approved by the student's Dual Program Committee Advisor. In addition, a dual degree candidate who majors in nuclear engineering must successfully defend, in an oral examination administered by at least three nuclear engineering faculty members including the student's Dual Program Committee Advisor, all work presented for the MS degree—all coursework and the culminating integrated project.

DUAL MS-MBA

Curriculum for Dual MS-MBA Degree • Nuclear Engineering Major

August—First Year

Business Administration 511 MBA Core I 3

Fall—First Year

Business Administration 512 MBA Core II 15

Mechanical Engineering 504 Product Development Process 1

Spring

Business Administration 513 MBA Core III 9

Mechanical Engineering 506 Product Selection and Evaluation 2

Mechanical Engineering 508 Integrated Product, Process, and Manufacturing System Design 3

Summer

—Internship —

Nuclear Engineering 509 Project Management 1

Fall — Second Year

Nuclear Engineering 509 Project Management 1

—Nuclear Engineering Courses 9

Spring

—MBA Hub Course Elective 3

Nuclear Engineering 509 Project Management 1

—Nuclear Engineering Courses 9

Summer (first session)

Nuclear Engineering 594 Culminating Integrated Project Report 3

Total 60

The dual degree candidate must satisfy the curriculum and graduation requirements of the engineering major being pursued and the College of Business Administration. Students withdrawing from the dual degree program before completing both degrees will not receive credit toward graduation in either degree program for courses taken in the other degree program, except as such courses qualify for credit without regard to the dual degree program. The MS and the MBA will be awarded upon successful completion of the requirements of the dual program.

DOCTOR OF PHILOSOPHY

Nuclear Engineering Major

Students in the field of nuclear engineering desiring to study for the Doctor of Philosophy degree must have a Bachelor of Science or Master of Science from a recognized university with a major in engineering, physics, chemistry, biology, or mathematics. All candidates will be required to demonstrate general competence in a comprehensive examination in the areas of engineering science, mathematics, chemistry, physics, and nuclear engineering.

REQUIREMENTS

Specific requirements for the PhD in nuclear engineering include

- A minimum of 48 hours beyond the bachelor's degree, exclusive of credit for the MS thesis or nuclear engineering practice.
- A minimum of 24 hours in doctoral research, Nuclear Engineering 600.
- A minimum of 30 hours in nuclear engineering courses numbered 500 and above (or the equivalent), with at least nine hours of 600-level courses. These are exclusive of thesis or dissertation credit. Three of the nine hours of 600-level courses can be from a department other than nuclear engineering provided the selection supports the student's research area.
- A minimum of 12 hours in mathematics, computer science, or statistics courses beyond nuclear engineering undergraduate requirements numbered 400 or above.
- A minimum of six hours in courses numbered 500 or above from a department other than nuclear engineering. The choice depends on the student's overall program and should expand his/her knowledge in a given field.

The first part of the comprehensive examination is prepared by the nuclear engineering faculty and consists of 12 hours of written examination that is administered over a three-day period. All past written examinations are filed in the library, and students are encouraged to review them. Students are invited to take the written examination after completing approximately 30 hours of graduate coursework. A student who fails the written examination must take and pass the examination the next time it is offered to remain in the PhD program. Registration for 600 is not permitted until the written examination is passed. The second part of the comprehensive examination is completed with the successful oral defense of a written dissertation proposal.

A candidate must successfully defend, in an oral examination, all work presented for the degree—all coursework and the dissertation.

Graduate Certificate in Maintenance and Reliability Engineering

The College of Engineering offers a graduate certificate in maintenance and reliability engineering. The program is designed primarily for part-time students in that all of the courses are available through distance education (see <http://www.anywhere.tennessee.edu/ne/default.htm>).

The 12-credit certificate is earned by completing 483 and 484, which are cross-listed among all participating departments in the College of Engineering, plus two elective courses selected from a list of courses provided by the participating departments. Currently, the available elective courses are Industrial Engineering 516 and 591, Mechanical Engineering 534 and 599, and Nuclear Engineering 579 and 585. The selection of elective courses is determined through an advising conference with each individual student, and is based on the student's personal interests, academic background, and work experience. Applicants must meet the minimum criteria established by the Graduate Council.

Graduate Certificate in Nuclear Criticality Safety

The Department of Nuclear Engineering offers a graduate certificate in nuclear criticality safety. The program is designed primarily for part-time students in that all of the courses are available through distance education (see <http://www.anywhere.tennessee.edu/ne/default.htm>).

The 12-credit certificate is earned by completing 421, 543, and 582 plus one of the following three courses: 470, 571, or 581. The selection of one of the latter three courses is determined through an advising conference with each individual student, and is based on the student's personal interests, academic background, and work experience. Applicants must meet the minimum criteria established by the Graduate Council. Students without a nuclear engineering background must take 301 (Fundamentals of Nuclear and Radiological Engineering) prior to beginning the graduate coursework described above.



College of Law

Thomas C. Galligan, Jr., Dean
John L. Sobieski, Jr., Associate Dean
Rachel E. Inman, Assistant Dean

<http://www.law.utk.edu/>

Professors

Ansley, F.L., LLM	Harvard
Best, R., MLS	Florida
Blaze, D.A., JD	Georgetown
Cohen, N.P., LLM	Harvard
Cook, J.G., LLM	Yale
Davies, T.Y., JD	Northwestern
Galligan, Jr., T.C., LLM	Columbia
Hess, A.M., JD	Virginia
King, J.H., JD	Pennsylvania
Leatherman, D.A., LLM	New York
Lloyd, R.M., JD	Michigan
Picquet, C., MSLS	Tennessee
Pierce, C.A., JD	Yale
Plank, T.E., JD	Maryland
Reynolds, G.H., JD	Yale
Rivkin, D.H., JD	Vanderbilt
Sobieski, Jr., J.L., JD	Michigan
Stein, G.M., JD	Columbia
Stephens, O.H., JD	Tennessee

Associate Professors

Aarons, D., JD	UCLA
Anderson, G.L., LLM	Harvard
Barton, B.H., JD	Michigan
Beintema, W.J., JD	Miami
Black, Jr., J.P., JD	Vanderbilt
Cornett, J.M., JD	Tennessee
Goodwin, I.J., JD	New York
Heminway, J.M., JD	New York
Hendricks, J.S., JD	Harvard
Hirsch, J.M., JD	New York
Jacobs, B.L., JD	Georgia
Kennedy, Deseriee A., LLM	Temple

Kuney, G.W., JD	California (Hastings)
Parker, C.M., JD	Illinois
Price, L., MSLS	Tennessee
Pulsinelli, G.A., JD	California (Boalt Hall)
Quinn, M.C., LLM	Georgetown
White, P.J., LLM	Georgetown
Williams, P.J., JD	New York

Assistant Professors

Cochran, C.R., MS	Tennessee
Collins, C.M., MS	Tennessee
Marshall, S.D., JD	Loyola

MAJOR

Law	JD, JD -MBA, JD-MPA
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DEGREES

The University of Tennessee College of Law commenced operation in 1890 and has continuously sought to provide high-quality legal education in a university community.

The principal objective of the college is to prepare students for the practice of law. The college teaches the analytical skills needed to interpret cases and statutes, the ability to communicate effectively, an awareness of the historical growth of the law, a knowledgeable appreciation of the interrelationship of law and society, and the ability to use law as an implement of social change and development. Students are thus equipped to serve their communities not only as advocates and counselors, but as policy makers and active, responsible citizens.

The program of the college has three dimensions—teaching and learning, research into and appraisal of our legal systems and institutions, and service to the community. Each plays a significant role in the college as a modern law center.

The teaching and learning element of legal education at the college involves a co-operative classroom interaction between faculty and students in the analytical study of a host of questions and problems found in today's legal profession. These involve decisional law, statutory interpretation, administrative regulation, techniques of trial and appellate advocacy, and the roles and responsibilities of the lawyer in advising and representing clients.

The college is also directly involved in providing service to the community. A major element of public service is centered in the Legal Clinic where students, under the guidance of skilled and experienced licensed practitioners, provide legal services to clients. Additionally, through research, consultation, and other services to legal institutions and groups within the state, the college seeks to participate in the development and improvement of the society in which its students may eventually practice law.

In combination, the direction and objectives of the college lead to the development not of a narrow technician, but of a student of the law with the perspective, breadth, and understanding necessary to accomplish the many tasks assigned by society to the legal profession.

Graduate Programs

The College of Law offers the Doctor of Jurisprudence degree program; a dual degree program with the College of Business Administration leading to the JD and the Master of Business Administration degree; and a dual degree program with the Department of Political Science, College of Arts and Sciences, leading to the JD and Master of Public Administration. In addition graduate students may be eligible to take a limited number of law courses to count toward a graduate degree.

Current information regarding admission, financial aid, course requirements, academic policies, extracurricular activities, and student services is available from the Admissions Office, The University of Tennessee College of Law, 1505 West Cumberland Avenue, Knoxville, Tennessee 37996-1810 and at the college's Web page www.law.utk.edu. Completed application should be received before February 1 of the year of requested admission.

Doctor of Jurisprudence

The Doctor of Jurisprudence degree will be conferred upon candidates who complete, with the required average, six semesters of resident law study and who have 89 semester hours of credit, including all required courses. The required average is 2.0 and that average must be maintained on the work of all six semesters and also for the combined work of the grading periods in which the last 28 credit hours taken in residence were earned. Averages are computed on weighted grades. Grades are on an alphabetical scale from A+ to F. No credit toward the JD degree is awarded for grades of D- or F.

Eligible law students may receive up to six hours of credit toward the JD for acceptable performance (a grade of B or higher) in upper-level courses that materially contribute to the study of law and which are taken in other departments at the University of Tennessee, Knoxville. Course selection and registration are subject to guidelines approved by the law faculty which include the requirement that any such course be acceptable for credit toward a graduate degree in the department offering the course.

Refer to the *Law Catalog and Student Handbook* for current degree requirements.

Concentration in Business Transactions

Students interested in a concentration in business transactions must complete all of the following law courses:

- 818 Fundamental Concepts of Income Taxation
- 826 Introduction to Business Transactions*
- 827 Business Associations
- 972 Income Taxation of Business Organizations
- 940 Land Finance Law
- 840 Commercial Law
- 842 Contract Drafting Seminar
- 833 Representing Enterprises OR
- 978 Transactional Tax Planning

Students electing a concentration in business transactions may not take any of the above courses on an S/NC basis except 826.

*This course is not required for students who have an undergraduate major in accounting, finance, or business administration, who hold the MBA, or who are enrolled in the dual JD-MBA program. Waivers may also be granted to students who have acquired the requisite business knowledge through other coursework or through practical experience.

Concentration in Advocacy and Dispute Resolution

Students interested in a concentration in advocacy and dispute resolution must complete all of the following courses:

- 813 Evidence
- 815 Introduction to Advocacy and Professional Responsibility
- 920 Trial Practice
- 921 Pretrial Litigation
- 922 Advanced Trial Advocacy
- 928 Case Development and Resolution

Students electing a concentration in advocacy and dispute resolution may not take any of the above courses on an Satisfactory/No Credit basis.

DUAL JD-MBA PROGRAM

The College of Business Administration and the College of Law offer a coordinated dual program leading to the conferral of both the Doctor of Jurisprudence and the Master of Business Administration.

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

ADMISSION

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

Students who have been accepted by both colleges may apply for approval to pursue the dual program anytime prior to, or after, matriculation in either or both colleges. Such approval will be granted, provided that dual program studies are started prior to entry into the last 28 hours of JD coursework and prior to the third semester of the MBA program. Students interested in entering the dual degree program should submit a letter of application to the Dual Program Committee. Upon receipt of the application, the Dual Program Committee will determine eligibility and assign students to advisors who will be responsible for course approval and supervision of the student's progress through the dual program.

REQUIREMENTS

A dual program candidate must satisfy the graduation requirements of each college. Students withdrawing from the dual program before completion of both degrees will not receive credit toward graduation from either college for courses in the other college, except as such courses qualify for credit without regard to the dual program.

The College of Law will award up to nine hours of credit toward the JD for acceptable performance in approved graduate-level courses offered by the College of Business Administration. The College of Business Administration will award up to six hours of credit toward the MBA for acceptable performance in approved courses offered in the College of Law. The approval of courses is the responsibility of the Dual Program Committee and the student's assigned advisor.

Students may begin their studies in either the JD or the MBA program, but may not enroll in MBA coursework while completing the first year of the law curriculum and may not enroll in JD coursework while completing the first year of the business curriculum. During the first year in the JD program, students register through the College of Law. During the first year in the MBA program, students register as graduate students. After the first two years, any term in which students take law courses or a mixture of law and graduate courses, they are classified and registered as law students. If taking only graduate courses, they are classified and registered as graduate students.

Approved Dual Credit

MBA courses in which the student has earned a B grade or higher and are to be counted toward the JD program must include nine hours approved by the College of Law. The six hours of law courses in which the student has earned a 2.3 or C+ grade or higher and are to be counted toward the MBA must be selected from those approved by the Assistant Dean of the MBA Program.

DUAL JD-MPA PROGRAM

The College of Law and the Department of Political Science in the College of Arts and Sciences offer a coordinated dual degree program leading to the conferral of both the Doctor of Jurisprudence and Master of Public Administration degrees. In this program, a student may earn the MPA and JD

in about four years rather than the five years that otherwise would be required. Students pursuing the dual degree program should plan to be enrolled in coursework or an internship for one summer term in addition to taking normal course loads for four academic years.

ADMISSION

Applicants for the JD-MPA program must make separate application to, and be independently accepted by, the College of Law for the JD and the Department of Political Science and the Office of Graduate Admissions for the MPA. Applicants must also be accepted by the Dual Degree Committee. All applicants must submit a Law School Admission Test (LSAT) score. An applicant's LSAT score may be substituted for the Graduate Record Examination (GRE) score, which is normally required for admission to the MPA program. Application may be made prior to or after matriculation in either the JD or the MPA program, but application to the dual program must be made prior to entry into the last 29 semester hours required for the JD and prior to entry into the last 15 hours required for the MPA.

REQUIREMENTS

A dual degree candidate must satisfy the requirements for both the JD and the MPA, as well as the requirements for the dual program. The College of Law will award a maximum of nine hours of credit toward the JD for successful completion of approved graduate level courses (500 or 600 level) offered in the Department of Political Science. The MPA program will award a maximum of nine hours of credit toward the MPA for successful completion of approved courses offered in the College of Law. All courses for which such cross-credit is awarded must be approved by the JD-MPA coordinators in the College of Law and the Department of Political Science. All candidates for the dual degree must successfully complete Administrative Law (Law 821). An internship is strongly recommended for students in the dual degree program, as it is for all MPA candidates, but an internship is not required.

During the first two years in the dual program, students will spend one academic year completing the required first year of the College of Law curriculum and one academic year taking courses solely in the MPA program. During those first two years, students may not take courses in the opposite area without the approval of the JD-MPA coordinators in both academic units. In the third and fourth years, students are strongly encouraged to take both law and political science courses each semester.

Dual degree students who withdraw from the program before completion of the requirements for both degrees will not receive credit toward either the JD or the MPA for courses taken in the other program except as such courses qualify for credit without regard to the dual program.

Awarding of Grades

For grade recording purposes in the College of Law and the Department of Political Science, grades awarded in courses in the other unit will be converted to either Satisfactory/No Credit and will not be computed in determining a student's GPA or class standing. The College of Law will award a grade of Satisfactory for an approved MPA course in which the student earns a grade of B or higher and a grade of No Credit for any lower grade. The Political Science Department will award a grade of Satisfactory for an approved law course in which the student earns a grade of C+

or higher and a grade of No Credit for any lower grade. The official academic record of the student maintained by the Office of the University Registrar shall show the actual grade assigned by the instructor without conversion.

Policy for Graduate Students Taking Law Courses

Students pursuing a graduate degree in another college may, upon approval of the College of Law and the major chairperson, take up to six hours of law courses and receive credit toward the graduate degree. The graduate student must register for the law course during regular registration at the College of Law requesting an S/NC grade only. If a C or above is earned in a law course, an S will be recorded on the transcript. If a student earns below a C, an NC will be recorded, and the course cannot be used toward meeting degree requirements. Grades for law courses will not be reflected in the cumulative average. Law courses may be taken for credit only by students enrolled in a graduate degree program.

Different rules apply to the student enrolled in the Dual JD-MBA or JD-MPA Programs. Grades must be earned according to the grading system of the respective college, e.g. numerical grades for law courses, letter grades for graduate courses. Refer to section on Grades for the grading scale acceptable toward meeting degree requirements. Cumulative GPA for law courses only will be carried until graduation, at which time both the graduate and the law cumulatives will be shown on the permanent record.



College of Nursing

Joan Creasia, Dean
 Jan L. Lee, Associate Dean for Academic Affairs
 Maureen Groer, Associate Dean for Research and Evaluation
 Sandra McGuire, Chair of Master's Program
 Sandra P. Thomas, Chair of Doctoral Program

<http://nightingale.con.utk.edu>

Professors

Creasia, J., PhD	Maryland
Farr, G., PharmD	Tennessee
Groer, M., PhD	Illinois
Hall, J., PhD	San Francisco
Lee, J., PhD	Southern California
Mozingo, J., PhD	Walden
Thomas, S., PhD	Tennessee

Associate Professors

Davis, M., PhD	Tennessee
McGuire, S., EdD	Tennessee
Robinson, C.R., PhD	Tennessee
Shoffner, D., PhD	Tennessee
Speraw, S., PhD	California

Assistant Professors

Bell, D., DNSc	Tennessee
Brown, A., MSN	Alabama (Birmingham)
Brown, M., PhD	Tennessee
Callen, B., PhD	Wisconsin
Chen, S., PhD	Utah
DuMont, P., PhD	Tennessee
Dyess, R., MSN	Tennessee
Evans, G., MSN	Tennessee
Gaylord, N., PhD	Tennessee
Gunther, M., PhD	Tennessee
Helton, S., MSN	Texas Women's
Kollar, M., PhD	Tennessee
Mefford, L., PhD	Tennessee
Nalle, M., PhD	Tennessee
Pierce, M., MSN	Tennessee
Powell, J., PhD	Wisconsin
Preston, J., DNSc	Tennessee
Roman, M., PhD	Kentucky
Witucki, J., PhD	Tennessee
Wyatt, T., PhD	Virginia

MAJOR

Nursing MSN, PhD

DEGREES

Facilities for Research and Service

Center for Nursing Practice
 Center for Nursing Research

The College of Nursing was established in July 1971. The master's program was initiated in 1976 and approval for the doctoral program was granted in 1988. More specific information about the programs may be obtained under Nursing, Departments and Courses of Instruction, or by contacting the Director of MSN or PhD Program, The University of Tennessee, College of Nursing, 1200 Volunteer Boulevard, Knoxville, Tennessee 37996-4180; (865) 974-4151.

MASTER OF SCIENCE IN NURSING

Nursing Major

The College of Nursing offers the Master of Science in Nursing degree with concentrations in adult health nursing, family nurse practitioner, mental health nursing, nurse anesthesia, nursing administration, and nursing of women and children. The program is accredited by the National League for Nursing Accrediting Commission that may be contacted at 61 Broadway, New York, NY 10006, 1-800-669-1656, and is unconditionally approved by the Tennessee Board of Nursing.

The purpose of the master's program in nursing is to prepare leaders, managers, and practitioners who facilitate achievement of optimal health in the dynamic health care system. The program prepares advanced practice nurses for a career in adult health nursing, nursing of women and children, mental health nursing, and nurse anesthesia as well as

role preparation as nurse practitioners, clinical nurse specialists or nursing administrators. Advanced practice nursing involves the delivery of care, management of resources, interdisciplinary collaboration, and application of technology, information systems, knowledge, and critical thinking.

Graduates of the program are expected to

- provide advanced nursing care in a variety of health care settings
- utilize theoretical knowledge to guide advanced practice nursing
- collaborate in research activities and utilize knowledge gained from research in advanced practice nursing
- evaluate health policies and economics related to delivery of health care
- assume roles as leaders and collaborators with other professionals and communities in planning, providing, and evaluating health care

ADMISSION

- Meet requirements for admission to graduate study.
- Achieve a competitive score on the combined verbal and quantitative portions of the Graduate Record Exam.
- Achieve a TOEFL score of 550 or above if native language is not English.
- Applicants for nurse anesthesia require an interview.
- Hold a bachelor’s degree in nursing (Bachelor of Science in Nursing) from an accredited program.
 - a. Hold or be eligible for licensure to practice nursing in Tennessee.
 - b. Have an undergraduate GPA of 3.0 or higher on a 4-point scale, or a GPA of 3.3 for courses in the undergraduate major.
 - c. Have completed a health assessment course.
 - d. Have completed three hours of graduate-level statistics.

OR

- Hold a bachelor’s degree in a discipline other than nursing (master’s entry student or RN) from an accredited college or university.
 - a. Have a cumulative undergraduate GPA of at least 3.0 on a 4-point scale.
 - b. Have satisfactorily completed the following prerequisite courses: chemistry (eight hours); microbiology (including lab); anatomy and physiology (six to eight hours); nutrition (covering lifespan in health and illness); social sciences (nine hours) and a general psychology course (three hours); undergraduate research course or equivalent; three hours of graduate-level statistics prior to enrollment in graduate research course.
 - c. Nurse anesthesia option not available to master’s entry students.
- New students normally are admitted to the program only at the beginning of fall semester. However, under special circumstances and on a space available basis, a BSN graduate may be admitted at the beginning of spring or summer terms in a temporary non-degree status. Applications from full-time BSN and master’s entry students for fall admission must be received by February 1. Part-time and post-master’s applications

must be received by October 1. Nurse anesthesia applications must be received by March 1 for spring admission in the following academic year.

Non-Degree Status

Only 501, 505, 510, 511, and 515 are open to students in Non-Degree Status. Students not yet accepted into the master’s program must see the Chair of the Master of Science in Nursing program for advising prior to enrolling in any course.

Special Requirements

- Each student must hold personal professional liability insurance and health insurance.
- Registered nurses must be eligible to practice nursing in Tennessee, i.e., licensed in Tennessee or one of the interstate compact states.
- Each student must present proof of hepatitis B vaccination and rubella and rubeola immunization or sufficient titer for immunity; TB status.
- Each student must present evidence of current two-person CPR certification.
- Non-registered nurse students must have completed courses in chemistry, nutrition, microbiology, anatomy, and physiology plus 12 hours of behavioral science courses.
- Contact student services for more detailed information about the application process—Student Services/Master of Science in Nursing Program, The University of Tennessee College of Nursing, 1200 Volunteer Boulevard, Knoxville, Tennessee 37996-4180; (865) 974-7606.

Thesis and Non-Thesis Options

The thesis option is available for interested students and is especially encouraged for those who are considering pursuit of doctoral degrees sometime in the future. Students who choose the non-thesis option must register for Nursing 582.

Program Requirements

All students must complete a minimum of 36 semester hours distributed as follows:

Core (7 credits)	Hours Credit
507 Concepts for Advanced Practice Nursing: Health Promotion and Health Policy	4
510 Theoretical Foundations of Nursing	3
Advanced Practice Core (9 credits) *	
504 Advanced Health/Physical Assessment	3
505 Advanced Clinical Pharmacology	3
515 Advanced Pathophysiology for Nursing Practice (not required for nurse anesthesia students)	3
Required for nurse anesthesia students:	
506 Advanced Anesthesia Pharmacology	3
516 Advanced Pathophysiology: Neurological and Cardiovascular with Anesthesia Implications	2
517 Advanced Pathophysiology: Respiratory/Renal with Anesthesia Implications	2
518 Advanced Pathophysiology: Obstetrics/Regional Anesthesia	2
523 Advanced Principles of Nurse Anesthesia Practice	2
524 Basic Principles of Anesthesia I	3
525 Basic Principles of Anesthesia II	3
526 Professional Issues in Nurse Anesthesia	2

Research (6-9 credits)

501 Nursing Research: Methods, Design and Analysis3
 500 Thesis6
 OR
 582 Scholarly Inquiry for Advanced Practice Nursing.....3

Concentration (choose one)

530-531 Adult Health I, II13
 544-545-546-547-548-549 Clinical Nurse Anesthesia Practicum/
 Seminar I, II, III, IV, V, VI40
 550-551 Nursing of Women and Children I, II16
 560-561 Mental Health Nursing I, II.....13
 570-571-572-573 Family Nurse Practitioner I, II, III.....19
 590-591 Nursing Administration I, II12

Electives (9 credits)

Required for students in nursing administration concentration only9
 * not required for nursing administration concentration

Students who enter the program as non-RNs must complete the following undergraduate nursing courses in addition to meeting the requirements listed above:

	Hours Credit
311 Foundations of Professional Nursing Practice.....	5
319 Pathophysiology of Health Deviations.....	4
333 Health Assessment.....	3
341 Transcultural Nursing.....	2
351 Pharmacology I.....	2
361 Health Maintenance and Restoration: Adult.....	5
382 Health Promotion, Maintenance, and Restoration in the Community .3	.3
406 Pharmacology II.....	2
415 Family/Community Health Nursing.....	6
421 Health Maintenance and Restoration in Mental Health.....	4
444 Care of Children, Adolescents, and Their Families.....	2
454 Professional Leadership Issues.....	2
461 Health Restoration: Adult.....	4

Registered nurses whose bachelor’s degrees are not in nursing must have completed courses in chemistry, nutrition, microbiology, anatomy, and physiology plus 12 hours of behavioral science courses. They must also complete 305, 432, and 454 and complete or successfully challenge the following:

	Hours Credit
311 Foundations of Professional Nursing Practice.....	5
319 Pathophysiology of Health Deviations.....	4
333 Health Assessment.....	3
351 Pharmacology I.....	2
361 Health Maintenance and Restoration: Adult.....	5
403 Health Promotion and Maintenance in Childbearing Families.....	5
406 Pharmacology II.....	2
421 Health Maintenance and Restoration in Mental Health.....	5
454 Professional Leadership Issues *.....	2
461 Health Restoration: Adult.....	4
490 Specialty Preceptorship.....	4

* cannot be challenged

A total of 24 credits can be obtained by successful completion of the NLN ACE Examination. See undergraduate catalog for other challenge options. RNs who are in the process of completing a BSN at the University of Knoxville, with the intent of enrolling in the MSN program, follow the same plan with the addition of 471.

Final Examination Requirements

All students must successfully complete a final examination as required by the Graduate Council. For thesis students, the examination will consist of an oral defense of the thesis

as well as other written or oral questions designed to measure student mastery of the entire program of study. For non-thesis students, the written examination will cover the entire program of study and may, at the discretion of the student’s committee, be followed by an oral examination.

Special Policies

- If the clinical performance of any student for any course is found to be unsatisfactory, the student will receive a grade of F for the course.
- If a student achieves a final grade of D or F for any required undergraduate or graduate nursing course, he or she will not be permitted to repeat the course and will be required to withdraw from the program.
- If the clinical performance of any student is characterized by unethical, unprofessional or unsafe behavior, or behavior that places the client in jeopardy, the student will be required to withdraw from the program.
- Students are expected to maintain a 3.0 cumulative GPA; however, students must maintain a grade of B or better in clinical concentration courses and/or directed clinical practice. Graduate students are not permitted to repeat a course, repeat an exam or do additional work for the purpose of raising a grade already received. A student who receives a final grade below a B in a clinical concentration course will be dismissed from the program. A student whose cumulative GPA drops below a 3.0 as a result of earning grades of C in other courses will be placed on academic probation. A student will be allowed to continue in graduate study while on academic probation as long as each semester’s grade point average is 3.0 or better and the grade for clinical concentration work is at least 3.0.

RN-MSN Track

The RN-MSN track provides an opportunity for qualified associate degree and diploma-prepared nurses to obtain the MSN.

ADMISSION

- Associate degree or diploma in nursing.
- Minimum grade point average 3.0 (on 4 point scale) for all pre-professional course requirements.
- Eligible to practice as a registered nurse in Tennessee (licensed as an RN in Tennessee or one of the interstate compact states).
- Have satisfactorily completed the following prerequisite courses—chemistry (eight hours); microbiology (including lab); anatomy and physiology (six to eight hours) nutrition (covering lifespan in health and illness); social sciences (nine hours) and a general psychology course (three hours).
- Three professional letters of reference.
- Personal statement of goals and objectives.

Prior to Admission to Graduate Program

- Complete the BSN with at least a 3.0 GPA.
- Achieve a competitive score on the combined verbal and the quantitative portions of the Graduate Record Examination.

Bachelor of Science in Nursing Courses

- RN’s are exempt from sophomore level Nursing 201 (Introduction to Nursing) and will be given proficiency credit based on RN status.
- RN students will take the NLN Acceleration Challenge Exams prior to starting upper division coursework. If a decision score of 100 is achieved (per section), the student will receive proficiency credit for Nursing 361, 403, 461, and 421.
- Proficiency credit can be obtained in courses marked with an asterisk (*).

Bachelor of Science in Nursing Degree

- A baccalaureate degree in nursing will be awarded upon completion of all required level 300 and 400 courses.
- A total of 123 undergraduate credit hours are required for the baccalaureate degree with the last 30 hours of credit completed in residence at the University of Tennessee, Knoxville.

The following schedules demonstrate full-time attendance. Plans for part-time attendance must be arranged with the RN advisor and communicated to all involved faculty.

ADULT HEALTH NURSING	Hours Credit
382 Health Promotion and Maintenance in Community	5
305 Transition to Professional Nursing	4
*333 Health Assessment	3
* 351 Pharmacology	2
511 Statistical Applications to Nursing Research (OR equivalent)	3
*319 Pathophysiology of Health Deviations	4
*406 Pharmacology II.....	2
454 Professional Leadership Issues	2
501 Nursing Research	3
507 Concepts for Advanced Practice Nursing: Health Promotion and Health Policy	4
510 Theoretical Foundations of Nursing	3
515 Advanced Clinical Pathophysiology	3
504 Advanced Health/Physical Assessment	3
505 Advanced Pharmacology	3
530 Adult Health Nursing I	6
582 Scholarly Inquiry for APN	3
531 Adult Health Nursing II	7

MENTAL HEALTH NURSING	Hours Credit
382 Health Promotion and Maintenance in Community.....	5
305 Transition to Professional Nursing	4
*333 Health Assessment	3
* 351 Pharmacology	2
511 Statistical Applications to Nursing Research (OR equivalent)	3
*319 Pathophysiology of Health Deviations	4
*406 Pharmacology II.....	2
454 Professional Leadership Issues	2
501 Nursing Research	3
507 Concepts for Advanced Practice Nursing: Health Promotion and Health Policy	4
510 Theoretical Foundations of Nursing	3
515 Advanced Clinical Pathophysiology	3
504 Advanced Health/Physical Assessment	3
505 Advanced Pharmacology	3
560 Mental Health Nursing I	6
582 Scholarly Inquiry for APN.....	3
561 Mental Health Nursing II	7

NURSING OF WOMEN AND CHILDREN**	Hours Credit
382 Health Promotion and Maintenance in Community.....	5
305 Transition to Professional Nursing	4
*333 Health Assessment	3
* 351 Pharmacology	2
511 Statistical Applications to Nursing Research (OR equivalent)	3
*319 Pathophysiology of Health Deviations	4
*406 Pharmacology II.....	2
454 Professional Leadership Issues	2
501 Nursing Research	3
507 Concepts for Advanced Practice Nursing: Health Promotion and Health Policy	4
510 Theoretical Foundations of Nursing	3
515 Advanced Clinical Pathophysiology.....	3
504 Advanced Health/Physical Assessment	3
505 Advanced Pharmacology	3
550 Nursing of Women and Children I	6
552 Care of the Critically-Ill Neonate (3) or Child Development **.....	3
582 Scholarly Inquiry for APN	3
551 Nursing of Women and Children II.....	6
** PNP students must complete a graduate level child development course	
** NNP students must complete Nursing 552	

FAMILY NURSE PRACTITIONER	Hours Credit
382 Health Promotion and Maintenance in Community.....	5
305 Transition to Professional Nursing	4
*333 Health Assessment	3
* 351 Pharmacology	2
511 Statistical Applications to Nursing Research (OR equivalent)	3
*319 Pathophysiology of Health Deviations	4
*406 Pharmacology II.....	2
454 Professional Leadership Issues	2
501 Nursing Research	3
507 Concepts for Advanced Practice Nursing: Health Promotion and Health Policy	4
510 Theoretical Foundations of Nursing	3
515 Advanced Clinical Pathophysiology	3
504 Advanced Health/Physical Assessment	3
505 Advanced Pharmacology	3
570 Family Nurse Practitioner I	6
571 Family Nurse Practitioner II	3
582 Scholarly Inquiry for APN	3
572 Family Nurse Practitioner II Clinical	2
573 Family Nurse Practitioner	8

NURSING ADMINISTRATION	Hours Credit
382 Health Promotion and Maintenance in Community.....	5
305 Transition to Professional Nursing	4
*333 Health Assessment	3
*351 Pharmacology	2
511 Statistical Applications to Nursing Research (or equivalent)	3
*319 Pathophysiology of Health Deviations	4
*406 Pharmacology II.....	2
454 Professional Leadership Issues	2
501 Nursing Research	3
507 Concepts for Advanced Practice Nursing: Health Promotion and Health Policy	4
510 Theoretical Foundations of Nursing	3
591 Nursing Administration Microanalysis	6
590 Nursing Administration Macroanalysis	6
582 Scholarly Inquiry for APN	3

DOCTOR OF PHILOSOPHY

Nursing Major

The College of Nursing offers a doctoral program leading to the Doctor of Philosophy degree with a major in nursing. This is a unified program offered jointly with the University of Tennessee, Memphis, College of Nursing. Students may complete all or part of the program at either site. The dissertation must be completed in its entirety at one site.

The doctoral program prepares nursing scholars capable of integrating research, theory, and practice into their roles as researchers, educators, and/or administrators. Specifically, the graduate of this program should be able to

- analyze, test, refine, and expand the theoretical basis of nursing
- conduct research that generates knowledge and advances nursing as a discipline
- provide leadership as nurse scientists who can function in a variety of roles and settings
- collaborate with members of other disciplines in health-related research
- develop, implement, evaluate, and recommend health care policy
- demonstrate professionalism, advocacy, ethical principles and scientific integrity

ADMISSION

- Meet requirements for admission to graduate study.
- Hold a master's degree in nursing from a program accredited by the National League for Nursing Accrediting Commission or the Commission on Collegiate Nursing Education. Some outstanding applicants who are prepared at the bachelor's level in nursing may be considered. In such cases, graduate level courses in nursing theory, concentration specialty, and/or research will be integrated into the formal program of doctoral degree requirements.
- Have a minimum cumulative graduate grade point average of 3.3 on a 4.0 scale for previous college work.
- Achieve a competitive score on the combined verbal and quantitative portions of the Graduate Record Exam.
- Have successfully completed a basic statistics course and graduate nursing theory and research courses prior to enrollment in nursing doctoral level courses.
- Have TOEFL scores of at least 550 if native language is not English.
- Complete Graduate Program Data Form, College of Nursing.
- Submit Graduate Rating Forms from three college level instructors and/or nurses and administrators who have supervised applicant's professional work.
- Submit a sample of scholarly writing (e.g., thesis, published paper).
- Submit an essay describing personal and professional aspirations.
- Submit Graduate Application for Admission, academic transcript(s), Graduate Record Examination scores, and, if required, TOEFL scores to the Office of Graduate and International Admissions. Submit three

Graduate Rating Forms, sample of scholarly writing, and Graduate Program Data Form with essay to the Director of the PhD program prior to November 1 of the year prior to fall admission.

- Schedule a personal interview with the College of Nursing PhD Student Admissions Committee prior to March 15 of the year preceding fall admission. International applicants may be interviewed by telephone or teleconferencing at the discretion of the admissions committee.

REQUIREMENTS

The following courses are required for all students.

	Hours	Credit
601 Philosophy and Theory for Nursing Science.....	3	3
603 Nursing Research and Inquiry	3	3
605 Middle-Range Theoretical Formulations for Nursing Science Development	3	3
606 Nursing Research Seminar	3	3
607 Qualitative Nursing Research	3	3
608 Quantitative Nursing Research	3	3
609 Research Practicum*	2	2
610 Nursing Science Seminar.....	2	2
612 Health and Nursing Policy/Planning	3	3
613 Nursing Leadership in Complex Systems	3	3
— Inferential Statistics	3	3
— Multivariate Statistics	3	3
— Cognates**.....	6	6
— Elective	3	3
600 Dissertation	24	24
Total		67

*Note: one hour per semester, must be taken for two semesters. **Possible cognate areas include, but are not limited to, anthropology, child and family studies, psychology, education, management, medical ethics, public health, social work, philosophy, and statistics.

Doctoral Committee

Early in the student's program, a nursing faculty advisor will be selected by the student in consultation with the program director. The student's comprehensive examination committee consists of the faculty teaching core courses and one representative from the cognate area. The student then selects the dissertation committee. Four faculty holding the rank of assistant professor or above comprise the committee, three of whom (including the chair) must be approved by the Graduate Council to direct doctoral dissertations. At least one member of the committee must be from an academic unit other than nursing.

Special Policies

- A maximum of six graduate hours taken before acceptance into the doctoral program may be applied toward the degree.
- A minimum grade of B in all nursing doctoral courses and a 3.0 cumulative GPA are required for continuation in the program.

Gerontology Minor

Graduate students in the College of Nursing may pursue a specialized minor in gerontology. This interdepartmental/interdisciplinary minor gives the student an opportunity for combining knowledge about aging in American society with his/her major concentration.

Nursing Education Minor

Graduate students in the College of Nursing may pursue a nursing education minor. The minor consists of 12 hours—six hours in Nursing and six in Education. Required courses in the College of Nursing are 566 Education Principles and Strategies (3) and 565 Nursing Education Practicum (3). In consultation with the Nursing Education Minor Coordinator, students select 6 credits of coursework from the College of Education, Health, and Human Sciences (see *College of Nursing Graduate Handbook* for listing) or may substitute courses at the discretion of the student and advisor.

Graduate Certificates

The College of Nursing offers certificates for nurses who need additional training. A master's degree in nursing is required for admission.

The total hours will vary depending on the student's academic record, clinical experience and objectives. Students must complete a minimum of 12 credits. Most students complete 16-20 hours of course credit with the exception of those pursuing the nurse anesthesia certificate. Typically, this certificate program requires students who have completed the master's degree in nursing within the preceding five years to complete 60-70 hours of course credit. Contact the MSN chair for more information.

• Adult Health Nursing

Course requirements are 530 and 531 plus additional hours as determined by the college.

• Family Nurse Practitioner

Course requirements are 570, 571, 572, and 573 plus additional hours as determined by the college.

• Mental Health Nursing

Course requirements are 560 and 561, plus additional hours as determined by the college.

• Nurse Anesthesia

In addition to the general requirements for admission to graduate study and the College of Nursing, the following are required of all nurse anesthesia certificate applicants.

- one year of critical care experience with adult clients
- certification in Advanced Cardiac Life Support (ACLS) and Pediatric Advanced Life Support (PALS)
- a personal interview

Course requirements are 506, 516, 517, 518, 522, 523, 524, 525, 526 of nurse anesthesia didactic content, plus additional hours as determined by the college and 54 hours of nurse anesthesia clinical practice courses, 544, 545, 546, 547, 548, 549, 583.

• Nursing Administration

Course requirements are 590 and 591, plus additional hours as determined by the college.

• Nursing Education

The post-master's certificate in Nursing Education consists of 12 hours—six hours in Nursing and six in Education. Required courses in the College of Nursing are 566 (3) and 565 (3). In consultation with the Nursing Education Minor Coordinator, students select 6 credits of coursework from the College of Education, Health, and Human Sciences.

• Nursing of Women and Children

Course requirements are 550 and 551, plus additional hours as determined by the college.



College of Social Work

Karen Sowers, Dean
Rodney Ellis, Acting Associate Dean, Nashville
Geraldine Faria, Associate Dean, Knoxville
Theora Evans, Acting Associate Dean, Memphis
Paul M. Campbell, Director, Office of Social Work Research and Public Service
Charles Glisson, Director, Children's Mental Health Services Research Center

<http://www.csw.utk.edu/>

Professors

Cetingok, M., PhD Washington (St. Louis)
 Glisson, C., PhD Washington (St. Louis)
 Nooe, R., DSW Tulane
 Nugent, W., PhD Florida State
 Orme, J., PhD Washington (St. Louis)
 Sowers, K., PhD Florida State
 Wodarski, J., PhD Washington (St. Louis)

Associate Professors

Bowie, S., PhD Barry
 Combs-Orme, T., PhD Washington (St. Louis)
 Cummings, S., PhD Georgia
 Dulmus, C., PhD State University of New York (Buffalo)
 Dupper, D., PhD Florida State
 Egan, M., PhD Maryland
 Ellis, R., PhD Florida International
 Evans, T., PhD Minnesota
 Faria, G., PhD Denver
 Patterson, D., PhD Utah
 Rocha, C., PhD Washington (St. Louis)
 Rogge, M., PhD Washington (St. Louis)
 Spicuzza, F., MSSW Tennessee
 Staudt, M., PhD Washington (St. Louis)
 Vaughn, H., EdD Memphis

Assistant Professors

Bolen, R., PhD Texas (Arlington)
 Brown, E., PhD Smith
 Cho, S., PhD Southern California
 Davis, C., PhD UCLA
 Hall, C., PhD Smith
 Johnson, T., PhD Texas (Austin)
 Jones, J., PhD Clark
 MacMaster, S., PhD Case Western Reserve
 Neely-Barnes, S., PhD Washington (Seattle)
 Strand, E., PhD Tennessee

Sullivan, M., PhD Georgia
 Theriot, M., PhD Texas (Austin)
 Washington, G., PhD Clark

Research Faculty

Campbell, P., DSW Alabama
 Green, P., PhD Tennessee
 Hemmelgam, A., PhD Tennessee

Field Coordinators

Betz, P., MSSW (Knoxville) Tennessee
 Enochs, P., EdD (Nashville) Tennessee State
 Jackson, R., MSSW (Knoxville) Tennessee
 Thompson, B., MSSW (Memphis) Tennessee

MAJOR

Social Work MSSW, PhD

DEGREES

The College of Social Work began as the Nashville School of Social Work, founded in 1942 under the auspices of Vanderbilt University, Scarritt College, and George Peabody College. It joined the University of Tennessee in 1951. By 1974 the three branches, located in Nashville, Memphis and Knoxville, offered the two-year master's program. The doctoral program was inaugurated in 1983. In 1985 the Bachelor of Science in Social Work program was added, and the School achieved college status.

The University of Tennessee College of Social Work is the only graduate professional social work education program in Tennessee and offers the full continuum of social work education degrees at the baccalaureate, master's and doctoral levels.

Social work is a helping profession which focuses on providing skilled intervention in the prevention and amelioration of individual and societal problems. It is the purpose of the college to provide an education which fosters growth in both individual and career development.

Graduate Programs

The two-year program (thesis or non-thesis option) leading to the Master of Science in Social Work is fully accredited by the Council on Social Work Education and is offered on all three campuses. The foundation curriculum of the PhD program is available only in Knoxville. The college also offers a post-master's certificate program in management and community practice. The Tennessee state school social work licensure program is available to currently enrolled MSSW students. Application materials are available from the College of Social Work, Henson Hall, Knoxville, Tennessee 37996-3333, or at <http://csw.utk.edu>. Please specify MSSW, PhD, or certificate program on the request.

Financial Aid

Students may apply directly to the university's Office of Financial Aid and Scholarships for assistance such as the National Direct Student Loan or the Work-Study Program.

Information regarding scholarships administered by the college is made available after admission. Financial aid is available to qualified students in the form of fellowships, scholarships, and teaching and research assistantships. Graduate assistantships and other forms of assistance are awarded on the basis of merit and interest to applicants who are accepted into the PhD program.

MASTER OF SCIENCE IN SOCIAL WORK

Social Work Major

The Master of Science in Social Work program prepares social workers to provide professional leadership in clinical social work practice and social work management and community practice. These objectives are met through a curriculum requiring of all students a professional foundation and a concentration in either clinical social work practice or social welfare management and community practice. The MSSW program is accredited by the Council on Social Work Education.

ADMISSION

Admission to the master's program is based on the following

- A bachelor's degree from an accredited college or university with appropriate preparation in the social sciences. At least three-fourths of the applicant's undergraduate work should be in the social sciences, humanities, physical sciences, and other arts and sciences subjects. Applicants must have a course in human biology and demonstrate a liberal arts perspective through coursework in at least four of the following five areas: economics or mathematics; government, political science or history; sociology or anthropology; psychology; philosophy, literature, or the arts. Applicants with other academic backgrounds may request consultation to discuss ways that they can meet the requirements.
- A grade point of 2.7 or higher on a 4.0 scale. Applicants falling below this average may be considered for probationary admission on the basis of supplemental evidence of the ability to perform at a satisfactory level. The university requires a minimum GPA of 2.7 for admission to graduate study.

- Personal qualifications acceptable for entrance into the professional practice of social work.
- All applicants must submit up-to-date scores from the Graduate Record Examination (general).

Preference is given to applicants with a GPA of 3.0 or above in their undergraduate work with substantial preparation in the social sciences.

Advanced Standing

The University of Tennessee College of Social Work has an advanced standing program. Admission to advanced standing requires a BSW from an accredited program; an overall undergraduate GPA of 3.0 or higher; and personal qualifications acceptable for entrance into the professional practice of social work. Students admitted into advanced standing are required to complete a minimum of 36 hours of study in either of the college's concentrations—clinical social work practice or social work management and community practice. These students will follow the curriculum plan and meet all requirements of the concentration during three semesters of study in the program.

Application for admission to the advanced standing program is through the regular admission process.

Extended Study

Planned part-time programs are available in all three locations of the college. Admission requirements are the same as for full-time study. Coursework can be completed over a three- or four-year period.

Transfer Credits

Coursework equivalent to the first year of the master's program, completed in another accredited graduate social work program, is usually accepted toward degree requirements. Applicants must meet the admission requirements of the Graduate Council and the College of Social Work. Transfer courses must be approved as equivalent to required and/or elective courses taken for graduate credit and passed with a grade of B or better. An S (Satisfactory/No Credit system) for the field practicum is also accepted. In addition, transfer courses must be part of an otherwise satisfactory graduate program (B average) and be approved by the dean. This coursework must be completed within the six-year period prior to the receipt of the degree.

A maximum of six hours from work earned in disciplines other than social work may be transferred as elective credits. The student's academic committee must approve the request and the transfer credit must meet Graduate Council requirements.

Proficiency Examination

Students in the master's program may earn a maximum of nine hours by proficiency examination, with the exception of field practice courses. Students interested in proficiency examinations are referred to the Graduate Catalog statement describing the procedure for applying for examination.

REQUIREMENTS

- The program requires successful completion of a minimum total of 60 semester hours including completion of the foundation curriculum (30 hours) and 30 hours in one of the two concentrations (clinical social work practice or social welfare management and community practice).

- Students may select a thesis or non-thesis option. Students pursuing the thesis option receive six credit hours for successful completion.
- Students must successfully complete a comprehensive exam or thesis defense.
- Students must have an overall GPA of 3.0 or better on all graded courses and satisfactory performance in field.

Professional Foundation Curriculum

All students must complete 30 hours in the foundation curriculum consisting of 24 hours in foundation classroom courses and 6 hours in field practice. The foundation is the initial phase of the master's program. It contributes to the process of professional identification and presents a comprehensive, broad base of theory, knowledge and skills from which to practice. The foundation classroom courses include Foundations of Social Work Practice I, II and III; Human Behavior in the Social Environment I and II; Social Welfare Policy and Services; Social Work Research; and Social Work and Oppression. Students also complete a two-semester field placement, Field Practice (six hours). Upon successful completion of the foundation curriculum, all students must complete a minimum of 30 hours in the concentration curriculum including field practice (12 hours). Students select a concentration in clinical social work practice or social welfare management and community practice.

Field Practice

Field instruction is a critical component of the student's first- and second-year programs. Through cooperation with a wide range of social agencies and human service programs throughout Tennessee, the college is able to provide field placements in a variety of social work practice areas. The faculty works closely with the placement agencies and the field instructors to ensure that students have quality field practice experiences that meet the objectives of the core curriculum and the concentration.

The college uses a concurrent class and field plan. Students are in field two days per week during the first year and three days per week during the second year.

First-year agency placements are selected to provide practice experiences related to the foundation curriculum content. Within the placement, each student's experiences are planned and designed according to educational objectives.

Second-year placements are selected according to the student's area of concentration, individual career interests, and educational needs. The student actively participates with the field practice coordinator and the educational committee in selection of the second-year placement. The second-year field placement experience focuses on the integration of social work knowledge and values and emphasizes the acquisition and development of practice skills.

Students are responsible for meeting the requirements of their placement agencies in terms of office hours and workload coverage. This responsibility takes precedence over scheduled university breaks and may result in variations in holidays and office hours for the student.

Students receiving a grade of NC in field practice may not repeat the field practice.

Clinical Social Work Practice Concentration

The clinical social work practice concentration focuses on students developing expertise in clinical social work practice with client systems including individuals and small groups, particularly with clients from high-risk and vulnerable groups. The concentration emphasizes theoretical and empirical knowledge and practice skills in differential assessment, clinical interventions and practice evaluation. The concentration also emphasizes knowledge and skills directed toward (1) amelioration of complex psychosocial, interpersonal problems; (2) ethically sound and culturally sensitive practice; and (3) influencing the development of services and programs that are responsive to the needs of vulnerable, high-risk clients and groups.

Required courses are

- 521 Clinical Social Work Practice with Individuals (three hours)
- 525 Clinical Social Work Practice with Groups (three hours)
- 526 Evaluating Clinical Practice (three hours)
- 582-583 Field Practice (12 hours)
- Minimum of three (total of nine hours) advanced course electives as follows:
 - one or more from a pool of advanced clinical practice courses; one or more from a pool of advanced general courses

Social Welfare Management and Community Practice Concentration

The social welfare management and community practice concentration focuses on students' developing skills directed toward the management and analysis of complex service delivery needs within organizations and communities, knowledge and skills in the development of service intervention strategies to address such and related needs, and the organizational and management skills that enable practitioners to work in a variety of challenging and turbulent environments. The concentration emphasizes theory and skills related to leadership and administration and permits flexibility in tailoring a program to fit the student's individual interests, capabilities, and career goals.

Required courses are

- 541 Leadership and Management in Human Services (three hours)
- 543 Financial Management and Resource Development (three hours)
- 547 Evaluation Research (three hours)
- 582-583 Field Practice (12 hours)

Minimum of three (total of nine hours) advanced course electives as follows:

one course in advanced policy (three hours); two courses from a pool of advanced general courses (six hours),

DOCTOR OF PHILOSOPHY

Social Work Major

The College of Social Work offers the Doctor of Philosophy with a major in social work.

The focus of social work education at the doctoral level is to foster the development of an attitude of scientific inquiry, knowledge of the scientific method, ability to extend the knowledge base of social work practice, and effective participation in leadership roles in social work education, research, and practice.

The emphasis of the doctoral program is upon

- The analysis of direct intervention and social administration and of the interrelationships among each of them and their social policy, organizational, and community contexts.
- Research-based knowledge to inform and guide social work practice, social policy, and social welfare program development.

The program consists of foundation courses, elective courses, and dissertation research. The courses are available only in Knoxville. Students and their committees can develop a plan for completing their research in Nashville and Memphis based on the availability of dissertation resources.

Students have the opportunity to work in the Children's Mental Health Services Research Center as part of their training. The center focuses on services to children who have experienced mental health problems associated with abuse, neglect, violence and a variety of psychosocial problems.

ADMISSION

The PhD program is designed for students who have completed a master's degree in an accredited school of social work and have post-master's social work/social welfare experience. Applicants who do not meet these requirements, but believe they have equivalent credentials should contact the Chair of PhD program for further information regarding admissions criteria.

Applications may be downloaded at www.csw.utk.edu/phd.

REQUIREMENTS

A minimum of 66 hours beyond the master's degree including

- completion of 27 hours of required coursework
- completion of 15 credits of advanced electives, at least 12 of which are taken outside the department, and nine of those 12 related to the dissertation
- completion of at least 24 credit hours of dissertation research
- successful completion of qualifying and comprehensive examinations
- completion and defense of the dissertation

The curriculum of the PhD program consists of foundation coursework, electives, and dissertation research. The foundation curriculum consists of 27 hours of coursework in the history and philosophy of social work, issues in direct service and administration and planning, areas of practice, and research methodology and statistics. Upon this foundation, students and their academic committees develop a plan of study consisting of coursework in Social Work and other departments of the university.

Typically, the 24 hours of foundation curriculum are completed and elective coursework begun during the first year of study, Social Work 670 and the elective requirement are completed and dissertation research begun in the second year of study, and dissertation research is continued in the third year of study. While it is generally expected that the coursework will be completed on a full-time basis, dissertation research can be completed on a planned part-time basis.

Specific courses required are 601, 602, 612, 613, 640, 650, 670, and Statistics 531 and 532 or any two graduate level statistics courses approved by the doctoral program chair.

Examinations

All doctoral students are required to pass a qualifying examination and a comprehensive examination. The qualifying examination covers the foundation curriculum. The comprehensive examination is administered by members of the comprehensive exam committee and is designed for the student to demonstrate comprehensive knowledge of the major and cognate areas and the dissertation topic. In case of failure of either examination, the student may request a retake. The result of the second examination is final.

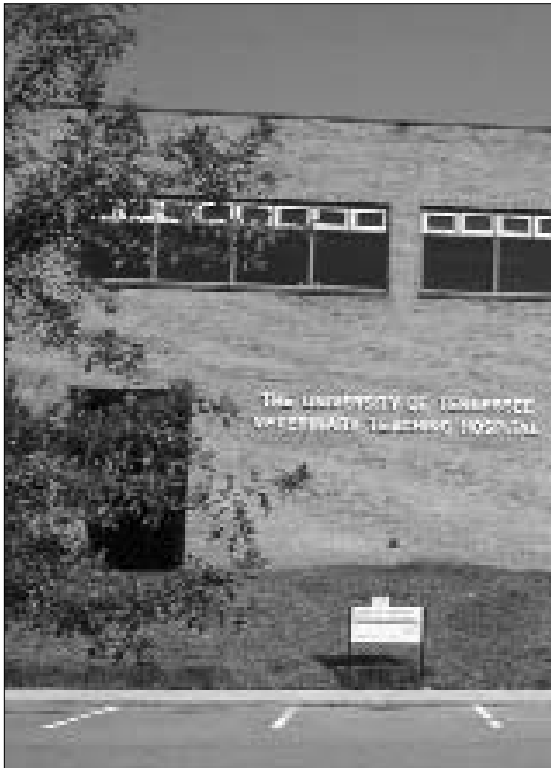
Gerontology Minor

Graduate students in the College of Social Work, at the Knoxville location, may pursue a specialized minor in gerontology. This interdepartmental/interdisciplinary minor gives the student an opportunity for combining the knowledge about aging in American society with his/her major concentration. Please refer to the College of Education, Health, and Human Sciences for specific requirements.

Graduate Certificate in Management and Community Practice

The College of Social Work offers a 15-credit hour graduate certificate designed for social workers desiring supervisory, management, administration and community practice training and education to enhance career advancement or career redirection. A master's degree in social work or a closely related field is required for admission.

Course requirements are 541, 543, 547, and two courses selected from 550, 551, 552, 555.



College of Veterinary Medicine

Michael J. Blackwell, Dean
James J. Brace, Associate Dean, Academic Programs
Robert N. Moore, Associate Dean, Research and Graduate Programs
Leon N.D. Potgieter, Associate Dean, Hospital Operations
Dennis R. Geiser, Assistant Dean, Outreach and Organizational Development

<http://www.vet.utk.edu/>

Departments

- Comparative Medicine
- Large Animal Clinical Sciences
- Pathobiology
- Small Animal Clinical Sciences

MAJOR

Veterinary MedicineDVM

DEGREE

The College of Veterinary Medicine, established in 1974, offers a professional curriculum leading to the Doctor of Veterinary Medicine (DVM) degree. Residency training programs in the various clinical specialties are also offered.

The primary objective of the college is to enable students to attain essential information, skills, attitudes and behaviors to meet the varied needs of society and the veterinary profession. The professional curriculum provides an excellent basic science education in addition to training in diagnosis, disease prevention, medical treatment, and surgery. Graduates are qualified to pursue careers in the many facets of veterinary medicine and related health professions.

About two-thirds of the veterinarians in the United States are engaged exclusively in pet or companion animal practice. A growing number are concerned with the health problems of zoo animals, laboratory animals, wildlife, and aquatic species. A number of veterinarians are involved in the health care of food and fiber animals ensuring the supply of safe and healthy food.

Veterinarians also find rewarding careers in the U.S. Public Health Service, the Armed Forces, and in state, county, or local health agencies. A number of veterinarians are employed by the U.S. Department of Agriculture and by state departments of agriculture for important work in livestock

disease control, meat and poultry inspection, serum and vaccine production, and the protection of our country against the importation of foreign animal diseases. With the events of September 11, 2001, veterinarians are making significant contributions to biosecurity and homeland defense.

Excellent research opportunities exist for veterinarians—research directly benefiting animals and research conducted with animals which benefits humans. Such opportunities are available at colleges and universities and with governmental agencies, private research institutions and biological and pharmaceutical companies.

The college jointly administers a graduate program leading to the Master of Science and the Doctor of Philosophy degrees with a major in comparative and experimental medicine. This program provides a wide spectrum of interdisciplinary training that prepares graduates for teaching and/or research careers in the health sciences. The majority of the graduate students and graduate faculty of the College of Veterinary Medicine are involved in the comparative and experimental medicine program. (See Comparative and Experimental Medicine in the Intercollegiate section of this catalog.)

Because of the interdisciplinary departmental administration of the college, the faculty also have opportunities in the graduate programs of other instructional units, including Animal Science (nutrition, physiology, genetics and animal management), Microbiology (bacteriology, virology and immunology), Ecology and Evolutionary Biology (environmental toxicology), Public Health. (Refer to other sections of this catalog for a full description of these programs.)

DOCTOR OF VETERINARY MEDICINE

ADMISSION

To qualify for admission to the professional program of the College of Veterinary Medicine, a candidate must have completed at least the minimum pre-veterinary course requirements listed below. These may be completed at any accredited college or university that offers courses equivalent to those at the University of Tennessee, Knoxville. Pre-veterinary course requirements must be completed by the end of spring term of the year in which the applicant intends to enroll. Biochemistry requirements must have been satisfactorily completed within five years of the time the applicant wishes to enter the program.

Subject Area	Semester Hours
English	6
¹ Humanities and Social Sciences	18
Physics	8
General Chemistry	8
Organic Chemistry	8
² Biochemistry	4
General Biology	8
Genetics.....	3
³ Cellular Biology.....	3
Total 66	

¹May include, for example, courses in English literature, speech, music, art, philosophy, religion, language, history, economics, anthropology, political science, psychology, sociology and geography.

²Exclusive of laboratory.

³It is expected that this requirement will be fulfilled by a course in cellular or molecular biology.

Admission Procedures

Admission of new students is for the fall semester, with first priority given to residents of Tennessee.

The College of Veterinary Medicine utilizes the Veterinary Medical College Application Service (VMCAS) for all applicants. Forms and instructions for making application for admission may be obtained from the Office of the Associate Dean, The University of Tennessee, College of Veterinary Medicine, 2407 River Drive, Room A102, Knoxville, Tennessee 37996-4550.

The deadline for receipt of the completed application materials is November 1. Non-Tennessee applicants must have a minimum cumulative grade point average of 3.2 on a 4.0 scale for application to be considered.

Applications are accepted only from U.S. citizens or permanent residents of the U.S.

REQUIREMENTS

The curriculum of the College of Veterinary Medicine is a nine-semester, four-year program. Each class begins in August and graduates four years later in May. The first three years generally follow the traditional fall and spring semesters with the summer break following years one and two. The final year of the professional curriculum begins immediately following semester six and is a continuous clinical rotation experience extending over 54 weeks.

Development of a strong basic science foundation is emphasized in the first year. Courses consist mostly of pre-clinical subjects of anatomy (gross and microscopic), physiology, immunology, bacteriology, virology and parasitology.

Also included in the first year are clinical subjects of physical diagnosis and epidemiology. Considerable integration of subject matter is incorporated during this year.

The second and third years include the study of diseases, their causes, diagnosis, treatment and prevention, and courses are team-taught on an organ system basis.

The final year (three semesters) is devoted to intensive education in solving animal disease problems involving extensive clinical experience in the Veterinary Teaching Hospital. Each student will participate exclusively in clinical rotations in the Veterinary Teaching Hospital and in required externships (preferably off-campus).

Innovative features of this curriculum include six weeks of student centered, small group, applied learning exercises in semesters one through five; three weeks of dedicated clinical experiences in the Veterinary Teaching Hospital in semesters three through five; and elective course opportunities in semesters four, five and six which allow students to focus on individual educational/career goals. Students enrolled in the DVM program may register for up to 10 credit hours of graduate courses and these hours will be credited toward the DVM. Elective study offers a unique educational alternative for students in the College of Veterinary Medicine and is intended to enhance professional growth, concentration in an area of interest and career opportunities.

In addition to education in the science and art of veterinary medicine, students receive instruction in paramedical subjects such as animal behavior, medical communication, professional ethics, jurisprudence, economics, and practice management.

The curriculum requires successful completion of 164 credit hours.

Veterinary Public Health Concentration

A veterinary public health concentration is available for students enrolled in the DVM curriculum and graduate veterinarians. This concentration is part of the Master of Public Health degree in the College of Education, Health, and Human Sciences. For more information, see Public Health in the Graduate Catalog. The College of Veterinary Medicine shares governance of the concentration through the Public Health Academic Program Committee and student advisors within this concentration are faculty in the College of Veterinary Medicine. This concentration requires a separate application to the MPH Program.



Intercollegiate

AVIATION SYSTEMS (UT Space Institute)

<http://www.utsi.edu/Academic/AvSys/index.html>

Ralph D. Kimberlin, Chair

Professor

Kimberlin, R.D., PhDRWTH (Germany)

Associate Professors

Richards, R.B., MSNew Jersey

Solies, U. P., (Liaison), PhDTennessee

Research Assistant Professor

Ranaudo, R.J., MSOhio

Emeriti Faculty

Collins, F. G., PhDCalifornia

Mason, A. A., PhDTennessee

Paludan, C. T., PhDDenver

Wu, J. M., PhDCal Tech

Young, R. L., PhDNorthwestern

MAJOR

Aviation SystemsMS

DEGREE

The University of Tennessee Space Institute offers a program leading to the Master of Science degree with a major in aviation systems. The aviation systems program is designed for those who possess a bachelor's degree in engineering or science and wish to study under a system philosophy toward careers in research and development or administration in areas pertinent to aviation. Current emphases include flight testing, aircraft design, aviation meteorology, air traffic control, and airport management.

ADMISSION

To qualify for admission to this program, the applicant must possess a bachelor's degree in engineering or science from an accredited institution, show evidence of ability to pursue and benefit from the program, and fulfill the University of Tennessee, Knoxville, graduate admission procedures and grade point standards. It is expected that the student will have a basic knowledge of computer utilization and statistics; an understanding of aerodynamic fundamentals, aircraft propulsion, and performance; and some understanding of economics.

MASTER OF SCIENCE

Aviation Systems Major

Both thesis and non-thesis programs are available. The thesis program involves a minimum of 30 hours credit while the non-thesis program involves a minimum of 33 hours. Both options are fully supported off-campus utilizing electronic media for videotaping and interactive distance teaching methods.

REQUIREMENTS

Thesis Option

The thesis program involves satisfactory completion of the following requirements.

REQUIREMENTS

Core courses are required for the program. A basic science and/or applied science concentration must be selected at the first meeting of the student's master's committee.

- **Basic science concentration:** Students must take at least 4 credit hours in 500- or 600-level courses in basic mechanisms of disease and at least 6 credit hours of 500-level biochemistry or cell biology. See listings under the Biochemistry and Cellular and Molecular Biology program for information on these courses.
- **Applied science concentration:** Students must take at least 6 credit hours of 600-level epidemiology and at least 5 credit hours of 500- or 600-level statistics.

In addition, students must complete a minimum of 8 hours of coursework in a specified discipline, 5 or more hours of electives, and 6 hours of Thesis 500. Exceptions to accommodate students with specific interests must be approved by the Joint Graduate Coordinating Committee after application, in writing, to the director.

The graduate committee (at least 3 members) is chosen after the first term and must include at least one member from the College of Veterinary Medicine and at least one member from the Graduate School of Medicine. If a minor is declared, one member must be from the minor discipline.

A final oral examination is given at the end of the program.

DOCTOR OF PHILOSOPHY

Comparative and Experimental Medicine Major

ADMISSION

Admission requirements of the Graduate Council of the University of Tennessee, Knoxville, apply. In addition, all applicants must furnish three letters of recommendation from individuals who are familiar with their scholastic or professional records.

Applicants generally will be expected to have a professional degree in one of the medical sciences (e.g., MD, DDS, DVM) or a master's degree in one of the biomedical sciences and a Graduate Record Examination score of at least 1000 for the quantitative and verbal sections.

An individual having a baccalaureate degree with a strong background in the physical and biological sciences may be admitted upon presenting evidence of exemplary performance on the Graduate Record Examination.

Exceptional veterinary students at the University of Tennessee, Knoxville, may be admitted to the comparative and experimental medicine graduate program but will be enrolled officially as veterinary students. During summers such students may take advantage of registering for graduate courses to be counted as elective courses in the veterinary program.

REQUIREMENTS

Core courses are required for the program. A basic science and/or applied science concentration must be selected at the first meeting of the student's doctoral committee.

- **Basic science concentration:** Students must take at least 4 credit hours in 500- or 600-level courses in basic mechanisms of disease and at least 6 credit hours of 500-level biochemistry or cell biology. See listings under the Biochemistry and Cellular and Molecular Biology program for information on these courses.
- **Applied science concentration:** Students must take at least 6 credit hours of 600-level epidemiology and at least 5 credit hours of 500- or 600-level statistics.

In addition, students must complete a minimum of 8 hours of coursework in a specified discipline. Exceptions to accommodate students with specific interests must be approved by the Joint Graduate Coordinating Committee after application, in writing, to the director. Areas of emphasis may include hematology, oncology, comparative pathology, comparative pharmacology, toxicology, immunology, genetics, infectious disease or biochemistry of diseases.

At least 24 hours of coursework, including a minimum of 6 hours at the 600 level, and 24 hours of Dissertation 600 are required for a total of 48 hours. For students with professional degrees, a minimum of 18 hours of coursework beyond the professional degree is required for a total of 42 hours.

The doctoral committee (at least 4 members) is chosen during the first year. Three of the four members, including the chair, must be approved by the Graduate Council to direct doctoral research. At least one member must be from the College of Veterinary Medicine and at least one member from the Graduate School of Medicine.

A comprehensive examination is given at the completion of coursework. A seminar and final oral defense of the dissertation culminate the program.



Facilities for Research and Service

Bureau of Evaluation, Research, and Service (College of Education, Health, and Human Sciences)

The Bureau is responsible for the coordination of research and evaluation activities and for the development of college research and service activities based in external funding. In addition, it may be called upon to provide brokering services to connect faculty expertise with needs for consultant services, technical assistance, and possible professional development activities. The Bureau directly coordinates select development of research proposals, as well as college grant and contract review, administration, and fiscal processes. The Bureau also provides the administrative home for GearUP, Gradkids, Tennessee Career Information Delivery System, Appalachian Rural Systemic Initiative, Center for Literary Studies, and Southeastern High School Equivalency Program (Migrant Education).

Center for Business and Economic Research (College of Business Administration)

William Fox, Director

The Center for Business and Economic Research (CBER) is well known within Tennessee for its extensive record of high quality public policy research related to a broad range of issues of importance to the life of Tennesseans, their economy, and their government. The research spans such diverse issues as welfare, taxation, Internet, health care, economic development, education and environmental policy. CBER is also the source of data that is used by both the public and private sectors for a wide range of purposes.

The quality and breadth of CBER's work is also recognized across the U.S. and around the world. The public policy and academic communities from many states and countries call upon CBER researchers to analyze key policy issues.

CBER was established in 1937 as an auxiliary of the College of Business Administration at the University of Tennessee, Knoxville. It is located on the first floor of Temple Court. CBER currently has three research faculty, seven graduate students, and an extensive support staff in the areas of research, data analysis, project management, administration, and publications. CBER is designated as a State Data Center, allowing direct and timely access to Census and other data. Additionally, CBER staffs the college's Technology Information Services, which provides technological support to the entire College of Business Administration.

Center for Executive Education (College of Business Administration)

<http://TheCenter.utk.edu>

Alex Miller, Associate Dean

The College of Business Administration's executive/management education efforts are facilitated through the Center for Executive Education, 702 Stokely Management Center. The center is a major outreach activity of the University of Tennessee, Knoxville, and a key link between the business community and the College of Business Administration.

The center offers four executive track Master of Business Administration degrees for working managers. Non-degree programs for the business community include programs in

lean enterprise, supply chain management, process improvement and general management.

Much of the center's work is customized to the needs of individual companies and provided at their sites in the U.S. or abroad.

A prominent feature of all programs is their applied nature. Through projects, assignments and workshops, participants use the courses to analyze their organizations and implement immediate changes.

Additional information about the Center for Executive Education can be found at <http://TheCenter.utk.edu>.

Center for Information Studies

(College of Communication and Information)

www.sis.utk.edu/cis/

The Center for Information Studies (CIS) was established in June 1989 to be a focal point for research related to information systems and services. The center, located at 401K Student Services Building, has performed research for the federal government, state and local governments, and business and industry. Projects have ranged from strategic planning efforts to information system and service evaluations, to modeling of scientific and technical communication. Staff of the center have been actively involved in proposal development and project performance with faculty and staff in other centers and departments at the university.

Areas of interest to the center include information systems design, information organization and retrieval in very large databases, directories and locator tools in a networked environment, design of regional library and information system networks, new technology applications, information system support for educational reform, modeling of information processes, development of measures and methods for evaluating information system performance and effectiveness.

Center for Literacy Studies

(College of Education, Health, and Human Sciences)

The Center for Literacy Studies, founded in 1988, links theory and practice in the field of adult learning and literacy. The center collaborates with practitioners, policy makers, and other research organizations in Tennessee and across the nation in providing research, professional development initiatives, partnership development, innovative technology applications, and new approaches and knowledge in the field.

Center for Physical Activity and Health

(College of Education, Health, and Human Sciences)

The mission of the Center for Physical Activity and Health is to integrate scientific research, education, and practical applications of exercise and health science in a manner that enhances health, fitness, performance, and quality of life. The center is a research and service oriented organization designed to educate the University of Tennessee, Knoxville, and Knoxville communities about the benefits of regular physical activity as well as warn about the serious potential health outcomes of leading a sedentary existence.

A number of research projects are currently being conducted through the center. Many of these projects involve the role that physical activity plays in the prevention and treatment of obesity.

In addition to supporting research, the center trains future leaders in exercise promotion, provides exercise opportunities for members of the university community, promotes exercise with the University of Tennessee and Knoxville communities, and provides exercise testing and assessment.

The center focuses its efforts in four main areas: training future leaders in exercise promotion, provides exercise opportunities for members of the university community, promotes exercise within the University of Tennessee and Knoxville communities, and provides exercise testing and assessment.

For additional information about services, contact Dr. Dixie L. Thompson at (865) 974-6040 or via e-mail at dixielee@utk.edu.

Center for Transportation Research

(Office of Research)

Stephen H. Richards, Executive Director

The Center for Transportation Research, formerly the Transportation Center, was created in 1970 to foster and facilitate interdisciplinary research, public service, and outreach in the field of transportation at the University of Tennessee, Knoxville. It began operating full-time in 1972 and since then has contributed greatly to the overall research program of the university.

The center, 600 Henley Street, Suite 309, is a university-level organization administratively positioned within the Office of Research at the University of Tennessee, Knoxville. The center's multidisciplinary staff includes over 120 full-time researchers and technicians augmented with numerous faculty and students. The center is presently organized into five major divisions: Logistics and Systems Analysis; Infrastructure and Environment; Safety and Traffic Operations; Mobility Services and Policy; and Information Technology.

The center has three goals. The first is to conduct a program of research in transportation that is recognized for its excellence, comprehensiveness, innovation, productivity, and national leadership. The second is to develop and sustain the technical expertise for high quality transportation research by the faculty and students within the various departments and colleges of the University of Tennessee, Knoxville. The third goal is to serve the transportation research, service, and training needs of state and local government, business, and industry in Tennessee, the southeast region, and the nation.

Center of Excellence for Materials Processing

The Center for Materials Processing is one of the Centers of Excellence created by the State of Tennessee. It has an inter-disciplinary program designed to bring together individuals with appropriate expertise to solve important materials processing problems. It emphasizes the development of desirable materials properties through the control of composition, molecular structure and microstructure; measurement of process variables; and control of those variables to ensure proper processing. The center conducts basic research and teaching in materials processing and carries out research to improve existing processing technologies and transfer of research results to private industry. A major aspect of the center is student participation in industry-sponsored research programs.

The center is located in 513 East Stadium Hall, 974-0816. For further information, contact Dr. C. J. McHargue, 974-7680.

Centers and Chairs of Excellence

The Centers of Excellence grew out of Tennessee's Better Schools Program, an initiative to upgrade state-aided education at all levels. State officials and legislators wanted to give a few outstanding academic programs in state-aided universities a special push toward prominence, well beyond regular annual increases for all programs.

In 1984, the General Assembly appropriated and the governor approved \$10 million for the first Centers of Excellence throughout the state. The public colleges and universities submitted their proposals for Centers of Excellence to the Tennessee Higher Education Commission, which made the final determinations. Now four of the university's ten Centers of Excellence are sponsored by the UT Knoxville or located in Knoxville.

Concurrently, the university has received state funding, which it must match dollar for dollar, for Chairs of Excellence. These Chairs are \$1 million endowed professorships in areas of significance to the university and to the individual, foundation, or corporation providing the matching gift money. Chairholders are noted within their respective academic units. The Chairs of Excellence are:

Knoxville

- Benard Blasingame Chair of Excellence in Agricultural Policy
- Chair of Excellence in Science, Technology and Medical Writing
- Clayton Homes Chair of Excellence in Finance
- College of Business Administration Chair of Excellence of Policy Studies
- Condra Chair of Excellence in Computer Integrated Engineering and Manufacturing
- Condra Chair of Excellence in Power Electronics Applications
- Goodrich Chair of Excellence in Transportation
- Hodges Chair of Excellence of English
- J. Fred Holly Chair of Excellence in Political Economy
- Nancy Gore Hunger Chair of Excellence in Environmental Studies
- The University of Tennessee Willis Lincoln Chair of Excellence in Physics
- Pilot Chair of Excellence in Management
- Ivan Racheff Chair of Excellence of Ornamental Horticulture
- Ivan Racheff Chair of Excellence in Materials Science and Engineering
- Forrest and Patsy Shumway Chair of Excellence in Romance Languages
- Bernadotte E. Schmitt Chair of Excellence of History

Memphis

- Maury W. Bronstein Chair of Excellence in Cardiovascular Physiology
- Crippled Children's Hospital Foundation
- Chair of Excellence in Biomedical Engineering
- William and Dorothy Dunavant Chair of Excellence in Pediatrics
- Federal Express Chair of Excellence in Pediatrics

- First Tennessee Chair of Excellence in Clinical Pharmacy
- Thomas A. Gerwin Chair of Excellence in Physiology
- Goodman Chair of Excellence in Medicine
- J. R. Hyde Chair of Excellence in Rehabilitation Engineering
- Le Bonheur Chair of Excellence in Pediatrics
- E. Erick Muirhead Chair in Pathology
- Plough Foundation Chair of Excellence in Pediatrics
- Second Le Bonheur Chair of Excellence in Pediatrics
- Semmes-Murphey Chair of Excellence in Neurology
- Mark S. Soloway Chair of Excellence in Urology
- Harriet S. Van Vleet Chair of Excellence in Biochemistry
- Harriet S. Van Vleet Chair of Excellence in Microbiology and Immunology
- Harriet S. Van Vleet Chair of Excellence in Pharmacology
- Harriet S. Van Vleet Chair of Excellence in Virology
- The University of Tennessee Medical Group Chair in Obstetrics and Gynecology

UTSI

- H. H. Arnold Chair of Excellence in Computational Mechanics
- Boling Chair of Excellence in Space Propulsion

The combination of the Centers of Excellence and Chairs of Excellence adds a dimension to the University of Tennessee that is not easily equaled by other institutions. UT's reputation as the premiere university in the state and as a regional and national leader in instruction, research, and public service is enhanced as a result of the infusion of these special funds.

For information concerning the individual centers sponsored by the University of Tennessee, contact:

Center for Laser Applications

Dr. Narendra Dahotre, Chairman
Space Institute
B. H. Goethert Pkwy
Tullahoma, Tennessee 37388-8897
(931) 393-7474
(jlewis@utsi.edu)

Center of Excellence for Computer Applications (CECA)

Dr. Clinton Smullen, Director
UT Chattanooga
124 Grote Hall
Chattanooga, Tennessee 37403
(423) 755-4787
(csmullen@cecasun.utc.edu)

Center of Excellence for Livestock Diseases and Human Health

Dr. Robert N. Moore, Director
The University of Tennessee College of Veterinary Medicine
Veterinary Teaching Hospital
Knoxville, Tennessee 37996
(865) 974-5570
(rmoore1@utk.edu)

Center of Excellence for Materials Processing

Dr. Carl McHargue, Director
 The University of Tennessee, Knoxville
 513 East Stadium Hall
 Knoxville, Tennessee 37996-2351
 (865) 974-7680
 (crl@utk.edu)

Center of Excellence for Neuroscience

Dr. David V. Smith, Director
 The University of Tennessee Health Science Center
 875 Monroe Avenue
 Memphis, Tennessee 38163
 (901) 448-5957
 (dvsmith@utm.edu)

Center of Excellence for Pediatric Pharmacokinetics and Therapeutics

Dr. Richard A. Helms, Director
 The University of Tennessee Health Science Center
 62 S. Dunlap Street, Suite 210
 Memphis, Tennessee 38163
 (901) 448-6034
 (rhelms@tennessee.edu)

Center of Excellence for Science and Mathematics Education

Dr. Geraldine Farmer, Interim Director
 UT Martin
 145 Gooch Hall
 Martin, Tennessee 38238
 (731) 587-7166
 (jgfarmer@utm.edu)

Molecular Resource Center of Excellence

Dr. Michael E. Dockter, Director
 The University of Tennessee Health Science Center
 62 S. Dunlap, Suite 400
 Memphis, Tennessee 38163
 (901) 448-7105
 (mdockter@tennessee.edu)

The Science Alliance

Dr. Jesse Poore, Director
 University of Tennessee
 101 South College
 Knoxville, Tennessee 37996
 (865) 974-6765
 (jpoore@utk.edu)

Waste Management Research and Education Institute

Dr. Gary Saylor, Director
 The University of Tennessee, Knoxville
 The University of Tennessee Conference Center, Suite 311
 Knoxville, Tennessee 37996
 (865) 974-8080
 (saylor@utk.edu)

Child Development Laboratories**(College of Education, Health, and Human Sciences)**

<http://web.utk.edu/~utkcdl/>

Kathy Fitzgerald, Director

The Child Development Laboratories, operated by the Department of Child and Family Studies since 1927, currently offer an early education program for young children ages six weeks to five years, including children with disabilities. Through its high-quality model program for children and for university students, the Child Development Laboratories serve three purposes: to promote the research and scholarship activities of the department and other university faculty and students through the observation and study of young children, their families and teachers; to prepare undergraduate and graduate child development and early education professionals to work effectively with young children and families; and to provide a model early education program for children, families and early childhood professionals.

Housed in three locations, the CDL sites are all equipped with videotaping capabilities, small group research rooms, and observation booths that facilitate observation and research. A variety of research projects (such as the development of creativity in young children, emergent literacy, making children's and teachers' learning visible) are ongoing at any time. Graduate assistants in the laboratories participate in teaching, assessment, administrative, supervisory and research activities while working with children and families under the guidance of faculty and staff. The Child Development Laboratories are accredited by the National Academy of Early Childhood Programs, a division of the National Association for the Education of Young Children.

For more information, check Web site at <http://web.utk.edu/~utkcdl/>.

**Energy, Environment, and Resources Center
(Office of Research)**

Jack N. Barkenbus, Executive Director

The Energy, Environment, and Resources Center, 600 Henley Street, Suite 311, was created in 1973 to encourage interdisciplinary research directed at solutions to problems related to energy and the environment. The center involves faculty and students in research and public service projects, manages research and development projects that involve several disciplines, and assists government and industry in specific problems related to energy, environmental, resource, and technology policy issues. The center has a close working relationship with the Joint Institute for Energy and Environment, and Oak Ridge organizations. Sponsors include federal and state agencies, industry, and foundations.

Current research includes sustainable development, solid and hazardous waste management, information systems, environmental education, global environmental problems, water, and cleaner production. The center operates the Waste Management Research and Education Institute, the Center for Clean Products and Clean Technologies, the Water Resource Research Center, the Center for Geography and Environmental Education, and the Technology Research and Development Program. Grants and contracts bring approximately \$4 million in research to the university each year.

Institute of Agriculture

Buddy Mitchell, Interim Vice President for Agriculture

The Institute of Agriculture dates to 1869 when the university was designated as Tennessee's Federal Land-Grant Institution. Since the enabling federal legislation, agriculture education programs expanded to include mission-oriented basic and applied research in agricultural sciences and natural resources, and extending this knowledge to the citizens of the state. The Institute of Agriculture is composed of four units: the Tennessee Agricultural Experiment Station, the Agricultural Extension Service, the College of Agricultural Sciences and Natural Resources, and the College of Veterinary Medicine.

AGRICULTURAL EXPERIMENT STATION

Thomas H. Klindt, Interim Dean

The university's Board of Trustees established the Agricultural Experiment Station on June 8, 1882, five years before the passage of the Hatch Experiment Station Act by the U.S. Congress. The university was one of the first five institutions in the U.S. to establish an Agricultural Experiment Station. Since its creation, the Station's priority has been research to improve agricultural production, products, and marketing in Tennessee. Over time, programs have expanded to include natural resources and environmental stewardship.

The mission-oriented research initiatives of the Tennessee Agricultural Experiment Station, which are also reflected in thematic areas of the academic programs, are

- molecular agriculture — applying the tools of biotechnology to agricultural and natural resources problems
- agro-environmental systems—systems approach to production and natural resources problems
- innovative technologies — engineering and processing technologies in agriculture and food systems
- agribusiness policies and practices — developing policies and practices that have economic, environmental and societal benefits

The seven academic departments located in Knoxville are part of the Tennessee Agricultural Experiment Station. The faculty members, with joint appointments in the Experiment Station and the College of Agricultural Sciences and Natural Resources, are the graduate faculty participating in the eleven Master of Science and five doctoral programs. Research is conducted on campus and at the branch experiment stations located across Tennessee and operated by the Experiment Station. The Experiment Station also supports graduate student assistantships.

UNIVERSITY OF TENNESSEE EXTENSION

Charles L. Norman, Dean

The University of Tennessee Extension was established in 1914. Its purpose is to extend through various educational means agricultural, natural resources, and family and consumer sciences information to the citizens in the state.

The program is carried on through offices in each of the 95 counties of the state. Educational emphasis includes work in four major program areas: agriculture and natural resources, resource development, family and consumer sciences, and youth education through 4-H Clubs. County Extension staff members working directly with local people

are supported in various disciplines by faculty who are stationed either in Knoxville, Nashville, or Jackson. The University of Tennessee Extension works cooperatively with faculty and staff at Tennessee State University in administering programs.

Faculty members, who are State Specialists, and area agents collaborate with other faculty members of the Institute of Agriculture to conduct ongoing and timely, issue-based applied research to meet the needs of agricultural producers, foresters, and others involved with the food and fiber system. Many of the extension faculty members are involved with the departmental graduate programs.

UT Extension operates as one of the four units in the Institute of Agriculture. The state is divided into three regions with directors located in their respective regions. Regional headquarters are maintained in Knoxville, Nashville and Jackson. Extension operates in a three-way partnership among county, state and federal governments. The University of Tennessee represents the state and federal government, and a County Agricultural Extension Committee represents county government in this partnership.

UNIVERSITY LIBRARIES

<http://www.lib.utk.edu/>

Barbara I. Dewey, Dean

Aubrey H. Mitchell, Associate Dean

Jill Keally, Assistant Dean

Professors

Baker, G., MLS	.....Alabama
Bayne, P., MSLS	.....North Carolina
Britten, W., MSLS	.....Clarion
Crowther, K., MLn	.....Emory
Dewey (Dean) B., MALS	.....Minnesota
Felder-Hoehne, F., MSLS	.....Atlanta
Leach, S., MLn	.....Emory
Phillips, L., MLS	.....Rutgers

Associate Professors

Atkins, D., MLIS	.....Wisconsin
Berry, T., MSLS	.....Tennessee
Bridges, A., MLS	.....Rhode Island
Deeken, J., MSLS	.....North Texas State
Dixon, L., MSLS	.....Tennessee
Garrett, M., MLS	.....Vanderbilt
Johnson, K., MLS	.....Pittsburgh
Keally, J., MSLS	.....Tennessee
Mack, T., MSLS	.....Tennessee
Mitchell, A., MSLS	.....Tennessee
Prescod, J., MSLS	.....Western Michigan
Ratledge, D., MSLS	.....Tennessee
Row, J., MSLS	.....Tennessee
Royse, M., MSLS	.....North Carolina
Smith, R., MSLS	.....Illinois
Thomas, D., MLS	.....George Peabody
Thomas, S., MSLS	.....Tennessee
Viera, A., MLIS	.....UCLA
Wallace, A., MLn	.....Washington
Williams, S., MSLIS	.....Simmons
Wise, N., MSLS	.....Tennessee

Assistant Professors

Beals, J., MLS	.....Kent State
Behrend, L., MSLS	.....Tennessee
Braquet, D., MSLS	.....Louisiana State
Casado, M., MSLS	.....Tennessee
Davis, T., MLIS	.....North Carolina
Dolence, T., MSLS	.....Illinois (Urbana-Champaign)

Gilmour, R., MSLS	North Carolina
Holden, Diana, MS	Tennessee
Hristov, N., MSLS	Louisiana State University
Hutt, A., MLS	Indiana
Manoff, M., MLIS	South Carolina
Purcell, A., MLS	Maryland
Read, E., MS	Tennessee
Smith, A., MS	Tennessee
Starmer, M., MLIS	Kentucky
Walker, T., MLIS	Tennessee
Williamson, J., PhD	North Carolina

The University of Tennessee Libraries own approximately 2.2 million volumes and subscribe to more than 14,000 periodicals and serial titles.* A growing collection of electronic resources are available through the Libraries' Web page at www.lib.utk.edu. The Libraries' membership in the Association of Research Libraries reflects the university's support of large collections of library materials to meet the needs of a comprehensive university curriculum.

Friendly experts at the reference desk in each library offer help and assistance in using the library. AskUs.Now (www.lib.utk.edu/refs/askusnow/) provides chat, e-mail, and telephone connections to librarians. Students will find a wide variety of materials and services in the main library (John C. Hodges Library), four branches on the Knoxville campus (Agriculture and Veterinary Medicine Library, Map Library, Music Library, and Special Collections), and the Social Work Library in Nashville.

Students can search the library catalog and hundreds of databases at any library location — and through the UT Libraries' Web site. Interlibrary Services is available to help students find and retrieve materials that are not available in the UT Libraries. The services and facilities of the University Libraries are accessible to persons with disabilities.

The John C. Hodges Main Library (1015 Volunteer Boulevard) is a 350,000 square-foot building housing collections in all subject areas. The Hodges Library can accommodate more than 3,500 people, with space for group and individual study. The second floor CyberCafe is open for late night study, with networked computers, reading tables, and a coffee shop. Students may check out laptop computers equipped for connection to the Library's wireless network. The Studio (located in the second floor Media Center) offers students a hands-on lab for creating and manipulating digital media. Workshops and classes are offered throughout the semester to help students learn how to get the most out of the Libraries' services.

The Agriculture and Veterinary Medicine Library (Room A-113, Veterinary Teaching Hospital) has a strong collection in agriculture; veterinary, comparative and human medicine; environmental studies and biodiversity; and related biological sciences.

The Map Library (Room 15, basement of the Hoskins Library, Cumberland Avenue and 15th Street) houses a large collection of sheet maps, atlases, journals, and books related to cartography. Materials in print, film, and digital formats are gathered from commercial sources as well as the Government Depository program.

The Music Library (301 Music Building) has a comprehensive collection of music and music literature, including books, scores, audio and video recordings, current periodicals, and microfilm. Most materials in the Library of Congress "M" classification are located here.

Special Collections (2nd floor, west wing, of the Hoskins

Library) is a repository of rare books, manuscripts (including the papers of James Agee and Alex Haley), and historical ephemera. Students are welcome to use Special Collections. Materials from Special Collections cannot be checked out, but they can be used in the Special Collections Reading Room. The University Archives are also housed in the Hoskins Library. The Archives contain official records of the university; items published by its units, departments, and agencies; and materials that document University of Tennessee life.

The Social Work Library (Suite 292, 193-E Polk Avenue, Nashville) serves College of Social Work students in field practice across the state. The library has a working collection of materials in social work and related disciplines.

The Law Library on the Knoxville campus and the libraries located on the campuses in Chattanooga, Martin, Memphis, and Tullahoma are separately administered. The students and faculty of the university can use all of the libraries affiliated with the University of Tennessee.

*Data describe the Knoxville campus, excluding the Law Library.

Maintenance and Reliability Center (College of Engineering)

Thomas V. Byerley, Director

The Maintenance and Reliability Center (MRC), located at East Stadium Hall, was created in 1996 to provide an international center for research, development and application of advanced maintenance and reliability engineering. Over 25 industrial firms and a network of universities and national laboratories have joined with the University of Tennessee, Knoxville, in this endeavor. The four-fold mission of the MRC consists of education, research and technology assessment, information sharing, and business support and alliances. The mission has established maintenance and reliability engineering as an interdisciplinary activity with application across a broad spectrum of industrial activities. In addition to the technology, the MRC stresses the development of management techniques that will provide industry with the means to assess the availability, costs and benefits of advanced maintenance and reliability engineering practices.

The Maintenance and Reliability Center involves all departments in the College of Engineering. Interested and qualified students may affiliate as interns with the MRC program while pursuing a degree in any of the engineering departments. Maintenance and reliability engineering courses are available. Research opportunities and graduate assistantships are also available for qualified students.

Measurement and Control Engineering Center (College of Engineering)

Kelsey Cook, Director

The Measurement and Control Engineering Center, 512 East Stadium Hall, is sponsored by the College of Engineering, the Oak Ridge National Laboratory, and the National Science Foundation. The Center's program combines education, research, and technology transfer. Graduate assistantships are available through individual faculty research projects for qualified students. The research is funded by major U.S. industrial companies and focuses on theoretical and practical developments in measurement and control, concentrating on areas that will significantly improve the productivity, reliability, and safety of industrial systems

and processes.

Center-sponsored research is carried out in the fields of process control, signal and image processing, and sensor development. Research in process control concentrates in the areas of process modeling, control system design, and real-time expert systems. Measurement research includes development of rheological, optical, and other sensors, and mass spectrometry, as tools for monitoring and control of chemical processes.

Nutrition Institute

(College of Education, Health, and Human Sciences)

Michael B. Zemel, Director

The Nutrition Institute is a system wide, multidisciplinary consortium of faculty who are engaged in clinical and experimental nutrition research, teaching and service. Its expertise and resources are multifaceted including tools and techniques used in cell biology, epidemiology, metabolism and clinical training.

The multidisciplinary nature of nutrition has created a situation where nutrition research and teaching is dispersed among a number of academic units, including the Department of Nutrition in the College of Education, Health, and Human Sciences as well as in several departments in the colleges of Agricultural Sciences and Natural Resources, Arts and Sciences, Medicine, and Veterinary Medicine. The institute fosters collaboration among all efforts in nutrition sciences, coordinates collaborative research programs in nutrition and provides a unified forum for exchange and interactions with the national and international nutrition community. In addition, by creating formal ties among the units within the university that are involved in undergraduate, graduate and professional education in nutrition, teaching resources are pooled to strengthen nutrition-related instruction in these units.

Office of Information Technology

<http://oit.utk.edu>

The Office of Information Technology (OIT) provides computing and telecommunications resources and services for students, faculty, and staff. Information about OIT is available on the OIT Web site <http://oit.utk.edu>.

OIT provides the core information technology equipment and services for the University of Tennessee, Knoxville. OIT provides public-access computer labs, central computing, administrative information systems and network services, as well as information security for UT Knoxville.

Individual computer accounts are provided at no charge for all UT Knoxville students. These accounts may be used for e-mail, coursework, research, and personal Web pages. Information and on-line registration for computer accounts are available at <http://oit.utk.edu/accounts.html>. Students are also encouraged to download <http://antivirus.utk.edu> and use antivirus software supplied by OIT at no cost to the student.

Students on the Knoxville campus may access the Internet through direct Ethernet, dial-up, or wireless connections. All students can take advantage of UT Knoxville's, new wireless infrastructure, which is now available in most of the academic and administrative buildings on the Knoxville campus.

To provide access to computing facilities on campus, OIT maintains seven staffed computing labs, several unstaffed labs, and supports computing installations in residence halls. The computing labs are equipped with more than 300 micro-

computers including current models of Apple, Dell, and Gateway machines. In addition, laser printers, wireless printers, scanners, CD writers and zip drives are available. A variety of industry standard software applications are available for use on the machines in the computing laboratories. Please refer to <http://oit.utk.edu/labs.html> for more information.

OIT Help Desk. OIT provides the telephone Help Desk as a centralized source of information and service for the computer and network resources managed by OIT. Help Desk services are available to all University of Tennessee students. To contact the Help Desk, please dial 974-9900. To contact the Help Desk, please dial 974-9900. You may also contact the HelpDesk online by filling out the HelpDesk request form which can be found at <http://oit.utk.edu/contact.html>. For more information, please visit our Help Desk Web site at <http://oit.utk.edu/helpdesk>.

OIT Customer Service Center. OIT maintains a Customer Service Center that centrally locates all contact points for walk-in support on related OIT services. Students can receive assistance and/or training on a wide variety of topics at our Customer Service Center. These services include installing academic software free of charge on personally owned computers and helping students diagnose problems with their computers. We will also help clean up virus infected machines and reload/upgrade operating systems. The Customer Service Center is located on the corner of Cumberland and Volunteer in Rooms 103/104 Aconda Court and is open Monday through Friday, 9 a.m. until 4 p.m.

Technology Training: Several courses offered are aimed at improving skills with the technology available at UT Knoxville. *Life Preserver: An Introduction to University of Tennessee Computing* is offered several times each semester on supported application software and operating systems. Other courses include those about MS Office products, Dreamweaver, JavaScript, using the Internet and search engines, and Web Page Essentials (four levels of HTML training). There is also a series of courses on Adobe Photoshop. Please refer to <http://web.utk.edu/~training> for more information.

Computer-Based Training. Computer-Based Training (CBT) is a self-paced series of interactive, Web delivered, learn-as-you-go courses offered on many computing topics. CBT offers courses for Microsoft products (Word, Excel, etc.), Internet topics (Internet basics, how to create a Web page, etc.), and more advanced topics, such as JavaScript, Visual Basic, object-oriented techniques, and open systems. There are over 500 courses available. This training is free to University of Tennessee students. For registration and access to the CBT courses on the Web, go to <http://oit.utk.edu/cbt/>.

Statistical Consulting Center. Our mission is to help UT Knoxville students, faculty, and staff enhance the quality of their research by working together to effectively apply analytical methods, especially statistics. We can help you with determining sample sizes, designing surveys and deploying them on Web pages, scanning and scoring scan forms, acquiring and managing data, analyzing or mining data or text, visualizing data through interactive or presentation graphics, and interpreting the results. The costs for most of our services are often centrally funded for the first ten hours of assistance each semester. Assistance is available by appointment via the Help Desk at 974-9900, by walk-in at 200 Stokely Management Center and by e-mail at StatHelp@utk.edu. For details, see <http://oit.utk.edu/scc/>.

The Innovative Technology Center: The Innovative

Technology Center (<http://itc.utk.edu>) provides the leadership, support, resources, and training necessary to help UT Knoxville faculty, graduate teaching assistants, and academic teaching staff make effective use of technology in their teaching, both online and in the classroom. The ITC offers a wide selection of workshops, supports a resource-rich faculty development lab, awards grants for instructional technology projects, and maintains Online@UT, the university's Blackboard-powered integrated online academic community. Students can get help with Online@UT/Blackboard by calling the OIT Help Desk at 974-9900.

Psychological Clinic (College of Arts and Sciences)

Leonard Handler, Director

The Psychological Clinic supports graduate research and training in clinical psychology. Psychological assessment and psychotherapy are offered on an outpatient basis to the general public as well as to university students and staff.

Research Centers of Excellence

<http://www.tennessee.edu/research/rcoe.shtml>

In 2000, the University of Tennessee, Knoxville, created nine Research Centers of Excellence in a competitive process that sought to emphasize some of the strongest, most promising research taking place at the university. With financial support from the state of Tennessee, the nine centers have created vital research programs that promise to enhance the university's teaching and research and to contribute positively to the state economy.

The five centers in Knoxville are in environmental biology, food safety, materials science, information technology, and structural biology. Memphis has four centers: genomics, neurology of brain diseases, diseases of connective tissue, and vascular biology. Several of the programs involve activities on the various university campuses and collaboration with Oak Ridge National Laboratory.

Center for Genomics and Bioinformatics

Daniel Goldowitz, Director

The Center for Genomics and Bioinformatics, located at the University of Tennessee Health Science Center in Memphis, is committed to fostering an atmosphere conducive to scientific research and collaboration in the area of functional genomics, involving both basic science and clinical departments across the campuses of the University of Tennessee.

Center for Information Technology Research (CITR)

Jack Dongarra, Director

The Center for Information Technology Research (CITR) was established in the spring of 2001 to drive the growth and development of leading-edge information technology research (ITR) at the University of Tennessee, Knoxville. The mission of CITR is to build a thriving, well-funded community in basic and applied ITR at the University of Tennessee, Knoxville, in order to help the university capitalize on the rich supply of research opportunities that exist in this area.

Center of Excellence for the Neurobiology of Brain Disease

William Pulsinelli, Director

The Center for the Neurobiology of Brain Disease works to improve the diagnosis, treatment, and prevention of neurological and psychiatric disorders. The center combines state-of-the-art technologies for brain disease research and molecular biology to improve understanding of brain function and the underlying reasons for neurological disorders ranging from Parkinson's and Huntington's diseases to schizophrenia and drug addiction.

Center for Environmental Biotechnology

Gary Saylor, Director

The Center for Environmental Biotechnology (CEB) was established in 1986 to foster a multidisciplinary approach toward training the next generation of environmental scientists and solving environmental problems through biotechnology. The CEB was given Research-Center-of-Excellence status by the University of Tennessee, Knoxville, in order to catalyze and advance a new research agenda that pushes the envelope of creative and pioneering research. This fundamental new research will revolutionize the ability to dissect, monitor and control processes at the molecular level to achieve real-time information and computational analysis in complex bioenvironmental systems.

Food Safety Center

Ann Draughon and Stephen Oliver, Directors

The Food Safety Center of Excellence was established in December 2000. The center develops and evaluates strategies to destroy or control food-borne pathogens and reduce the occurrence of food-borne illnesses. Contributing to this work is a multidisciplinary team of researchers, consisting of members of UT's Institute of Agriculture's Department of Food Science and Technology as well as researchers from departments outside the institute. Specialists include scientists with expertise in biochemistry, reproductive biology, food service management, parasitology, infectious diseases and risk assessment.

Vascular Biology Center of Excellence

Lisa K. Jennings, Director

The Vascular Biology Center of Excellence at the University of Tennessee Health Science Center (UTHSC) in Memphis was initiated in January 1999. The study of cellular and integrated vascular function under normal and pathologic conditions is the major research and clinical focus of the UT Vascular Biology Center of Excellence. The major collaborations formed by the participating faculty and trainees, along with the TAM (Tennessee, Arkansas, Mississippi) Cardiovascular Network of more than 70 cardiologists, creates an innovative and powerful research consortium.

Center of Excellence for Diseases of Connective Tissue

Andrew Kang, Director

The Center for Diseases of Connective Tissue is located at the University of Tennessee Health Science Center in Memphis. Scientists at the center conduct basic research in five areas: autoimmune diseases, such as rheumatoid arthritis and lupus; degenerative diseases, such as osteoarthritis; inflammation and the basic science of how the body reacts to injury;