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 with a major in nuclear engineering include the following.

- 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 9 hours of 600-level courses. These are exclusive of thesis or dissertation credit. Three of the 9 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 or statistics courses beyond nuclear engineering undergraduate requirements numbered 400 or above.
- A minimum of 6 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-hour 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-hour 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 Nuclear Engineering 301 prior to beginning the graduate coursework described above.
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 hours taken in residence were earned. Averages are computed on weighted grades. Grades are awarded on a numerical scale (in increments of 0.1) from 0.0 to 4.3. No credit toward the JD degree is awarded for grades of 0.0 to 0.7.

Eligible law students may receive up to 6 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 ADVOCACY AND DISPUTE RESOLUTION

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

- Second Year Fall Semester – 813, 920.
- Third Year (one of the following) – 905, 908 and 914 or 947.
- During the second and third year, any combination totaling 12 hours from the following courses – 821, 855, 877, 915, 916, 918, 921, 922, 923, 927, 990*, 991*. (*Only if approved by the Dean or Dean’s designee as satisfying the requirements of the concentration.)

Students electing a concentration in advocacy and dispute resolution may not take any of the above courses on an S/NC basis.

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.

DUAL JD-MBA PROGRAM

The College of Business Administration and the College of Law offer a coordinated dual program leading to the conferred dual degree 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 and International 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 9 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 6 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 cur-
riculum. 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 9 hours approved by the College of Law. The 6 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 and International 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 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 9 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 9 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 6 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
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
Hall, J., PhD .................................................. San Francisco
Lee, J., PhD .................................................. Southern California
Mozingo, J., PhD .................................................. Walden
Thomas, S., PhD .................................................. Tennessee

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

Assistant Professors
Beebe, L., PhD .................................................. Kentucky
Bell, D., DNSc .................................................. Tennessee
Brown, A., MSN .................................................. Alabama (Birmingham)
Brown, M., PhD .................................................. Tennessee
Callen, B., PhD .................................................. Wisconsin
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
Melford, L., PhD .................................................. Tennessee
Nalle, M., PhD .................................................. Tennessee
Pierce, M., MSN .................................................. Tennessee
Preston, J., DNSc .................................................. Tennessee
Roman, M., PhD .................................................. Kentucky
Witucki, J., PhD .................................................. Tennessee
Wyatt, T., PhD .................................................. Virginia

MAJOR
Nursing
Adult health nursing concentration
Family nurse practitioner concentration
Homeland security nursing concentration
Mental health nursing concentration
Nurse anesthesia concentration
Nursing administration concentration
Nursing of women and children concentration

DEGREES
MSN

Nursing
Graduate Certificate Programs
Adult Health Nursing
Family Nurse Practitioner
Homeland Security Nursing
Mental Health Nursing
Nurse Anesthesia
Nursing Administration
Nursing Education
Nursing of Women and Children

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. For more information, contact the Director of MSN or PhD Program, The University of Tennessee, College of Nursing, 1200 Volunteer Boulevard, Knoxville, Tennessee 37996-4180; (865) 974-4151.

Facilities for research and service include the Center for Nursing Practice and the Center for Nursing Research.

MAJOR OF SCIENCE IN NURSING

NURSING MAJOR

The College of Nursing program is accredited by the Collegiate Commission on Nursing Education that may be contacted at One Dupont Circle NW, Ste 530, Washington, DC 20036-1120, 1-202-887-6791, 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 at least 550 on the paper test, 213 on the computer-based test, or 80 on the Internet-based Test 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 3 hours of graduate-level statistics.
- 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 (8 hours); microbiology (including lab); anatomy and physiology (6 to 8 hours); nutrition (covering lifespan in health and illness); social sciences (9 hours) and a general psychology course (3 hours); undergraduate research course or course; 3 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.
- For more detailed information about the application process, contact 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 hours)**

<table>
<thead>
<tr>
<th>Course (7 hours)</th>
<th>Hours Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>507</td>
<td>Concepts for Advanced Practice Nursing: Health Promotion and Health Policy</td>
</tr>
<tr>
<td>510</td>
<td>Theoretical Foundations of Nursing</td>
</tr>
</tbody>
</table>

**Advanced Practice Core (9 hours)**

<table>
<thead>
<tr>
<th>Course (9 hours)</th>
<th>Hours Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>504</td>
<td>Advanced Health/Physical Assessment</td>
</tr>
<tr>
<td>505</td>
<td>Advanced Clinical Pharmacology</td>
</tr>
<tr>
<td>515</td>
<td>Advanced Pathophysiology for Nursing Practice</td>
</tr>
</tbody>
</table>

* Not required for nursing administration concentration.

**Required for nurse anesthesia students**

<table>
<thead>
<tr>
<th>Course (3 hours)</th>
<th>Hours Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>506</td>
<td>Advanced Anesthesia Pharmacology</td>
</tr>
<tr>
<td>516</td>
<td>Advanced Pathophysiology: Neurological/Cardiovascular with Anesthesia Implications</td>
</tr>
<tr>
<td>517</td>
<td>Advanced Pathophysiology: Respiratory/Renal with Anesthesia Implications</td>
</tr>
<tr>
<td>518</td>
<td>Advanced Pathophysiology: Obstetrics/Regional Anesthesia</td>
</tr>
<tr>
<td>523</td>
<td>Basic Principles of Anesthesia I</td>
</tr>
<tr>
<td>524</td>
<td>Basic Principles of Anesthesia II</td>
</tr>
<tr>
<td>526</td>
<td>Professional Issues in Nurse Anesthesia</td>
</tr>
</tbody>
</table>

**Research (6-9 hours)**

<table>
<thead>
<tr>
<th>Course (6-9 hours)</th>
<th>Hours Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>501</td>
<td>Nursing Research: Methods, Design and Analysis</td>
</tr>
<tr>
<td>500</td>
<td>Thesis</td>
</tr>
<tr>
<td>582</td>
<td>Scholarly Inquiry for Advanced Practice Nursing</td>
</tr>
</tbody>
</table>

**Concentration (choose one)**

<table>
<thead>
<tr>
<th>Course (Concentration)</th>
<th>Hours Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>530-531 Adult Health</td>
<td>13</td>
</tr>
<tr>
<td>544-545-546-547-548-549 Clinical Nurse Anesthesia Practicum</td>
<td>28</td>
</tr>
<tr>
<td>532-533-534-535-536 Homeland Security</td>
<td>40</td>
</tr>
<tr>
<td>550-551-553-554-555-556 Nursing of Women and Children: Women’s Health</td>
<td>20</td>
</tr>
<tr>
<td>550-551-552-528-562-563 Nursing of Women and Children: Child Health</td>
<td>20</td>
</tr>
<tr>
<td>550-551-552-564-568-569 Nursing of Women and Children: Neonatal Health</td>
<td>20</td>
</tr>
<tr>
<td>560-561 Mental Health Nursing I, II</td>
<td>13</td>
</tr>
<tr>
<td>570-571-572-573 Family Nurse Practitioner I, II, III</td>
<td>19</td>
</tr>
<tr>
<td>590-591 Nursing Administration: Macro/Micro Analysis</td>
<td>12</td>
</tr>
</tbody>
</table>
Electives (9 hours)
Required for students in nursing administration concentration only .... 9

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

<table>
<thead>
<tr>
<th>Course</th>
<th>Hours Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>311 Foundations of Professional Nursing Practice</td>
<td>5</td>
</tr>
<tr>
<td>319 Pathophysiology of Health Deviations</td>
<td>4</td>
</tr>
<tr>
<td>333 Health Assessment</td>
<td>3</td>
</tr>
<tr>
<td>341 Transcultural Nursing</td>
<td>2</td>
</tr>
<tr>
<td>351 Pharmacology I</td>
<td>2</td>
</tr>
<tr>
<td>361 Health Maintenance and Restoration: Adult</td>
<td>2</td>
</tr>
<tr>
<td>406 Pharmacology II</td>
<td>2</td>
</tr>
<tr>
<td>415 Nursing the Childbearing Family</td>
<td>4</td>
</tr>
<tr>
<td>421 Health Maintenance and Restoration in Mental Health</td>
<td>5</td>
</tr>
<tr>
<td>432 Health Promotion, Maintenance, Restoration in the Community</td>
<td>3</td>
</tr>
<tr>
<td>444 Care of Children, Adolescents, and Their Families</td>
<td>3</td>
</tr>
<tr>
<td>454 Professional Leadership Issues</td>
<td>2</td>
</tr>
<tr>
<td>461 Health Restoration: Adult</td>
<td>4</td>
</tr>
</tbody>
</table>

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, 382, and 454 and complete or successfully challenge the following.

<table>
<thead>
<tr>
<th>Course</th>
<th>Hours Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>311 Foundations of Professional Nursing Practice</td>
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<td>319 Pathophysiology of Health Deviations</td>
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<td>333 Health Assessment</td>
<td>3</td>
</tr>
<tr>
<td>351 Pharmacology I</td>
<td>2</td>
</tr>
<tr>
<td>361 Health Maintenance and Restoration: Adult</td>
<td>5</td>
</tr>
<tr>
<td>406 Pharmacology II</td>
<td>2</td>
</tr>
<tr>
<td>421 Health Maintenance and Restoration in Mental Health</td>
<td>5</td>
</tr>
<tr>
<td>461 Health Restoration: Adult</td>
<td>4</td>
</tr>
<tr>
<td>490 Specialty Preceptorship</td>
<td>4</td>
</tr>
</tbody>
</table>

A total of 24 hours 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 Tennessee, 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 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 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 (8 hours); microbiology (including lab); anatomy and physiology (6 to 8 hours) nutrition (covering lifespan in health and illness); social sciences (9 hours) and a general psychology course (3 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, 404, 421, and 461.
- 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 hours are required for the baccalaureate degree with the last 30 hours completed in residence at the University of Tennessee, Knoxville.

RN-MSN students will complete (or challenge*) the following courses, prior to beginning MSN courses.

<table>
<thead>
<tr>
<th>Course</th>
<th>Hours Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>305 Transition to Professional Nursing</td>
<td>4</td>
</tr>
<tr>
<td>*319 Pathophysiology of Health Deviations</td>
<td>4</td>
</tr>
<tr>
<td>*333 Health Assessment</td>
<td>3</td>
</tr>
<tr>
<td>*351 Pharmacology I</td>
<td>2</td>
</tr>
<tr>
<td>382 Health Promotion and Maintenance in Community</td>
<td>5</td>
</tr>
<tr>
<td>*406 Pharmacology II</td>
<td>2</td>
</tr>
<tr>
<td>454 Professional Leadership Issues</td>
<td>2</td>
</tr>
<tr>
<td>511 Statistical Applications to Nursing Research (OR equivalent)</td>
<td>3</td>
</tr>
</tbody>
</table>
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 score of at least 550 on the paper test, 213 on the computer-based test, or 80 on the Internet-based Test 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.

<table>
<thead>
<tr>
<th>Hours Credit</th>
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</tr>
</thead>
<tbody>
<tr>
<td>601 Philosophy and Theory for Nursing Science</td>
<td>3</td>
</tr>
<tr>
<td>603 Nursing Research and Inquiry</td>
<td>3</td>
</tr>
<tr>
<td>605 Middle-Range Theoretical Formulations for Nursing Science Development</td>
<td>3</td>
</tr>
<tr>
<td>606 Nursing Research Seminar</td>
<td>3</td>
</tr>
<tr>
<td>607 Qualitative Nursing Research</td>
<td>3</td>
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<tr>
<td>608 Quantitative Nursing Research</td>
<td>3</td>
</tr>
<tr>
<td>609 Research Practicum*</td>
<td>2</td>
</tr>
<tr>
<td>610 Nursing Science Seminar</td>
<td>3</td>
</tr>
<tr>
<td>612 Health and Nursing Policy/Planning</td>
<td>3</td>
</tr>
<tr>
<td>613 Nursing Leadership in Complex Systems</td>
<td>3</td>
</tr>
<tr>
<td>617 Inferential Statistics</td>
<td>3</td>
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<tr>
<td>618 Multivariate Statistics</td>
<td>3</td>
</tr>
<tr>
<td>620 Cognates**</td>
<td>6</td>
</tr>
<tr>
<td>630 Elective</td>
<td>3</td>
</tr>
<tr>
<td>600 Dissertation</td>
<td>24</td>
</tr>
</tbody>
</table>

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, 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 6 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.

Intercollegiate/Interdisciplinary Gerontology Minor

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

Core courses and a practicum are offered by the College of Social Work and selected departments within the Colleges of Education, Health, and Human Sciences and Arts and Sciences. A cross-listed seminar between contributing programs is designed to integrate experiences from different sources and to demonstrate the multi-faceted nature of working within an aging society. Please refer to the College of Education, Health, and Human Sciences for specific requirements.

Nursing Education Minor

Graduate students in the College of Nursing may pursue a nursing education minor. The minor consists of 12 hours – 6 hours in nursing and 6 in education. Required courses in the College of Nursing are 566 and 565. In consultation with the Nursing Education Minor Coordinator, students select 6 hours of coursework from the College of Education, Health, and Human Sciences.
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 hours. Most students complete 16-20 hours of course credit with the exception of those pursuing the homeland security nursing certificate or the nurse anesthesia certificate. The nurse anesthesia 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.

• HOMELAND SECURITY NURSING
  Course requirements are 532, 533, 534, 535, 536, 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 – 6 hours in nursing and 6 in education. Required courses in the College of Nursing are 566 and 565. In consultation with the Nursing Education Minor Coordinator, students select 6 hours 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
Celingok, M., PhD ................................. Washington (St. Louis)
Combs-Orme, T., PhD ................................. Washington (St. Louis)
Glisson, C., PhD ................................. Washington (St. Louis)
Nugent, W., PhD ................................. Florida State
Orme, J., PhD ................................. Washington (St. Louis)
Sowers, K., PhD ................................. Florida State
Wodarski, J., PhD ................................. Washington (St. Louis)

Associate Professors
Bolen, R., PhD ................................. Texas (Arlington)
Bowie, S., PhD ................................. Barry
Cummings, S., PhD ................................. Georgia
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)

Assistant Professors
Brown, E., PhD ................................. Michigan
Cho, S., MSW ................................. Ewha (Korea)
Davis, C., PhD ................................. UCLA
Hall, C., PhD ................................. Smith
Jones, J., PhD ................................. Clark
MacMaster, S., PhD ................................. Case Western Reserve
Neely-Barnes, S., PhD ................................. Washington
Strand, E., PhD ................................. Tennessee
Sullivan, M., PhD ................................. Georgia
Theriot, M., PhD ................................. Texas (Austin)
Washington, G., PhD ................................. Clark

Research Faculty
Black, B., MSSW ................................. Tennessee
Campbell, P., DSW ................................. Alabama
Green, P., PhD ................................. Tennessee
Hemmelnard, A., PhD ................................. Tennessee

Field Coordinators
Enochs, P., EdD (Nashville) ................................. Tennessee State
Jackson, R., MSSW (Knoxville) ................................. Tennessee
Lodato, G., MSW ................................. Marywood
Thompson, B., MSSW (Memphis) ................................. Tennessee

MAJOR  DEGREES

Social Work
Clinical Social Work Practice concentration
Social Welfare Management and Community Practice concentration

Social Work PhD

Graduate Certificate Program
Management and Community Practice

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 that 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 that 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://www.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. Applicants who have a prior conviction, other than a minor traffic violation, may not necessarily be denied admission. The university requires a minimum GPA of 2.7 for admission to graduate study. Preference is given to applicants with a GPA of 3.0 or above in their undergraduate work with substantial preparation in the social sciences. Applicants who have a prior conviction, other than a minor traffic violation, may not necessarily be denied admission to the MSSW program. However, such convictions may prevent placement in certain field practice agencies and/or licensure in certain states.

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 welfare management and community practice. These students will follow the curriculum plan and meet all requirements of the concentration duration.

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 6 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 9 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 6 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 (6 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

- 521 (3 hours).
- 525 (3 hours).
- 526 (3 hours).
- 582-583 Field Practice (12 hours).
- Minimum of 3 advanced course electives (total of 9 hours): 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

- 541 (3 hours).
- 543 (3 hours).
- 547 (3 hours).
- 582-583 Field Practice (12 hours).
- Minimum of 3 advanced course electives (total of 9 hours): one course in advanced policy (3 hours); two courses from a pool of advanced general courses (6 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 the following.

- Completion of 27 hours of required coursework.
- Completion of 15 hours of advanced electives, at least 12 of which are taken outside the department, and 9 of those 12 related to the dissertation.
- Completion of at least 24 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 adminis-
tation 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.

Intercollegiate/Interdisciplinary Gerontology Minor
Graduate students in the College of Social Work, at the Knoxville location, may pursue an intercollegiate/interdisciplinary minor in gerontology. The gerontology minor gives the student an opportunity for combining the knowledge about aging in American society with his/her major concentration.

Core courses and a practicum are offered by the College of Social Work and selected departments within the Colleges of Education, Health, and Human Sciences and Arts and Sciences. A cross-listed seminar between contributing programs is designed to integrate experiences from different sources and to demonstrate the multi-faceted nature of working within an aging society. 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-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.
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 that 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 wishes to enter the program.

<table>
<thead>
<tr>
<th>Subject Area</th>
<th>Semester Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>English</td>
<td>6</td>
</tr>
<tr>
<td>Humanities and Social Sciences</td>
<td></td>
</tr>
<tr>
<td>Physics</td>
<td>8</td>
</tr>
<tr>
<td>General Chemistry</td>
<td>8</td>
</tr>
<tr>
<td>Organic Chemistry</td>
<td>8</td>
</tr>
<tr>
<td>Biochemistry</td>
<td>4</td>
</tr>
<tr>
<td>Genetics</td>
<td>3</td>
</tr>
<tr>
<td>Cellular Biology</td>
<td>3</td>
</tr>
</tbody>
</table>

Total 66
May include, for example, courses in English literature, speech, music, art, philosophy, religion, language, history, economics, anthropology, political science, psychology, sociology and geography.

Exclusive of laboratory.

It 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 October 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 through nine which allow students to focus on individual educational/career goals. Students enrolled in the DVM program may register for up to 10 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.
AVIATION SYSTEMS
(UT Space Institute)

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

Stephen Corda, Chair and Liaison

Associate Professors
Corda, S. (Liaison), PhD ........................................... Maryland
Richards, R.B., MS ................................................. New Jersey
Solies, U.P., PhD ................................................... Tennessee

Research Assistant Professor
Allison, R., MS ..................................................... Tennessee
Ranaudo, R.J., MS ................................................... Ohio

Emeriti Faculty
Collins, F.G., PhD .................................................. California
Paludan, C.T., PhD ................................................ Denver

Adjunct Faculty
Masters, George W.
Cavagnaro, Catherine

MAJOR DEGREE
Aviation Systems MS

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.

Research and Development Specialization
• 12 hours of 500-level courses in the major field of aviation systems.
• 6 hours in industrial engineering (engineering management).
• 6 hours of electives from the major field, mathematics or engineering.
• 6 hours of Aviation Systems 500 demonstrating the ability to conduct and report on an independent investigation.
• Defense of thesis and completion of final exam.

Administration Specialization
• 12 hours of 500-level courses in the major field of aviation systems.
• 3 hours in industrial engineering (engineering management).
• 3 hours in economics or finance.
• 6 hours of electives selected from the major field, mathematics or engineering.
• 6 hours of Aviation Systems 500 demonstrating the ability to conduct and report on an independent investigation.
• Defense of thesis and completion of final exam.
Non-Thesis Option
The non-thesis program will be permitted in special circumstances and involves satisfactory completion of the following requirements.

Research and Development Specialization
- 12 hours of 500-level courses in the major field of aviation systems.
- 6 hours in industrial engineering (engineering management).
- 12 hours of electives in the major field, mathematics or engineering.
- 3 hours of an assigned project under Aviation Systems 550.
- A comprehensive final written examination on all coursework submitted for the degree and defense of the project course paper.

Administration Specialization
- 12 hours of 500-level courses in the major field of aviation systems.
- 3 hours in industrial engineering (engineering management).
- 3 hours in economics or finance.
- 12 hours of electives in the major field, mathematics or engineering.
- 3 hours of an assigned project under Aviation Systems 550.
- A comprehensive final written examination on all coursework submitted for the degree and defense of the project course paper.

COMPARATIVE AND EXPERIMENTAL MEDICINE
http://www.vet.utk.edu/graduate
Robert N. Moore, Director and Graduate Liaison
Joint Graduate Coordinating Committee
Bartges, J.W., DVM, PhD, Veterinary Teaching Hospital
Lawler, J.E., PhD, Psychology
Lozzo, C., M.D., Medical Genetics
Matteson, K.J., PhD, Medical Genetics
Moore, R.N., PhD, Veterinary Teaching Hospital

DEGREES
Comparative and Experimental Medicine
MS, PhD

Comparative and Experimental Medicine (MS and PhD) is a jointly-administered graduate program intended to prepare students for teaching and/or research careers in the health sciences. This program emphasizes the comparative approach to the study of experimental pathobiology, infectious diseases, pharmacokinetics, epidemiology, clinical medicine, immunopathology, hematology, aberrant metabolism, oncology, and genetic disorders. The PhD program is open to approved graduate students seeking training in this area and is especially useful for individuals with professional degrees. For the student with undergraduate biological science background, the comparative and experimental medicine program provides an unusual opportunity to study disease processes common in humans and animals from a multidisciplinary perspective. The scope of this intercollegiate program, which pools faculty resources from both veterinary and human medicine, is broadened by faculty members representing animal science and numerous areas of the life sciences. The interdisciplinary training environment includes such diverse support as facilities and personnel at the Veterinary Teaching Hospital, the University of Tennessee Medical Center at Knoxville, the Oak Ridge National Laboratory, and departments of life sciences.

MASTER OF SCIENCE
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 must have a baccalaureate degree with coursework in chemistry through organic, mathematics through calculus, physics, and basic biology. More advanced study in biology such as biochemistry, mammalian anatomy, histology, cell biology, or other appropriate biomedical courses from an accredited university is recommended.

Applicants for admission to the Master of Science degree program whose background include no formal training in the biomedical field beyond the baccalaureate degree will be required to score at least 1,000 on the quantitative and verbal portions of the Graduate Record Examination.

Requirements
Students must complete a minimum of 24 hours of coursework and 6 hours of Thesis 550. Comparative and Experimental Medicine 541 and 608 are required, as are 4 hours of 600-level graduate journal clubs. In addition, students must complete at least 3 hours of 500- or 600-level statistics and a minimum of 8 hours of coursework in a specified discipline. Areas of emphasis may include hematology, oncology, pathology, pharmacology, toxicology, immunology, genetics, infectious disease, epidemiology, metabolism, or other areas of medicine. 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 three members) is chosen before the end of the second 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 must be passed at the completion 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.

For additional information, write to the Office of Research and Graduate Programs, or access the Web site.
Requirements

Students with professional degrees (e.g., MD, DDS, DVM) or master’s degrees in a program-related biomedical science must complete at least 24 hours of coursework and 24 hours of Dissertation 600. Others must complete a minimum of 48 hours of coursework and 24 hours of Dissertation 600.

Comparative and Experimental Medicine 541 and 608 are required, as are 6 hours of 600-level graduate journal clubs. In addition, students must take at least 3 hours of 500- or 600-level statistics and a minimum of 8 hours of coursework in a specified discipline. Areas of emphasis may include hematology, oncology, pathology, pharmacology, toxicology, immunology, genetics, infectious disease, epidemiology, metabolism, or other areas of medicine. Exceptions to accommodate students with specific interests must be approved by the Joint Graduate Coordinating Committee after application, in writing, to the director. The doctoral committee is chosen during the first year. 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 must be passed before the end of the third year of the program. In addition, students must prepare and defend a prospectus outlining their proposed research projects before the end of their third year in the program. Exceptions to these requirements are provided for medical residents pursuing doctoral degrees who must successfully complete the comprehensive examination and research prospectus before the end of their fourth year in the program.
Facilities for Research and Service

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 four 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 420 Communications 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
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 within 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 College of Engineering 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.

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 as follows.

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 Leadership
Ivan Racheff Chair of Excellence in Materials Science and Engineering
Ivan Racheff Chair of Excellence of Plant Molecular Genetics
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
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
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. James W.L. Lewis, Director  
Space Institute  
B. H. Goethert Pkwy.  
Tullahoma, Tennessee 37388-8897  
(931) 393-7485  
(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  
514 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  
855 Monroe Avenue, Suite 515  
Memphis, Tennessee 38163  
(901) 448-5957  
(dvsmith@utmem.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)

**Molecular Resource Center of Excellence**
Terry Mark-Major, Manager  
The University of Tennessee Health Science Center  
956 Court Avenue, Room A130  
Memphis, Tennessee 38163  
(901) 448-2656  
(mrc@utmem.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 Sayler, Director  
The University of Tennessee, Knoxville  
The University of Tennessee Conference Center, Suite 311  
Knoxville, Tennessee 37996  
(865) 974-8080  
(sayler@utk.edu)

**Early Learning Center for Research and Practice**  
(College of Education, Health & Human Sciences)  
[http://elc.utk.edu](http://elc.utk.edu)  
Rena Hallam, Executive Director

The Early Learning Center for Research and Practice, operated by the Department of Child and Family studies since 1927, currently offers 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 Early Learning Center serves three purposes – to promote the research and scholarship activities of the department and other university faculty and students through 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 ELC 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, early childhood assessment, teachers as collaborative researchers, and nutritional preferences of toddlers) are ongoing. The Early Learning Center is accredited by the National Academy of Early Childhood Programs, a division of the National Association for the Education of Young Children and is a Tennessee Three-Star rated child care facility.

For more information, check the website at [http://elc.utk.edu](http://elc.utk.edu).

**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, UT Extension, 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 research.
  - 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 ten Research and Education Centers located across Tennessee and operated by the Experiment Station. The Experiment Station also supports graduate student assistantships.

### University of Tennessee Extension

**Charles Goan, Interim 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. 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

**Barbara J. Dewey, Dean**

**Aubrey H. Mitchell, Associate Dean**

**Jill Keally, Assistant Dean**

[http://www.lib.utk.edu/](http://www.lib.utk.edu/)

#### Professors

<table>
<thead>
<tr>
<th>Name</th>
<th>MSLS/MLS</th>
<th>Institution</th>
</tr>
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<tbody>
<tr>
<td>Atkins, D.</td>
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<td>Deeken, J.</td>
<td>MSLS</td>
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<td>Thomas, D.</td>
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<td>Georgia Peabody</td>
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#### Assistant Professors

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The University of Tennessee Libraries own approximately 2.4 million volumes and subscribe to more than 32,000 periodicals and serial titles.* The UT Libraries are committed to providing access to information in all formats. A strong collection of electronic resources are available through the Libraries' Web page at www.lib.utk.edu. UT's Digital Library Center hosts a growing number of digital collections. 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.

Experts at the reference desk in each library offer help and assistance in using the library for research. AskUs.Now (www.lib.utk.edu/refts/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. Workshops and classes are offered throughout the semester to help students learn how to get the most out of the Libraries' services. The services and facilities of the UT Libraries are accessible to persons with disabilities.

The John C. Hodges Main Library (1015 Volunteer Blvd.) is a 350,000 square-foot building housing collections in all subject areas. Reference assistance and research consultation are available in Reference Services (Room 135) and The Commons (Room 235). The Commons, which is jointly staffed by the University Libraries and the Office of Information Technology, offers a computer help desk, a wide range of software applications and computer equipment, spaces for individual and group study, and loaner laptops configured to access the wireless network. The Commons is open continuously from noon on Sunday to midnight on Friday, during Fall and Spring Semesters. The second floor CyberCafe, with reading tables and a coffee shop, also is open for late night study. The Studio (Room 245) offers students a state-of-the-art lab for graphics, video and web production. Still and video cameras are available for checkout from The Studio. The Center for Children's and Young Adult Literature on the third floor provides a study collection of children's books.

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, 1401 Cumberland Ave.) houses a large collection of sheet maps, atlases, journals, and digital resources related to cartography and GIS. Materials in print, film, and digital formats are gathered from commercial sources as well as the Government Depository program.

The Music Library (301 Music Bldg.) 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 dedicated to building collections of manuscripts, rare books, and other unique research materials. Collection strengths include Tennessee authors, Tennessee history and politics, Oak Ridge, and TVA. The Great Smoky Mountains Regional Collection is an ongoing effort to collect and preserve materials on the region. 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.

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

The Social Work Library (Room 292, 193-E Polk Ave., 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.

**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 30 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.

**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. The student’s UT email account is the official way the University communicates with students. These accounts may be used for e-mail, course work, research, and personal Web pages. Information and on-line registration for computer accounts are available at http://oit.utk.edu/accounts/. 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 wireless, direct Ethernet, or dial-up connections. UT Knoxville’s wireless infrastructure is available in most of the academic and administrative buildings on the Knoxville campus.

To provide access to computing facilities on campus, OIT staffs seven computing labs, maintains several unstaffed labs, and supports computing installations in residence halls. The computing labs are equipped with more than 300 microcomputers including current models of Apple, Dell, and Gateway machines. In addition, there are laser printers, wireless printers, scanners, CD-Writers, and zip drives 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. The Help Desk may also be contacted online by filling out the Help Desk request form which can be found at http://oit.utk.edu/contact.html. For more information, please visit the 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. The Customer Service Center also cleans up virus and spyware infected machines and reloads/upgrades 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 are offered aimed at improving skills with the technology available at UT. Life Preserver: An Introduction to UT 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 800 courses available. This training is free to 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 students, faculty, and staff enhance the quality of their research by working together to effectively apply analytical methods, especially statistics. The software we support includes SPSS, SAS, Maple, MATLAB, LabVIEW, QDA Miner, WordStat, Enterprise Miner and Text Miner. The SCC 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. Assistance is available by appointment via the Help Desk at 974-9900, by walk-in at 200 SMC, 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 University of Tennessee faculty, graduate teaching assistants, and academic teaching staff make effective use of technology in their teaching, both online and in the classroom. The ITC supports the University’s academic community by providing free production services for the design and development of web-based course materials, implementing faculty grants for instructional technology projects, and administering 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

(Office of Arts and Sciences)

Lance Laurence, 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 Sayer, 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 of Excellence  
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; fibrotic diseases, such as heart failure and emphysema; and clinical research. The center also educates and trains pre-and postdoctoral fellows and conducts outreach programs.

Tennessee Advanced Materials Laboratory (TAML)  
Ward Plummer, Director  
The Tennessee Advanced Materials Laboratory (TAML) calls on experts in materials science and engineering, chemistry, chemical engineering, and physics at the University of Tennessee, Knoxville, and the Oak Ridge National Laboratory to explore the creation of new materials through computer-intensive modeling and experimental research.

Center of Excellence for Structural Biology  
Engin Serpersu, Director  
The mission of the University of Tennessee Center of Excellence for Structural Biology (CESB) is to expand the frontiers of knowledge in biomolecular structural and functional research. The center brings together a large group of structural molecular biologists working on a wide range of biological molecules, biomolecular assemblies and complexes. Its participants represent specialties in all of the current major techniques for high-resolution structure determination of large molecules, including X-ray crystallography, NMR spectroscopy and a battery of sophisticated biophysical tools including mass spectrometry and other spectroscopic techniques.

Research Consortiums  
The University of Tennessee, Knoxville, is a member of three not-for-profit research consortiums — Oak Ridge Associated Universities (ORAU); Southeastern Universities Research Association (SURA); and Universities Research Association, Inc. (URA). Oak Ridge Associated Universities (ORAU). Since 1946, students and faculty of the University of Tennessee, Knoxville, have benefited from its membership in Oak Ridge Associated Universities (ORAU). ORAU is a consortium of 91 colleges and universities and a contractor for the U.S. Department of Energy (DOE) located in Oak Ridge, Tennessee. ORAU works with its member institutions to help their students and faculty gain access to federal research facilities throughout the country; to keep its members informed about opportunities for fellowship, scholarship, and research appointments; and to organize research alliances among its members.

Through the Oak Ridge Institute for Science and Education (ORISE), the DOE facility that ORAU manages, undergraduates, graduates, postgraduates, as well as faculty enjoy access to a multitude of opportunities for study and research. Students can participate in programs covering a wide variety of disciplines, including business, earth sciences, epidemiology, engineering, geological sciences, physics, pharmacology, ocean sciences, biomedical sciences, nuclear chemistry, and mathematics. Appointment and program length range from one month to four years. Many of these programs are especially designed to increase the numbers of under-represented minority students pursuing degrees in science- and engineering-related disciplines. A comprehensive listing of these programs and other opportunities, their disciplines, and details on locations and benefits can be found in the ORISE Catalog of Education and Training Programs, which is available at http://www.orau.gov/orise/educ.htm, or by calling either of the contacts below.

ORAU’s Office of Partnership Development seeks opportunities for partnerships and alliances among ORAU’s members, private industry, and major federal facilities. Activities include faculty development programs, such as the Ralph E. Powe Junior Faculty Enhancement Awards, the Visiting Industrial Scholars Program, consortium research funding initiatives, faculty research, and support programs as well as services to chief research officers.

For more information about ORAU and its programs, contact Lillian T. Mashburn; Director, Office of Federal Relations; ORAU Councilor for the University of Tennessee or Monnie E.
workshops on stormwater management and erosion prevention and sediment control. The center sponsors and conducts training to contribute to careers in these fields. The center maintains a technical library that includes numerous water resources-related databases on CD-ROM and other references in support of its broad-based program involving watershed management, water quality education, urban stormwater management, erosion prevention, and sediment control. The center sponsors and conducts training workshops on stormwater management and erosion prevention and sediment control for the state.

Tennessee Water Resources Research Center
(Office of Research)
http://eerc.ra.utk.edu/divisions/WRRC.html
Timothy R. Gangaware, Associate Director
Dr. Bruce A. Tschantz, Senior Research Associate
Ruth Anne Hanahan, Senior Research Associate

The Tennessee Water Resources Research Center, 600 Henley Street, Suite B060, is a federally designated institute for sponsoring and coordinating water research for the state. The mission of the center is: (1) to assist and support all the academic institutions of the state, public and private, in pursuing water resources research which addresses a wide range of problems of interest to the state, region, and nation; (2) to provide for information dissemination and technology transfer services to state and local government bodies, academic institutions, professional groups, environmental organizations, and others, including the general public, who have an interest in water resources matters; and (3) to promote education and training in fields relating to water resources and to encourage the entry of promising students into careers in these fields. The center maintains a technical library that includes numerous water resources-related databases on CD-ROM and other references in support of its broad-based program involving watershed management, water quality education, urban stormwater management, erosion prevention, and sediment control. The center sponsors and conducts training workshops on stormwater management and erosion prevention and sediment control for the state.

Textiles and Nonwovens Development Center
(Office of Research)
Linda R. Painter, Director
G. Allan Stahl, Project Director
Jack L. Wyrick, Operations Supervisor

The Textiles and Nonwovens Development Center (TANDEC) is a research and application development facility for melt processed nonwoven fabrics. These are materials used in a variety of products such as disposable diapers, wipes, hospital gowns and drapes, and protective clothing and masks. Officially dedicated in 1990, TANDEC was established through a grant from Exxon Mobil Chemical Company. The Center brings together academics and industry to provide leadership in research, education, and industry services, by developing innovative materials, studying basic engineering and scientific aspects of products and processes, building cross-disciplinary research groups, and providing a range of laboratory and pilot scale equipment. Opportunities exist for faculty and students to work with pilot scale processing lines and interact with industrial engineers and scientists.

Tourism Institute
(Office of Research)
Stephen C. Morse, Director

Through education, research, and public service the Tourism Institute at the University of Tennessee seeks to add value to Tennessee's largest sector of the economy - hospitality and tourism. Centered in the department of Retail, Hospitality, and Tourism Management in the College of Education, Health and Human Sciences, many research projects involve maintaining databases of tourism trends, economic impacts and educational issues in management, marketing, and the development of market valued tourism products. The institute will assist public and private tourism professionals in efficient and profitable operational analysis as well as marketing and economic assistance.

Since tourism is a demand driven industry, understanding consumer demand and tourist behavior is essential to expanding markets and increasing demand for the Tennessee tourism product. Recognizing the tourism product includes consumer spending on lodging, retail shopping, food and beverage, transportation, and attractions provides special opportunities to track the impact and growth of these hospitality related industries as a result of tourist spending. It also works with Tennessee and Southeast regional public and private tourism organizations in developing educational, research and service projects to grow the state and regional tourism economy. The institute works with the Tennessee Department of Tourism Development, College of Agriculture and Natural Sciences and other agencies in developing research studies to expand the tourism industry.

The University of Tennessee Space Institute
John E. Caruthers, Associate Vice President and Chief Operating Officer

The Space Institute is a graduate education and research institution located on a 365-acre lakeshore campus in Middle Tennessee. UTSI was established in 1964 and has evolved into an internationally recognized institution for graduate study and research in engineering, physics, and mathematics. The accredited academic programs and educational policies of the Space Institute have their origins in appropriate departments of the University of Tennessee. The more than 30 faculty members of the Institute carry out these accredited academic programs through classroom teaching, informal seminars, active research, and directing the research of their students in an environment of creative work and advanced study. Programs are available to students devoting full-time or part-time effort toward MS and PhD degrees, those interested in continuing education for updating...
and broadening knowledge, and those who wish to pursue postdoctoral research.

Graduate degree programs are available with majors in aerospace engineering, aviation systems, chemical engineering, electrical engineering, engineering science, Industrial engineering (engineering management concentration), mathematics, mechanical engineering, and physics. In addition to the fundamental studies characteristic of each discipline, research opportunities are available in many areas including aerodynamics, fluid mechanics, advanced space propulsion, energy conversion processes, thermal sciences, coal combustion, magnetohydrodynamics, plasma physics, space systems, propulsion, computational fluid dynamics, and other aspects of atmospheric and space flight.

The Institute has an established Center of Excellence in Laser Applications and offers graduate studies and research opportunities in laser diagnostics, laser materials interactions, pico-second processes, and coherent and non-linear optics, and biophysical applications.

The Institute was established in part to increase the research and engineering resources of Tennessee through education and practice in relevant scientific and technical areas and in part to interface university faculty and student research with the Air Force Arnold Engineering Development Center. The faculty, research activities, and facilities of the Institute, and those available at Arnold Center through appropriate contractual arrangements, provide students an unusual opportunity for significant research in these areas. Students who enroll at UTSAI are admitted to graduate study at the University of Tennessee. Graduate Research Assistantships are available for qualified students. Further information may be obtained from the Dean for Academic Affairs, the University of Tennessee Space Institute, Tullahoma, Tennessee 37388.

University Outreach and Continuing Education
Norvel Burkett, Assistant Vice Chancellor

The University of Tennessee, Knoxville, is committed to its land-grant mission of public service. The institution meets that mission by extending its continuing education services and programming resources through outreach initiatives. University Outreach and Continuing Education works with academic departments to offer courses, educational services and programs. The division offers programs using a variety of modes, helping people of all ages achieve degrees and certificates, accomplish professional development goals, and pursue intellectual and self-improvement interests.

Programs and courses are based upon student needs and desires, whether for self-motivated learning; for leisure and recreational programs; or for professional promotion, certification, licensure, re-licensure, or mid-career changes. The division provides these opportunities through program coordination and development of the four departments – Department of Conferences, Department of Distance Education and Independent Study, English Language Institute, and Professional and Personal Development.

For more information, contact
University Outreach and Continuing Education
The University of Tennessee
313 Conference Center Building
Knoxville, Tennessee 37996-4137
Phone (865) 974-3181, fax (865) 974-6629
E-mail outreach@tennessee.edu
Web site www.outreach.tennessee.edu

Department of Conferences
Robert Gibbs, Director

The Department of Conferences, housed in the Conference Center Building in downtown Knoxville, provides management services to university departments and faculty or outside groups that desire to hold an educational meeting anywhere in Tennessee or across the United States.

The department assists organizations in designing and managing programs to meet the needs of attendees. The staff provides professional guidance and management for small group meetings as well as for major conventions of several thousand delegates. Consulting and support services can include planning and budgeting, registration, lodging, food services, promotional materials, meeting-site management and all details to ensure a successful event. Some programs qualify for Continuing Education Units (CEUs), which become a permanent record maintained by the University Outreach and Continuing Education.

Additional information may be obtained from
University of Tennessee Conferences
The University of Tennessee
P.O. Box 2648
Knoxville, Tennessee 37901
Phone (865) 974-0250, fax (865) 974-0264
E-mail conferences@tennessee.edu
Web site www.outreach.tennessee.edu/conferences

University Conference Center
Robert Gibbs, Director

The University Conference Center, managed by the Department of Conferences, offers quality meeting facilities and service to university units, business and industry groups, professional organizations, and government agencies. Professional groups and interested individuals can request interactive videoconferencing to locations worldwide. Arrangements can also be made to receive (downlink) programming or transmit (uplink) programming via satellite. The University Conference Center is located at 800 Henley Street in downtown Knoxville.

Additional information may be obtained from
UT Conference Center
University Outreach and Continuing Education
The University of Tennessee
Suite 212
Knoxville, Tennessee 37996
Phone (865) 974-0250, fax (865) 974-0264
E-mail conferences@tennessee.edu
Web site www.outreach.tennessee.edu/conferences

English Language Institute
Jim Hamrick, Director

The English Language Institute (ELI) offers a non-credit language-study program. It is designed to assist students in their pursuit of career goals or educational objectives in the United States. The courses emphasize development of communicative ability in listening, speaking, reading, and writing. Faculty members are trained in teaching English to speakers of other languages and different national backgrounds.

The curriculum consists of eight proficiency levels: 101-108, Introductory through Pre-Academic.

Classes meet each day with emphasis on English Structure (Grammar); Listening Comprehension, Writing/Composition (Rhetoric), Conversation Practice for Communicative Purposes, Reading and Vocabulary.

Classes also assist students in pronunciation, test-taking strategies, U.S. culture orientation, and university study skills.

ELI offers on and off-campus classes for professional and academic audiences. ELI also offers seminars for international
graduate students who need to improve their spoken English or pedagogical skills for the purpose of serving as graduate teaching assistants.

Additional information may be obtained from

English Language Institute
University Outreach and Continuing Education
The University of Tennessee
907 Mountcastle Street
Knoxville, Tennessee 37996-3505
Phone (865) 974-3404
Fax (865) 974-6383
E-mail eli@tennessee.edu
Web site www.outreach.tennessee.edu/eli

Department of Professional and Personal Development
Mary F. Jerger, Director

The Department of Professional and Personal Development provides a comprehensive array of non-credit courses, certificates, and seminars designed to serve the needs of individuals and businesses in Knoxville and surrounding communities. Courses are offered on the university campus, at off-campus locations (including two Oak Ridge classrooms), and online. Classes are taught by university faculty, staff, and community experts. Courses also are delivered on-site for business clients, with instructional services tailored to the needs of each group.

Business topics include professional development, career planning, computer training, and several specialized certificate programs. Personal interest topics range from creative writing to art, dance, gardening, music, and sports. There are also courses that meet requirements of the state or other agencies for certification in real estate and financial planning.

Special programming also includes Kids U which provides summer hands-on workshops for elementary and secondary education students; Seniors for Creative Learning, a membership-based program focusing on issues and courses for senior adults; and the Smoky Mountain Field School, a program co-sponsored with Great Smoky Mountains National Park.

For further information or to register, contact

Department of Professional and Personal Development
University Outreach and Continuing Education
The University of Tennessee
313 Conference Center Building
Knoxville, Tennessee 37996-4137
Phone (865) 974-0150
Fax (865) 974-0154
E-mail ProfessionalPgms@utk.edu
Web site www.outreach.utk.edu/ppd

Department of Distance Education and Independent Study
George H. Hoemann, Assistant Dean

The Department of Distance Education and Independent Study, in concert with academic departments, offers Internet-based, Web-delivered classes, and programs leading to certificates and degrees. The College of Communication and Information and the College of Engineering offer Master’s degree programs through Web-based courses, while the Departments of Nuclear Engineering and Statistics offer courses leading to degree and certificate programs. Other undergraduate and graduate classes and programs are available, as well as a variety of individual courses in many disciplines. Current course availability can be found on the Web at anywhere.tennessee.edu.

The department provides services and support for faculty, students, and industry interested in flexibly-delivered education.

The Internet eLearning Institute provides certificate programs, professional development courses and training.

For information and registration forms, contact the Distance Education Program at
Courses of Instruction

REGISTRATION NOTES
(RE) Prerequisite(s) and Corequisite(s) will be enforced by the Registration System in the future. They are currently enforced by the department.
(DE) Prerequisite(s) and Corequisite(s) are enforced by the department. Registration Restrictions are enforced by the Registration System.

Accounting (009)

451 Operational Auditing and Consulting (3) Approaches auditors might use to evaluate an entity’s efficiency and effectiveness in variety of settings and techniques auditors might use in consulting to provide entity competitive advantage.

502 Registration for Use of Facilities (1-15) Required for the student not otherwise registered during any semester when student uses university facilities and/or faculty time before degree is completed.

Grading Restriction: Satisfactory/No Credit grading only.

Credit Restriction: May not be used toward degree requirements.

507 Financial Reporting Research and Contemporary Issues (3) Theory and practice of contemporary financial reporting issues are covered with an emphasis on researching the authoritative accounting literature. Specific contemporary issues covered vary each semester.

Comment(s): Master of Accountancy admission or consent of instructor required.

518 Professional Standards (3) Basic standards and contemporary issues relevant to assurance providers. Actual practice cases are used to illustrate application.

Comment(s): Master of Accountancy admission or consent of instructor required.

519 Seminar in Business Risk and Assurance Methodology (3) Business risk and emerging methodology used by assurance providers.

Comment(s): Admission to a graduate program or consent of instructor required.

521 Advanced Management Accounting (3) Analysis of management accounting and cost management practices and models. Topics include cost behavior, strategies and models for decision making, and performance measurement issues.

(DE) Prerequisite(s): Management accounting course.

Comment(s): Admission to a graduate program or consent of instructor required.

531 Tax Strategy, Tax Research, and Entity Taxation (3) Current issues in tax strategy including investment models, implicit taxes, tax arbitrage, organizational form, and other selected topics. Methods of researching tax issues within the U.S. federal tax system with emphasis on Web-based research tools. Income taxation of business entity operations.

Comment(s): Master of Accountancy admission or consent of instructor required.

532 Corporate Taxation and Reorganizations (3) Current issues in corporate taxation including organization and capital structure, distributions, liquidations, acquisitions, and reorganizations. Course emphasizes group projects and presentations. Web-based research tools used extensively.

(DE) Prerequisite or (DE) Corequisite: 531.

Comment(s): Master of Accountancy admission or consent of instructor required.

533 Taxation of Partnerships and S Corporations (3) Current issues in partnership and S corporation taxation including partnership formation, operations, allocations, and distributions; LLCs; S corporation election and operations; and comparisons of different flow-through entities. Course emphasizes group projects and presentations. Web-based research tools used extensively.

(DE) Prerequisite or (DE) Corequisite: 531.

Comment(s): Master of Accountancy admission or consent of instructor required.

534 Family Tax Planning (3) Methods used to value closely-held business, the law and planning strategies related to inter vivos and post-mortem property transfers and the taxation of estates, and financial planning techniques used to meet family tax planning objectives.

(DE) Prerequisite or (DE) Corequisite: 531.

Comment(s): Master of Accountancy admission or consent of instructor required.

539 Multi-Jurisdictional Tax Planning and Policy (3) International and state tax law as it pertains to business transactions. Particular emphasis is placed on identifying tax planning opportunities and designing tax strategies to meet planning objectives.

(DE) Prerequisite: 531.

Comment(s): Master of Accountancy admission or consent of instructor required.

592 Graduate Internship in Accounting (3) Full-time resident professional employment for one academic semester involving qualified job experience, written report of responsibilities, and evaluation of student performance.

Comment(s): Master of Accountancy admission or consent of Master of Accountancy advisor required.

593 Individual Research in Accounting (3) Directed research in topic of mutual interest.

Repeatability: May be repeated. Maximum 6 hours.

Comment(s): Master of Accountancy admission or consent of Master of Accountancy advisor required.

600 Doctoral Research and Dissertation (3-15)

Grading Restriction: P/NP only.

Repeatability: May be repeated.

611 Doctoral Seminar in Accounting (3) Analysis of issues reflected in accounting literature.

Registration Permission: Consent of PhD program advisor.

612 Doctoral Seminar in Accounting (3) Analysis of issues reflected in accounting literature.

Registration Permission: Consent of PhD program advisor.

619 Doctoral Research in Accounting (3) Study of research methodology and application of various research methods in accounting literature.

Registration Permission: Consent of PhD program advisor.

621 Accounting Colloquium (1) Research and discussion of contemporary issues in practice of accounting.

Grading Restriction: Satisfactory/No Credit grading only.

Repeatability: May be repeated.

Registration Permission: Consent of PhD program advisor.
622 Accounting Colloquium (1) Research and discussion of contemporary issues in practice of accountability.  
Grading Restriction: Satisfactory/No Credit grading only.  
Registration Permission: Consent of PhD program advisor.

693 Independent Study (3) Directed research in topic of mutual interest.  
Repeatability: May be repeated.  
Registration Permission: Consent of instructor.

Advertising (012)  
490 Special Topics (3) Detailed study of a specialized area of advertising. Topics vary by semester and include advanced media strategy, advanced creative strategy, direct marketing, and multicultural advertising.

500 Thesis (1-15)  
Grading Restriction: P/INP only.  
Repeatability: May be repeated.

502 Registration for Use of Facilities (1-15) Required for the student not otherwise registered during any semester when the student uses university facilities and/or faculty time before degree is completed.  
Grading Restriction: Satisfactory/No Credit grading only.  
Repeatability: May be repeated.  
Credit Restriction: May not be used toward degree requirements.

510 Advertising and Society (3) Analysis of advertising as institution in a free-enterprise democratic society and its relation to social, legal, cultural, and economic institutions.

520 Advertising and Communications Theory (3) Application of contemporary communications theories of attitude change, information-processing, and persuasion as applied to creative strategy decisions.

530 Advertising and Public Relations Research (3) Nature, scope, and application of research function to advertising and public relations decisions.

540 Advertising Decision Making (3) Analysis of decision making in budgeting, creative strategy, media strategy, research, evaluation, and agency-client relationships. Advertising response functions.

590 Project (3) Capstone project under guidance of faculty. Application of principles from previous coursework.

597 Independent Study (3)  
Repeatability: May be repeated. Maximum 6 hours.  
Registration Permission: Consent of instructor.

Aerospace Engineering (018)  
Not all the courses listed below are available at both the University of Tennessee, Knoxville, and UTSI campuses.

422 Aerodynamics (3) Theory and design of aerodynamic bodies for desired characteristics. Potential flow theory, viscous effects, and compressibility effects. Subsonic, transonic, and supersonic airfoils.

424 Astronautics (4) Solar system, orbital mechanics, propulsion, atmospheric entry including thermal protection materials, human factors in space flight, the space environment, and current topics.


426 Introduction to Aerospace Design (2) Design process, synthesis, design studies. Individual design reports required.

429 Aerospace System Design (3) Synthesis and design of a complete aerospace system. Participation in team design effort including formal presentations and design report.

449 Aerospace Engineering Laboratory (3) Designing, conducting, and reporting results of experimental exercises. Test standards and specifications. Analysis of data and formation of conclusions.

495 Selected Topics in Aerospace Engineering (1-4) Problems and topics related to developments and practice in aerospace engineering.  
Registration Permission: Consent of instructor.

500 Thesis (1-15)  
Grading Restriction: P/INP only.  
Repeatability: May be repeated.

502 Registration for Use of Facilities (1-15) Required for the student not otherwise registered during any semester when the student uses university facilities and/or faculty time before degree is completed.  
Grading Restriction: Satisfactory/No Credit grading only.  
Repeatability: May be repeated.  
Credit Restriction: May not be used toward degree requirements.

510 Registration for Use of Facilities (1-15) Required for the student not otherwise registered during any semester when the student uses university facilities and/or faculty time before degree is completed.  
Grading Restriction: Satisfactory/No Credit grading only.  
Repeatability: May be repeated.  
Credit Restriction: May not be used toward degree requirements.

511 Inviscid Flow (3) Kinematics and dynamics of inviscid fluids; potential flow about body, conformal mapping.

512 Viscous Flow (3) Derivation of fundamental equations of compressible viscous flow; boundary conditions for viscous heat-conducting flow; exact solutions for Newtonian viscous flow (Navier-Stokes) equations for special cases; similarity solutions. Thermal boundary layers, stability of laminar flows, transition to turbulence, 2-D turbulent boundary layer equations, Incompressible-turbulent mean flow, and compressible boundary layer flow.

531 Experimental Methods in Fluid Mechanics (3) Experimental techniques with laboratory experiments; representative experiments: hot wire anemometry and turbulence measurements, flow visualization, wind tunnel tests, water table experiments, supersonic flow experiments, boundary layer measurements, laser-optical measurements.

587 Independent Study (3) Directed research in topic of mutual interest.  
Repeatability: May be repeated. Maximum 6 hours.  
Registration Permission: Consent of instructor.

589 Project (3) Capstone project under guidance of faculty. Application of principles from previous coursework.

597 Independent Study (3)  
Repeatability: May be repeated. Maximum 6 hours.  
Registration Permission: Consent of instructor.

599 Multidisciplinary Project (1) (See Industrial Engineering 509.)
532 Introduction to Turbulence (3) Macroscopic effects, analogies, statistical treatment, correlation functions, energy spectra, diffusion; application of turbulent jets and pipe flow.
(DE) Prerequisite(s): 511 and 512.

533 Dynamics (3) (See Mechanical Engineering 533.)

534 Atmospheric Entry (3) Reentry trajectories; lift and drag during reentry; vehicle motion and stability during reentry; aerodynamic heating and heat protection systems.
(DE) Prerequisite(s): 512, Recommended Background: 522.

535 Mechanical Vibrations (3) (See Mechanical Engineering 534.)

539 Continuum Mechanics (3) (See Engineering Science 539.)

541 Fluid Mechanics I (3) (See Mechanical Engineering 541.)

542 Fluid Mechanics II (3) (See Mechanical Engineering 542.)

544 Transonic Flow (3) Nature of flow at transonic speeds; small disturbance theory; shock wave properties; shock-free flows; strong viscous interaction phenomena; solution techniques.
(DE) Prerequisite(s): 522.

551 Aerospace Mechanics (3) Principles of mechanics applicable to aerospace vehicles, equations of motion, multibody problems and trajectory analysis.
(DE) Prerequisite(s): Mathematics 471.

554 Aerospace Vehicle Stability and Control (3) Static and dynamic longitudinal directional and lateral stability and control. Coupled modes. Motion with free and fixed flight control surfaces. Automatic control systems.
(DE) Prerequisite(s): 423 and 551.

555 Human Vibrations Analysis and Protection (3) (See Biomedical Engineering 555.)

556 Vertical or Short Take Off and Landing Aircraft (3) Performance, stability, control of rotary wing, tilt wing, vectored lift and jet vertical riser type aircraft. Vertical and transition flight modes. High lift airfoils. Automatic controls. Simulation facility types and flight testing.
(DE) Prerequisite(s): 555.

(DE) Prerequisite(s): 523 and 551.

559 Advanced Mechanics of Materials I (3) (See Mechanical Engineering 559.)

561 Fundamentals of Aeroacoustics (3) Generation, propagation and absorption of sound in static and moving media.
Registration Permission: Consent of instructor.

564 Spacecraft Attitude Dynamics and Control (3) Rotational attitude dynamics of space vehicles. Gyroscopic instruments; passive and active attitude control devices. Linear control theory and attitude stabilization.
(DE) Prerequisite(s): 551 and Mathematics 471.

571 Finite Elements for Engineering Applications (3) (See Engineering Science 551.)

572 Computational Fluid-Thermal Systems (3) (See Engineering Science 552.)

573 Computational Solid Mechanics (3) (See Engineering Science 553.)

574 Space Engineering: Satellite Technology (3) Satellites and rockets (orbit, launch vehicles and launching), spacecraft structure, power systems, attitude control system, telemetry/tracking/command, and communication systems, spacecraft testing, reliability, and application of satellites (communications, weather, Earth observation, and future applications).
(DE) Prerequisite(s): 425, Mathematics 471, and Mathematics 404.

590 Selected Engineering Problems (2-6)
Repeatable: May be repeated. Maximum 6 hours.
Comment(s): Enrollment limited to students in problems option.
Registration Permission: Consent of advisor.

595 Seminar (1) All phases of aerospace engineering, reports on current research at the University of Tennessee, Knoxville, and UTSI.
Grading Restriction: Satisfactory/No Credit grading only.
Repeatable: May be repeated.

599 Special Topics in Aerospace Engineering (1-3)
Repeatable: May be repeated. Maximum 6 hours.

600 Doctoral Research and Dissertation (3-15)
Grading Restriction: P/NP only.
Repeatable: May be repeated.
502 Registration for Use of Facilities (1-15) Required for the student not otherwise registered during any semester when student uses university facilities and/or faculty time before degree is completed.
Grading Restriction: Satisfactory/No Credit grading only.
Repeatability: May be repeated. Maximum 6 hours.

511 Extension History, Philosophy and Objectives (3) Historical and philosophical foundation of adult education in American agriculture, key figures, issues, legislative movement, farmer organizations and programs. Cooperative Extension Service, origin, legislation and growth, and nature of present-day objectives and programs.
(DE) Prerequisite(s): 211 or consent of instructor.

521 Extension Program Planning and Evaluation (3) Theories and models of program development and evaluation and their use in extension education: planning and conducting needs assessments; planning, organizing, implementing and evaluating extension educational program content and learning activities; development and interaction of county, state and federal extension plans of work; and principles, techniques and instruments used to identify, gather and analyze information to evaluate extension programs.
(DE) Prerequisite(s): 211 and 511 or consent of instructor.

522 Educational Technology in Agricultural and Extension Education (3) Advanced concepts and methods relevant to both formal and non-formal instructional methodologies. Processes by which professional and other agents influence the introduction, adoption, and diffusion of technological change.
(DE) Prerequisite(s): 435 and 436 or consent of instructor.

524 Research Methodology (3) Social science research methods related to research in agricultural and extension education. Issues: research design, reliability and validity in measurement, sampling procedures, logic of analysis, scaling and measurement, and selection and interpretation of appropriate inferential tests of significance.
(DE) Prerequisite(s): 436 and 511 or consent of instructor.

525 Curriculum Development in Agricultural and Extension Education (3) Models, principles, and procedures for developing curricula in agriculture and extension education programs and scheduling learning activities used to implement these planned programs.
(DE) Prerequisite(s): 435 and 436 or consent of instructor.

526 Agricultural Education for First-Year Teachers (2) Developing competencies needed by first-year teachers for planning, organizing and conducting program of vocational agriculture in local community. Group meetings in selected centers and visits by instructor.
(DE) Prerequisite(s): 211 or consent of instructor.

527 Adult Education Strategies in Agricultural and Extension Education (3) Methods of developing and implementing educational programs for adults in agricultural and extension education and related contexts: different learning of adults and children (androgyne vs. pedagogy); understanding and determining adult needs, priorities and motivation for participating in educational programs; adoption of new ideas by adult learners; methods and materials effective in teaching adults; developing favorable attitudes toward post-secondary education and life-long learning.
(DE) Prerequisite(s): 211 and 511 or 346 or consent of instructor.

530 Special Topics in Agricultural and Extension Education (1-3) Current issues.
Repeatability: May be repeated. Maximum 9 hours.
Registration Permission: Consent of instructor.

532 Managing Organizations, Programs and Personnel (3) Theory and principles of management for individual and organizational effectiveness of agricultural organizations.
(DE) Prerequisite(s): 511 and 521 or consent of instructor.

592 Internship in Agricultural and Extension Education (1-3) Practical field experience in selected setting under supervision of local practitioner and departmental representative.
Grading Restriction: Satisfactory/No Credit grading only.
Repeatability: May be repeated. Maximum 3 hours.
Registration Permission: Consent of instructor.

593 Special Problems in Agricultural and Extension Education (1-4) Special research and/or special reports based on supervised independent study.
Repeatability: May be repeated. Maximum 6 hours.
Registration Permission: Consent of instructor.

Agricultural Economics (047)

412 Agricultural Finance (3) Macro-finance, financial objectives, acquisition of debt and equity funds, capital investments, capital allocation, debt repayment, credit analysis, borrower and lender loan application analysis; insurance strategies, computer applications, kids and sources of agricultural credit, and financial intermediation.

420 International Agricultural Trade and Marketing (3) Introduction to real and monetary aspects of international trade effect on agricultural commodity flows; partial equilibrium analysis of international trade in agricultural products; institutional aspects of international marketing of agricultural products.

430 Agricultural Policy (3) Values, goals and policy process. Economic rationale and effects of policy. Historical development and current characteristics of commodity, credit, food, and trade policy.

442 Agribusiness Management (3) Advanced concepts in developing business and marketing plans and in applied management principles such as inventory control and pricing techniques. Discussion of management issues including going international, employee supervision, management succession and guerrilla marketing. Teamwork emphasized in managing an agribusiness firm through game simulation. Written and oral presentation required.

450 Agricultural Industry Analysis and Forecasting (3) Analytical tools for decision making in agricultural sector; analysis of commodity supply and demand conditions; economic modeling; market forecasting, analysis of temporal and spatial patterns.

470 Natural Resource Economics (3) Nature of natural resources; economic efficiency as basis for natural resource use; externalities in natural resource use; factors influencing environmental quality; alternative public policy tools for influencing natural resource use or improving environmental quality.

500 Thesis (1-15) Grading Restriction: P/NP only.
Repeatability: May be repeated.
Registration Restriction: Master of Science – agricultural economics major.

502 Registration for Use of Facilities (1-15) Required for the student not otherwise registered during any semester when student uses university facilities and/or faculty time before degree is completed.
Grading Restriction: Satisfactory/No Credit grading only.
Repeatability: May be repeated.
Credit Restriction: May not be used toward degree requirements.

503 Managerial Economics for Agribusiness (3) Practical application of economic concepts to agribusiness management and marketing decisions. Topics include supply and demand analysis, demand estimation, production economics, cost analysis, pricing decisions, break-even analysis, capital budgeting, time value of money, and risk and uncertainty. Students will use Microsoft Excel to analyze managerial economic questions.

505 Microeconomic Analysis (3) Theory of utility maximization and demand, production, cost, firm behavior, and supply; price in product and factor markets; efficiency and welfare.
Recommended Background: Calculus and intermediate microeconomics courses.

512 Advanced Agribusiness Finance (3) Financial and investment analysis tools and concepts and their application to decisions faced by agribusiness. Emphasis on financial analysis and planning principles, capital budgeting, debt structure and financing, options, present value concepts, and risk analysis.
Recommended Background: Senior-level finance course.

520 Research Methods in Agricultural Economics (1) An overview of the logic and process of economic inquiry. Topics covered include the relationship between theory and applied research, problem formulation, definition of research problems, development of research problem statements with goals and objectives, and presentation and interpretation of results.

524 Econometric Methods in Agricultural Economics (3) Application of statistical methods to agricultural economic models; estimation of supply, demand and production functions; microeconomic forecasting models; interpretation of results.
Recommended Background: Calculus and statistics courses.

525 Agribusiness Operations Research Methods (3) Applications of operations research methods and concepts for agribusiness. Theoretical background and applied considerations of each technique with emphasis on applications. Computer and other applications of each technique for relevant agribusiness problems.
Recommended Background: Calculus and intermediate microeconomics courses.

530 Agricultural Policy Analysis (3) Evaluation of public policy as related to agricultural industry and rural areas.
Animal Science (113)
420 Advanced Reproduction (3) Collection, evaluation, and preservation of ova, spermatozoa and embryos; application of methods of natural breeding and techniques of artificial insemination and embryo transfer; herd sire and dam evaluation; pregnancy determination; gestation and parturition; infertility; recent advances in theriogenology.
Contact Hour Distribution: 1 hour and 2 labs.
(De) Prerequisite(s): 320 or equivalent.
430 Nutrient Evaluation and Ration Formulation (3) Ration nutrient analyses and formulations for beef and dairy cattle, sheep, horses, swine, poultry, laboratory, zoo, and companion animals. Mathematical and computer solutions and applications to formulating complex rations with constraints.
Contact Hour Distribution: 2 hours and 1 lab.
(De) Prerequisite(s): 330 or equivalent and an introductory computer science course.
481 Beef Cattle Production and Management (3) Integration of principles of nutrition, breeding, physiology, and marketing into complete production and management programs. Structure of industry, enterprise establishment, systems of production, production practices, and improvement programs. Management evaluated in terms of production response and economic returns. Comparisons made to small ruminant, forage-based production systems.
Contact Hour Distribution: 2 hours and 1 lab.
(De) Prerequisite(s): Completion of animal science sophomore and junior core courses or consent of instructor.
482 Dairy Cattle Production and Management (3) Integration of principles of nutrition, breeding, physiology, and marketing into complete production and management programs. Structure of industry, enterprise establishment, systems of production, production practices, and herd improvement programs. Alternatives evaluated in terms of production responses and economic returns.
Contact Hour Distribution: 2 hours and 1 lab.
(De) Prerequisite(s): Completion of 300-level courses or consent of instructor.
483 Pork Production and Management (3) Integration of principles of nutrition, breeding, physiology, and marketing into complete production and management programs. Structure of industry, enterprise establishment, systems of production, production practices, and herd improvement programs. Management evaluated in terms of production responses and economic returns.
Contact Hour Distribution: 2 hours and 1 lab.
(De) Prerequisite(s): Completion of 300-level core courses or consent of instructor.
484 Poultry Production and Management (3) Integration of principles of nutrition, breeding, physiology, and marketing into complete production and management programs. Structure of industry, enterprise establishment, systems of production, production practices, and improvement programs. Management evaluated in terms of production responses and economic returns.
Contact Hour Distribution: 2 hours and 1 lab.
(De) Prerequisite(s): Completion of 300-level core courses or consent of instructor.
500 Thesis (1-15)
Grading Restriction: P/NP only.
Repeatability: May be repeated.
502 Registration for Use of Facilities (1-15) Required for the student not otherwise registered during any semester when student uses university facilities and/or faculty time before degree is completed.
Grading Restriction: Satisfactory/No Credit grading only.
Repeatability: May be repeated.
Credit Restriction: May not be used toward degree requirements.
507 Professional Development Seminar (1) (See Agriculture and Natural Resources 507.)
511 Special Problems in Animal Science (1-4)
Repeatability: May be repeated. Maximum 9 hours.
Registration Permission: Consent of instructor.
(De) Prerequisite(s): General undergraduate coursework in anatomy/physiology and biochemistry or consent of instructor.
523 Advanced Mammalian Reproduction (3) Current topics and new frontiers in reproductive biology.
(De) Prerequisite(s): 320.
530 Animal Nutrition and Metabolism (4) Comparative digestive physi-
ology, digestion, absorption and metabolism of nutrients in ruminant and
nonruminant species. Concepts and methodologies of animal growth and
nutrient requirements; interrelationships, availability and deficiencies of
nutrients. (DE) Prerequisite(s): Animal nutrition, feeds, and ration formulation course or
consent of instructor.

535 Ruminology (2) Anatomy, physiology, and microbiology of rumen
ecosystem: microbial fermentation and metabolism of polysaccharides,
lipids and nitrogen. (DE) Prerequisite(s): 530 or consent of instructor.

571 Design and Analysis of Biological Research (3) Experimental de-
sign and procedures; selection of experimental units; analysis and inter-
pretation of data; statistical models and contrasts, analyses of variance;
covariates, treatment arrangements, mean separation and regression.
(Same as Plant Sciences 571.) Recommended Background: 3 hours of statistics.

572 Least Squares Analysis (3) Least squares estimation and hypoth-
thesis testing procedures for linear models; mixed model methodology; full
rank and non-full rank situations; covariance structures; estimation of
variance components.

596 Seminar on Advanced Topics in Animal Science (1) Required of all
first- and second-year MS students. Repeatability: May be repeated. Maximum 2 hours.

600 Doctoral Research and Dissertation (3-15) P/NP only. Grading Restriction: P/NP only.
Repeatability: May be repeated. (DE) Prerequisite(s): 530 or consent of instructor.

621 Advanced Topics in Animal Physiology (1-4) Recent advances and
concepts, research techniques, current problems. Repeatability: May be repeated. Maximum 6 hours.

631 Advanced Topics in Animal Nutrition (1-4) Recent advances and
concepts, research techniques, current problems. Repeatability: May be repeated. Maximum 6 hours.

651 Advanced Topics in Animal Anatomy (1-4) Current and future re-
search methodology, laboratory situation, recent advances in quantitative
techniques for gross and microscopic anatomy. (Same as Comparative and
Experimental Medicine – Veterinary Medicine 651.) Repeatability: May be repeated. Maximum 6 hours.

652 Disorders of the Endocrine System (2) Pathological and physiologi-
cal aspects of diseases; endocrine glands of various animal species. (Same
as Comparative and Experimental Medicine – Veterinary Medicine 652.)
Recommended Background: 3 hours of physiology.

681 Advanced Topics in Animal Health and Well-Being (1-4) Recent
advances and concepts, research techniques, and current problems asso-
ciated with animal health and behavior. Repeatability: May be repeated. Maximum 6 hours.

696 Seminar (1) Advanced topics in animal science. Required of all first-
and second-year PhD students. Repeatability: May be repeated. Maximum 2 hours.

Anthropology (122)

410 Principles of Cultural Anthropology (3) Exploration and illustration of
major concepts, theories, and methods in cultural anthropology, with application to
analysis of specific ethnographic data. (DE) Prerequisite(s): 130.

411 Linguistic Anthropology (3) Basic linguistic concepts applied to
research in cultural anthropology, particularly investigation of relationships between
language and culture. (Same as Linguistics 411.) (DE) Prerequisite(s): 130 or Linguistics 200.

412 Folklore in Anthropology (3) Introduction to anthropological study
of folklore, using folklore and folklore materials from various tribal, peasant,
and complex societies. (DE) Prerequisite(s): 130 or consent of instructor.

413 Dynamics of Culture (3) Definition and in-depth study of major
forms of culture change, ranging from evolution and diffusion to religious
revitalization and political revolt. Continuity and change in diverse cultural
settings examined through use of archaeological, ethnographic, and
contemporary case studies. (DE) Prerequisite(s): 130 or consent of instructor.
494 Primate Behavior (3) Social organization and behavior of selected primates: group composition, size, and structure; patterns of mating; other social interactions; communication; and cultural behavior. Application of primate studies to human ethology.  
(DE) Prerequisite(s): 110 or consent of instructor.

500 Thesis (1-15) Grading Restriction: P/NP grading only.  
Repeatability: May be repeated.

501 Graduate Research (1-9) Independent investigation of special problems in anthropology.  
Repeatability: May be repeated. Maximum 18 hours.

502 Registration for Use of Facilities (1-15) Required for the student not otherwise registered during any semester when student uses university facilities and/or faculty time before degree is completed.  
Grading Restriction: Satisfactory/No Credit grading only.  
Repeatability: May be repeated.  
Credit Restriction: May not be used toward degree requirements.

510 Method and Theory in Cultural Anthropology (3) Development of primary theoretical orientations by cultural anthropologists; formulation of research problems and methods of collecting, organizing, and utilizing data.  
Registration Permission: Consent of instructor.

511 Special Topics in Cultural Anthropology (3) Seminars for advanced students on topics of special interest: ethnomedicine, psychological anthropology, comparative social organization, religion, and art.  
Repeatability: May be repeated. Maximum 9 hours.  
Registration Permission: Consent of instructor.

512 Urban Studies in Anthropology (3) Process of urbanization examined cross-culturally; theory and method in researching urban communities; urban problems and applied anthropology.

515 Medical Anthropology (3) Cultural impact on disease patterning, theories of disease causation, and models of therapy. Theoretical and applied aspects of the anthropological study of health and disease.  
Registration Permission: Consent of instructor.

517 Forms of Social Inequality (3) Anthropological perspectives on societies stratified along lines of rank, caste, race, ethnicity, and class; inequalities engendered by sex role structure. Construction of social distinctions before and after rise and consolidation of modern world system. Intersections of race and ethnicity with class and gender.

520 Seminar in Zooarchaeology (3) Approaches to analysis and interpretation of archaeological fauna. Intensive reading; evaluation and discussion of major faunal studies, guides to identification, methods of presenting faunal data.  
Repeatability: May be repeated. Maximum 6 hours.

521 Laboratory Studies in Zooarchaeology (4) Examination and comparison of skeletons of major vertebrate groups, shells of terrestrial and aquatic mollusks, in relation to animal remains from archaeological contexts. Basic osteology and shell characters of species encountered in original sites; use of comparative collections.  
Repeatability: May be repeated. Maximum 8 hours.

522 Seminar in Archaeology (3) Theoretical and practical issues in contemporary archaeology: ethnarchaeology, paleoethnobotany, taphonomy, ceramic analysis, agricultural origins, and regional archaeological cultures.  
Repeatability: May be repeated. Maximum 9 hours.

530 Fieldwork in Archaeology (3-9) Practicum in surveying, excavating, processing, and analysis of archaeological data.  
Repeatability: May be repeated. Maximum 9 hours.  
Registration Permission: Consent of instructor.

550 Contemporary Issues in Anthropology (1-3) Review of recent directions in method and theory in anthropology.  
Repeatability: May be repeated. Maximum 6 hours.

560 Theory in Archaeology (3) Detailed consideration of theory in contemporary archaeology: models of scientific explanation, research design, archaeological formation processes, and methods of analysis and interpretation.

561 Archaeological Resource Management (3) Federal legislation and regulations affecting identification, protection, and management of archaeological resources. Professional ethics and responsibilities and relationship of federal and state agencies, public interest groups, and professional archaeologists in conduct of federally sponsored archaeology.

562 Special Topics in Mediterranean Archaeology (3) (See Classics 562.)

563 Lithic Artifact Analysis (3) Methods for analyzing prehistoric stone tools in practical laboratory/lecture format. Stone tool production, use, stylistic variability, and discard processes.

564 Archaeology of Southeastern United States (3) Archaeological research on prehistoric American Indian cultures in Southeastern United States; Tennessee prehistory.

565 Graduate Seminar in Ancient Mediterranean Civilization (3) (See Classics 565.)

580 Advanced Human Variation (3) Genetic and morphological variation among extant human groups; relationships of variation to geography, ecology and subsistence.

(DE) Prerequisite(s): 480.

582 Paleoanthropology (4) Fossil record from origin of hominids to appearance of anatomically modern humans. Functional morphology and phylogenetic relationships of fossil humans.  
(DE) Prerequisite(s): 480.

583 Skeletal Biology (3) Practical and theoretical approaches to analysis of prehistoric human skeletal remains. Demography, vital statistics, pathology, nutrition, and measures of biological relationships as related to population as adaptive unit.  
(DE) Prerequisite(s): 480.

585 Laboratory Studies in Biological Anthropology (3) Topical coverage of laboratory methods in biological anthropology.  
Repeatability: May be repeated. Maximum 9 hours.  
Registration Permission: Consent of instructor.

590 Method and Theory in Biological Anthropology (3) Current methods of analysis in biological anthropology and of past and current history of theoretical perspectives. Paleoanthropology, human osteology, and human variation and population structure.  
Registration Permission: Consent of instructor.

591 Foreign Study (1-15)  
Repeatability: May be repeated. Maximum 15 hours.

592 Off-Campus Study (1-15)  
Repeatability: May be repeated. Maximum 15 hours.

593 Independent Study (1-15)  
Repeatability: May be repeated. Maximum 15 hours.

600 Doctoral Research and Dissertation (3-15)  
Grading Restriction: P/NP only.  
Repeatability: May be repeated.

601 Advanced Graduate Research (1-6) Independent investigation of special problems in anthropology by advanced graduate students.  
Repeatability: May be repeated. Maximum 12 hours.  
Credit Restriction: Only 3 hours may be applied toward the 600-level requirement.

611 Advanced Seminar in Cultural Anthropology (3) Critical evaluation of current issues in theory and data interpretation.  
Repeatability: May be repeated. Maximum 6 hours.

660 Advanced Seminar in Archaeology (3) Selected topics in prehistoric and historic archaeology.  
Repeatability: May be repeated. Maximum 6 hours.

690 Selected Topics in Physical Anthropology (3)  
Repeatability: May be repeated. Maximum 6 hours.  
Comment(s): For doctoral students in biological anthropology concentration.

691 Selected Topics in Paleoanthropology (3)  
Repeatability: May be repeated. Maximum 6 hours.

695 Gross Human Anatomy (9) Skeleton, muscles, and cardiovascular system. Dissection of cadavers.  
Contact Hour Distribution: 5 hours and 5 labs.  
(DE) Prerequisite(s): 480 or human biology course.

Architecture (133)

403 Introduction to Preservation (3) History, theory, and legal aspects of architectural preservation and restoration.

404 Preservation Technology (3) Techniques of preservation—methods of analysis, history of materials and technology used in old buildings.  
(DE) Prerequisite(s): 403.

406 Ideas in Architecture (3) Historical and critical review of major ideas of architecture through the ages.  
Comment(s): Open to all students.

410 History and Theory of Urban Form (3) Patterns of community development. Selected historical and contemporary examples. Basic urban design issues and exemplary design approaches examined through lectures, readings, essays, and sketch studies including historical change in urban form and design.
412 Non-Western and Indigenous Architecture (3) Building responsive to climate, material availability, and economic level, as designed by anonymous builders. Examples from prehistoric times to present including the fertile crescent; the Indus Valley; Hindu, Buddhist, and Mughal architecture of India, China, and Japan.

415 Medieval Architecture (3) History of architecture from decline of Rome to beginning of Renaissance. (Same as Medieval Studies 415.)

417 The International Style (3) Survey of architecture of the early modern movement, primarily in Europe and America, covering the years 1900 to 1940.

420 History of American Architecture (3) Consideration of architecture and city planning in the United States from the pre-Columbian period until the mid-20th century.

425 Special Topics in Architecture (1-6) Faculty-initiated courses. Topics vary.

432 Computer Applications in Design II (3) Advanced computer-aided design using three-dimensional modeling software. Design analysis using computer animation, rendering techniques, visualization, and video. (DE) Prerequisite(s): 231 or consent of instructor.

433 Computer Applications in Design III (3) Advanced course that integrates three-dimensional modeling and technical analysis with computers to augment building design. Independent studies under faculty direction. Registration Permission: Consent of instructor.

445 Advanced Lighting (3) In-depth analysis and innovative concepts in design of lighting. (DE) Prerequisite(s): 342.

463 Architectural Development (3) Principles and practice of the architect as a developer. Impact of economics, finance and urban policy on the design and development of real estate.

473 Architectural Photography (3) Photography as a design, research, and presentation medium. Application of photographic techniques, printing and processing. Color and black and white.

500 Thesis (1-15) Grading Restriction: P/NP only. Repeatability: May be repeated.

502 Registration for Use of Facilities (1-15) Required for the student not otherwise registered during any semester when student uses university facilities and/or faculty time before degree is completed. Grading Restriction: Satisfactory/No Credit grading only. Repeatability: May be repeated. Credit Restriction: May not be used toward degree requirements.

503 Modern Architecture: Histories and Theories (3) History and theory of modern architecture: late 19th and 20th centuries through broad-based examinations of question of modernity and specific case studies of buildings, projects, landscapes and theories.

507 Architecture, Culture and Modernity (3) Scope of ideas generated in architecture’s recent history to reveal and explain production and reception of architecture: historical background necessary to understand those concepts. Complements history sequence but in specialized field of theory.

509 Seminar in Architectural Technology (3) Technological aspects influencing building form. Role of technical aspects of structural, environmental and building infrastructure as integrated systems supporting access use and expression of building.

514 Seminar in Ethical Imperatives (3) Social, cultural, philosophical and moral issues which impact professional responsibilities. Attitudes, values, and ideas that address formation of profession’s ethos.

515 Seminar in Issues in Urban Design (3) Investigations of urban forms, patterns, and attitudes that have shaped towns and cities. Registration Permission: Consent of instructor.

516 Materials and Methods of Construction (3) Properties of interior and exterior building materials and their relation to construction methods and detailing. Theory of materials selection and application and role materials and methods play in design process.

521 Principles of Architectural Form (3) Historical and contemporary architectural theory through investigation of literature and related examples. Theories of understanding and theories of application related to generation of architectural form and space in response to both cultural and environmental focus.

525 Special Topics in Architecture (1-3) Student- or instructor-initiated course.

526 Directed Readings in Architecture (3) Readings on topics of interest: primary texts, history, theory, urban issues, technology and professional practice.

528 Topics in Architectural History and Theory (3) Historic topics, ideas, and theories in architecture.

545 Principles of Environmental Control I (3) Introduction to heating, ventilating, air conditioning, solar energy, plumbing, and fire-protection systems. (DE) Prerequisite(s): 180. Comment(s): Enrollment is limited to Master of Architecture students.

551 Research Methods (3) Quantitative and qualitative methods of research in architectural inquiry. Systematic study and application of applied and speculative investigations in field of architectural research. Review and identification of techniques and methodologies and applications for architectural research and scholarship.

553 Advanced Topics in Architectural Technology (3) In-depth investigations and analysis: architectural technology lighting, structure, enclosure, mechanical and other architectural technologies.

562 Professional Practice (3) Management and organizational theories and practices for delivering professional design services: assessment of building industry and its influence on practice; analysis of basic management functions within professional firms; legal and ethical concerns facing practitioners today; and introduction to special obligations and privileges of design professional.

571 Architectural Design Studio: Building Groups/Complexes (6) Investigations analyzing cultural and contextual influences and precedents informing architectural form, space and structure in communal complex of buildings. Design of residential, recreational, educational, religious and communal facilities comprising distinctive/individual and modular/repetitive units. (DE) Prerequisite(s): 282.

572 Architectural Design Studio: Technological Traditions (6) Investigations analyzing cultural, physical, and environmental influences and precedents of community on architectural form, space and structure. Design of projects: civic realm of urban forms and spaces. (DE) Prerequisite(s): 571.


589 Urban Site Planning Workshop (4) Explores ideas, vocabulary, conventions, and technical skills essential to a critical understanding of how design and planning operate within the various scales of urban and ecological context. Examines both underlying terrain elements (landform, vegetation, water, climate) and human site interventions (urban infrastructure, buildings, and landscape). Strategies and analysis techniques for reading, mapping, and analyzing urban sites are introduced, as are issues, language, and principles of site design in urbanized landscapes. Comment(s): Open to all majors. Registration Permission: Consent of instructor.

591 Foreign Study (1-9)

592 Off-Campus Study (1-9)

593 Independent Study (1-9)
Art (140)
481 Museum Studies I: Museums, Purpose and Function (3) Purposes, functions, and development of museums of art, history, natural and applied science. (Same as Anthropology 481.)
482 Museum Studies II: Exhibition, Planning and Installation (3) Exhibition concept, development and implementation. Exhibition design and installation techniques. Publicity, production, matting and framing, shipping and storage. (Same as Anthropology 482.)
(DE) Prerequisite(s): 481 or consent of instructor.
484 Museum Studies III: Field Projects (1-12) Special field projects including restoration, preservation, registration, and other related research on or off campus. (Same as Anthropology 484.)
Repeatability: May be repeated. Maximum 12 hours.
(DE) Prerequisite(s): 481 and 482.
Registration Permission: Consent of instructor.
499 Special Topics (3) Student- or instructor-initiated course offered at convenience of department.
Repeatability: May be repeated. Maximum 12 hours.
502 Registration for Use of Facilities (1-15) Required for the student not otherwise registered during any semester when student uses university facilities and/or faculty time before degree is completed.
Grading Restriction: Satisfactory/No Credit grading only.
Repeatability: May be repeated. Credit Restriction: May not be used toward degree requirements.
507 Professional Practices: Teaching Internship (1) Individual study in development of skills and methodology in teaching studio courses.
Grading Restriction: Satisfactory/No Credit grading only.
Repeatability: May be repeated. Maximum 4 hours.
Credit Restriction: May not be applied toward degree requirements.
Comment(s): Enrollment is limited to students who are not GTAs.
Registration Permission: Consent of instructor.
591 Foreign Study (1-6)
Repeatability: May be repeated. Maximum 15 hours.
592 Off-Campus Study (1-6)
Repeatability: May be repeated. Maximum 15 hours.
593 Independent Study (1-4)
Repeatability: May be repeated. Maximum 15 hours.
Registration Permission: Consent of instructor.
595 Visiting Artist Seminar (2) Contemporary art issues by different visiting artists.
Repeatability: May be repeated. Maximum 8 hours.
Credit Restriction: May not be applied toward the art history requirement.

Art Ceramics (135)
421 Ceramics: Advanced Handbuilding (6) Continued investigation of ceramic form: emphasis on the development of individual direction.
Repeatability: May be repeated. Maximum 12 hours.
(DE) Prerequisite(s): 321 and 322.
422 Ceramics: Advanced Throwing (6) Continued, in-depth investigation of ceramic form: emphasis on the development of individual direction.
Repeatability: May be repeated. Maximum 12 hours.
(DE) Prerequisite(s): 321 and 322.
424 Ceramics: Clay and Glazes (3) Clay chemistry, clay bodies, glaze theory, and calculation. Formulating, mixing and testing of clay bodies and glaze formulas.
(DE) Prerequisite(s): 320.
429 Ceramics: Special Topics (3) Student- or instructor-initiated course: offered at convenience of department.
Repeatability: May be repeated. Maximum 12 hours.
Registration Permission: Consent of instructor.
521 Graduate Ceramics I (2-5)
Repeatability: May be repeated. Maximum 10 hours.
525 Graduate Ceramics II (2-5)
Repeatability: May be repeated. Maximum 10 hours.
593 Independent Study (1-4)
Repeatability: May be repeated. Maximum 15 hours.
Registration Permission: Consent of instructor.
595 Visiting Artist Seminar (2) Contemporary art issues by different visiting artists.
Repeatability: May be repeated. Maximum 8 hours.
Credit Restriction: May not be applied toward the art history requirement.
599 Projects in Lieu of Thesis (10)
Grading Restriction: Satisfactory/No Credit grading only.
Repeatability: May be repeated. Maximum 20 hours.
Comment(s): Completion of all graduate coursework and successful second-year evaluation by graduate faculty required.

Art Design/Graphic (136)
400 Typography (3) Principles of typography as well as classical and contemporary type forms as vehicles for communication. An intensive introduction to the fundamentals of type, from individual letterforms to large bodies of textual information. Attention to formal, technological, rhetorical and historical issues.
(DE) Prerequisite(s): Art 295 and Art Design/Graphic 251.
405 Computer Enhanced Graphic Design (3) Exploration of new technologies and their significance to graphic design.
Repeatable: May be repeated. Maximum 12 hours.
(DE) Prerequisite(s): 351 and 356 with a grade of C or better.
Registration Permission: Consent of instructor.
410 Advanced Typographic Investigation (3) Expands on principles introduced in Typography 400. Projects will include work in reflective as well as electronic environments with an emphasis on personal exploration.
(DE) Prerequisite(s): Art Design/Graphic 400.
425 Illustration (3) Develops skills and critical analysis for effective visual communication. Projects will explore the relationship between image and meaning. Students will explore a variety of media as they develop a personal visual vocabulary.
Repeatable: May be repeated. Maximum 6 hours.
(DE) Prerequisite(s): Art 295 and Art Design/Graphic 251.
451 Advanced Graphic Design (3) Theory and techniques of visual problem-solving as applied to advanced applications of graphic design.
(DE) Prerequisite(s): 352 with a grade of C or better.
452 Graphic Design Seminar (3) Discussion of design and professional issues including politics, economics, and ethics for the graphic designer. Culminates in a student-initiated project.
(DE) Prerequisite(s): 451 with a grade of C or better.
456 Graphic Design Practicum (1-12) Practical work experience in the graphic design field. Must be prearranged with department.
Repeatable: May be repeated. Maximum 12 hours.
Registration Permission: Consent of instructor.
459 Special Topics in Graphic Design (3) Student- or instructor-initiated course offered at convenience of department.
Repeatable: May be repeated. Maximum 12 hours.
Registration Permission: Consent of instructor.
550 Studies in Graphic Design/Illustration History (3) Design and illustration c. 1850 to present.
Repeatable: May be repeated. Maximum 6 hours.
Comment(s): Enrollment is limited to MFA candidates.
551 Graphic Design I (2-6)
Repeatable: May be repeated. Maximum 10 hours.
552 Graphic Design II (2-6)
Repeatable: May be repeated. Maximum 10 hours.
553 Computer Enhanced Design (2-6)
Repeatable: May be repeated. Maximum 10 hours.
Registration Permission: Consent of instructor.
593 Independent Study (1-4)
Repeatable: May be repeated. Maximum 15 hours.
Registration Permission: Consent of instructor.
595 Visiting Artist Seminar (2) Contemporary art issues by different visiting artists.
Repeatable: May be repeated. Maximum 8 hours.
Credit Restriction: May not be applied toward the art history requirement.
599 Projects in Lieu of Thesis (10)
Grading Restriction: Satisfactory/No Credit grading only.
Repeatable: May be repeated. Maximum 20 hours.
Comment(s): Completion of all graduate coursework and successful second-year evaluation by graduate faculty required.

Art Drawing (137)
419 Special Topics in Drawing and Painting (3) Student- or instructor-initiated course offered at convenience of department to enhance/expand the painting, drawing, and watercolor curriculum.
Repeatable: May be repeated. Maximum 12 hours.
Registration Permission: Consent of instructor.
511 Graduate Drawing I (2-6)
Repeatable: May be repeated. Maximum 10 hours.
512 Graduate Drawing II (2-6)
Repeatable: May be repeated. Maximum 10 hours.
593 Independent Study (1-4)
Repeatable: May be repeated. Maximum 15 hours.
(DE) Prerequisite(s): Consent of instructor.
565 Visiting Artist Seminar (2) Contemporary art issues by different visiting artists.
Repeatable: May be repeated. Maximum 8 hours.
Credit Restriction: May not be applied toward the art history requirement.

599 Projects in Lieu of Thesis (10)
Grading Restriction: Satisfactory/No Credit grading only.
Repeatable: May be repeated. Maximum 20 hours.
Comment(s): Completion of all graduate coursework and successful second-year evaluation by graduate faculty required.

Art Education (141)
510 History and Philosophy of Art Education (3) United States from 1860s to present.
Registration Permission: Consent of instructor.

520 Studies in Art Education (3) Issues and topics current to the field of art education.
Registration Permission: Consent of instructor.

530 Production and Critical Pedagogy in Art (3) Relationship of production to aesthetics and critical analysis of works of art.

540 Use and Construction of Instructional Materials for Teaching Art (3) Examination and construction of curriculum and instructional aids related to teaching strategies in art education.

Art History (139)
403 History of Photography (3) Survey of history of photography from introduction of daguerreotype and calotype to more recent trends. Emphasis will be placed on aesthetics and the use of photography as a medium for artistic expression.

411 Art of South and Southeast Asia (3) Survey of art and architecture of the Indian subcontinent and Southeast Asia from 2000 BC to the 20th century. The major achievements of each period are examined in relation to their religious, political, and social contexts.

415 Art of China (3) Survey of art and architecture of China from Neolithic period to the 20th century. The major achievements of each period are examined in relation to their religious, political, and social contexts.

416 Chinese Art of the 20th and 21st Centuries (3) Survey of Chinese art from the late 19th century through the present. Hong Kong, Taiwanese, and expatriate artists are also considered.

419 Art of Japan (3) Survey of the art and architecture of Japan from the Neolithic period to the 20th century. The major achievements of each period are examined in relation to their religious, political, and social contexts.

425 Early Christian and Byzantine Art to 1350 (3) Art in Italy and the Eastern Empire from the beginnings of Christian art to c. 1350. Mosaic and painting, sculpture and architecture. (Same as Judaic Studies 425.)

431 Medieval Art of the West, 800-1400 (3) Western European art of the Dark Ages, Romanesque, and Gothic periods. (Same as Judaic Studies 431; Medieval Studies 431.)

441 Northern European Painting, 1350-1600 (3) From courtly art of late Middle Ages to Northern Renaissance. Jan van Eyck, Roger van der Weyden, and Dürer; early printmakers. (Same as Medieval Studies 441.)

442 Art of Northern Europe, 1600-1675 (3) Concentrated study of Bruegel, Rubens, Rembrandt, Georges de La Tour, Vermeer, Poussin, and Hals.

451 Art of Italy, 1250-1540 (3) Development of exploration of naturalism. Revival of antiquity and development of theories of perspective in Early Renaissance. Including Duccio, Giotto, Masaccio, Donatello, Botticelli. (Same as Medieval Studies 451.)


453 Art of Southern Europe, 1575-1700 (3) Concentrated study of Caravaggio, Bernini, and Italian Baroque developments in all media. Spanish Baroque painting and sculpture with special attention to Velazquez.

454 Renaissance and Baroque Theory (3) Addresses the theory of Western art in the early modern period with emphasis on the development and evolution in European Art during the Renaissance and Baroque periods.
(PE) Prerequisite(s): 172 and 173 or consent of instructor.

461 Art of Southern and Eastern Africa (3) Art traditions of the eastern and southern regions of Africa. Sculpture, painting, pottery, textiles, architecture and human adornment will be examined. Some ancient Stone and Iron Age traditions will be examined, but the main emphasis will be on the diverse ethnic and regional art traditions practiced in the area from 19th century to present. (Same as Africana Studies 461.)

462 Art and Archeology of Ancient Africa (3) Historical art traditions of sub-Sahara Africa. Topics to be covered include prehistoric rock paintings; art from archaeological sites and ancient kingdoms. The time period covered ranges from the first and second millennia BC for some of the early terracotta sculpture and rock paintings, the 11th through 19th centuries AD for the later ancient kingdoms. (Same as Africana Studies 462.)

463 Arts of the African Diaspora (3) Examines the aesthetic, philosophical and religious patterns of the African descendants of Brazil, Suriname, Caribbean and United States. Emphasis will be placed on the full range of art forms, including the sculptural and performance traditions, as well as architecture, textile, basketry and pottery art forms. (Same as Africana Studies 463.)

464 Oceanic Art (3) Concentrated study of selected sculpture, textiles, architecture and other traditional art forms of Polynesia, Micronesia, and Melanesia. Objects are discussed on the basis of style, style relationship, iconography and the uses to which they were put in their traditional religious, political and social contexts.

471 History of North American Art (3) Survey of landmarks in painting, architecture, sculpture, and design from prehistory to 1900.

472 History of 20th-Century American Art (3) Developments in architecture, painting, and design from 1900.

473 19th-Century American Painting (3) From West and Copley to emergence of “The Eight.”

474 Theory of 20th-Century Art in Europe and America (3) Addresses the theoretical basis for the modern movement. Emphasis on analyzing and discussing individual works of art in light of contemporary writings by artists and theorists.


476 History of 20th-Century Painting and Sculpture in Europe (3) Development of the Modern and Post-Modern movements in Europe. Investigation of progression of abstraction through more recent conceptual trends. Analysis of the work of individual artists such as Picasso, Matisse, and others.

479 Special Topics in Art History (3) Student- or instructor-initiated course offered at convenience of department.
Repeatable: May be repeated. Maximum 12 hours.

483 History of American Sculpture (3) American sculpture from prehistory to the 1960s.

489 Studies in Art History (3) Concentration in individually selected area.
Repeatable: May be repeated. Maximum 6 hours.
Registration Permission: Consent of instructor.

571 Studies in Medieval Art (3) Art and architecture of the Middle Ages – major monuments from Byzantium or western Europe.
Repeatable: May be repeated with consent of department. Maximum 6 hours.
Comment(s): For MFA candidates.

572 Studies in Italian Renaissance Art (3) Art and architecture of the 14th, 15th, and/or 16th centuries in Italy. Early or High Renaissance or Mannerist periods.
Repeatable: May be repeated with consent of department. Maximum 6 hours.
Comment(s): For MFA candidates.

573 Studies in Baroque Art (3) Seventeenth century art and architecture – major artists and works from southern or northern Europe.
Repeatable: May be repeated with consent of department. Maximum 6 hours.
Comment(s): For MFA candidates.

574 Studies in Modern Western Art (3) Selected topics in 19th- and 20th-century western art.
Repeatable: May be repeated with consent of department. Maximum 6 hours.
Comment(s): For MFA candidates.

575 Studies in Modern American Art (3) Selected topics in 19th- and 20th-century American art.
Repeatable: May be repeated with consent of department. Maximum 6 hours.
Comment(s): For MFA candidates.

576 Studies in Asian Art (3) Selected topics in Japanese or Chinese Art.
Repeatable: May be repeated with consent of department. Maximum 6 hours.
Comment(s): For MFA candidates.

579 Special Topics in Art History (3) Student- or instructor-initiated course offered at convenience of department.
Repeatable: May be repeated with consent of department. Maximum 9 hours.
Comment(s): For MFA candidates.
Art Media Arts (134)

431 Photography III (3-6) Individual development of photographic problems and techniques. 
Repeatability: May be repeated. Maximum 12 hours. 
(DE) Prerequisite(s): 231, 330, and 331.

433 History of Film and Modern Art (3) Study of the development and interaction between cinematic arts and visual arts within the context of modern art history. 
(Same as Cinema Studies 433.) 
Comment(s): Available for art history credit.

435 Cinematography as Art (4) Continued development of concepts and techniques for the creation of film as an art form with an emphasis on individual projects. 
(Same as Cinema Studies 435) 
Repeatability: May be repeated. Maximum 9 hours. 
(DE) Prerequisite(s): 235 and 330 or consent of instructor.

436 Video Art (4) Continued development of concepts and techniques for the creation of video works as an art form with emphasis on individual projects. 
(Same as Cinema Studies 436) 
Repeatability: May be repeated. Maximum 9 hours. 
(DE) Prerequisite(s): 236 and 330 or consent of instructor.

439 Special Topics in Media Arts (3) Student- or instructor-initiated course offered at convenience of department. 
Repeatability: May be repeated. Maximum 12 hours.

441 Digital Photography II (4) Continuation of exploration and implications of use of computer in photography. 
Repeatability: May be repeated. Maximum 12 hours. 
Registration Permission: Consent of instructor.

442 Large Format Photography II (4) Studio course that continues exploration of the use of the large format camera in photography. 
Repeatability: May be repeated. Maximum 12 hours. 
Registration Permission: Consent of instructor.

531 Photography I (2-6) 
Repeatability: May be repeated. Maximum 10 hours.

532 Photography II (2-6) 
Repeatability: May be repeated. Maximum 10 hours.

535 Media Arts I (2-6) 
Repeatability: May be repeated. Maximum 10 hours.

536 Media Arts II (2-6) 
Repeatability: May be repeated. Maximum 10 hours.

577 Studies in Media as Art (3) Selected topics in theory and history of media as art form. 
Repeatability: May be repeated. Maximum 9 hours.

593 Independent Study (1-4) 
Repeatability: May be repeated. Maximum 15 hours. 
Registration Permission: Consent of instructor.

595 Visiting Artist Seminar (3) Contemporary art issues by different visiting artists. 
Repeatability: May be repeated. Maximum 12 hours. 
Credit Restriction(s): May not be applied toward the art history requirement.

599 Projects in Lieu of Thesis (10) 
Grading Restriction: Satisfactory/No Credit grading only. 
Repeatability: May be repeated. Maximum 20 hours. 
Comment(s): Completion of all graduate coursework and successful second-year evaluation by graduate faculty required.

Art Printmaking (132)

461 Advanced Print Workshop (1-6) Individual and collaborative studio work encompassing theory and practice in intaglio, lithography, relief printing, screenprinting, monoprint, papermaking, book arts, and/or photo-print processes. 
Repeatability: Not repeatable. May be taken once for 2-6 hours.

561 Printmaking I (2-6) Directed exploration of any or all matrix-based imaging: intaglio, relief, lithography, screen printing, photo-print methods, and monoprint. 
Repeatability: May be repeated. Maximum 12 hours.

562 Printmaking II (2-6) Directed exploration of any or all matrix-based imaging: intaglio, relief, lithography, screen printing, photo-print methods, and monoprint. 
Repeatability: May be repeated. Maximum 15 hours.

563 Printmaking III (2-6) Directed exploration of any or all matrix-based imaging: intaglio, relief, lithography, screen printing, photo-print methods, and monoprint. 
Repeatability: May be repeated. Maximum 12 hours.

564 Printmaking IV (2-6) Directed exploration of any or all matrix-based imaging: intaglio, relief, lithography, screen printing, photo-print methods, and monoprint. 
Repeatability: May be repeated. Maximum 15 hours.

593 Independent Study (1-6) 
Repeatability: May be repeated. Maximum 15 hours. 
Registration Permission: Consent of instructor.

595 Visiting Artist Seminar (2) Contemporary art issues by different visiting artists. 
Repeatability: May be repeated. Maximum 8 hours. 
Credit Restriction: May not be applied toward the art history requirement.

599 Projects in Lieu of Thesis (10) 
Grading Restriction: Satisfactory/No Credit grading only. 
Repeatability: May be repeated. Maximum 20 hours. 
Comment(s): Completion of all graduate coursework and successful second-year evaluation by graduate faculty required.

Art Sculpture (143)

441 Advanced Sculpture (3) Individual development of sculptural problems and techniques. Students work independently while participating in group projects, critique, and discussion. 
Repeatability: May be repeated. Maximum 12 hours. 
(DE) Prerequisite(s): 6 hours of 300-level sculpture.

449 Special Topics in Sculpture (3) Student- or instructor-initiated course offered at convenience of department. 
Repeatability: May be repeated. Maximum 12 hours. 
Prerequisite(s): Successful completion of any portfolio review.

541 Graduate Sculpture I (2-6) 
Repeatability: May be repeated. Maximum 10 hours.

542 Graduate Sculpture II (2-6) 
Repeatability: May be repeated. Maximum 10 hours.

593 Independent Study (1-4) 
Repeatability: May be repeated. Maximum 15 hours. 
Registration Permission: Consent of instructor.

595 Visiting Artist Seminar (2) Contemporary art issues by different visiting artists. 
Repeatability: May be repeated. Maximum 8 hours. 
Credit Restriction: May not be applied toward the art history requirement.
Asian Languages (144)

431 Readings in Chinese Literature (3) (Same as Chinese 431.)
    Repeatability: May be repeated. Maximum 9 hours.
    (DE) Prerequisite(s): Mastery of intermediate-level Chinese or consent of instructor.

451 Readings in Pre-Modern Japanese Literature (3) (Same as Japanese 451.)
    (DE) Prerequisite(s): Mastery of intermediate-level Japanese or consent of instructor.

452 Readings in Modern Japanese Literature (3) (Same as Japanese 452.)
    (DE) Prerequisite(s): Mastery of intermediate-level Japanese or consent of instructor.

Asian Studies (145)

471 Selected Topics in Asian Studies (3) Content varies.
    Repeatability: May be repeated. Maximum 6 hours.

510 Special Topics (3)
    Repeatability: May be repeated. Maximum 6 hours.

Astronomy (150)

411 Astrophysics (3) Development of analytical physical models of galactic structure of the universe, stellar and interstellar matter, and planetary systems. Topical and interdisciplinary approach includes consideration of quasars, pulsars, black holes and current developments in the field. Acceptable for credit toward the physics major.
    (DE) Prerequisite(s): Physics 136 or 138 or 222 or 232.
    Registration Permission: Consent of instructor.

490 Special Topics in Astronomy (1-3) Topics of current interest in astronomy and astrophysics. Acceptable for graduate credit in physics with consent of department.
    Repeatability: May be repeated with consent of department. Maximum 9 hours.

Audiology and Speech Pathology (160)

    (DE) Prerequisite(s): 300 or consent of instructor.

433 Observation of Clinical Practice (1)
    (DE) Prerequisite(s): 320 or consent of instructor.

434 Clinical Practice in Speech-Language Pathology II (1-4)
    Repeatability: May be repeated. Maximum 4 hours.
    (DE) Prerequisite(s): 433.
    Comment(s): Enrollment for fewer than 2 hours must have prior departmental approval.

435 Introduction to Speech Sound Disorders (3) Etiology, diagnosis, and treatment of articulatory and phonological disorders.
    (DE) Prerequisite(s): 300 and 306 or consent of instructor.

    (DE) Prerequisite(s): 300 and 306 or consent of instructor.

455 Problems in Speech Pathology (1-3)
    Repeatability: May be repeated. Maximum 6 hours.
    Registration Permission: Consent of instructor.

461 Introduction to Language Pathology in Children (3) Etiology, diagnosis, and treatment of language impairments in children.
    (DE) Prerequisite(s): 300 and 305 or consent of instructor.

473 Introduction to Audiologic Assessment (3) Basic principles of clinical audiometry; pure tone, speech, masking and overview of special auditory tests.
    (DE) Prerequisite(s): 300. Registration Permission: Consent of instructor.

475 Appraisal of Speech and Language Disorders (3) Diagnostic procedures for children and adults with speech and language problems including observation and practice with diagnostic tests.
    (DE) Prerequisite(s): 300. Registration Permission: Consent of instructor.

494 Introduction to Aural Habilitation/Rehabilitation of the Hearing Impaired (3) Introduction to psychosocial aspects, amplification components/characteristics, assistive devices, speech acoustics, speech perception, speech reading, parent-child, preschool school years of children, communication impairments/handicaps/remediation of adults, effects of aging/remediation on the elderly, and case studies.
    (DE) Prerequisite(s): 305 and 473 or consent of instructor.

500 Thesis (1-15)
    Grading Restriction: P/NP only.
    Repeatability: May be repeated.

502 Registration for Use of Facilities (1-15) Required for the student not otherwise registered during any semester when student uses university facilities and/or faculty time before degree is completed.
    Grading Restriction: Satisfactory/No Credit grading only.
    Repeatability: May be repeated.
    Credit Restriction: May not be used toward degree requirements.

506 Neural Bases of Speech and Language (3) Structure and function of the central and peripheral nervous systems, role in speech and language.
    (DE) Prerequisite(s): 306.

507 Anatomy and Physiology of Hearing (3) Structure and function of the peripheral and central auditory systems, and their roles in mediating auditory processes.
    (DE) Prerequisite(s): 473 or consent of instructor.

511 Introduction to Research in Speech and Hearing (3) Analysis of research techniques, fundamentals of statistics, application of statistics, and completion of a proposal and hypothetical pilot research project.

512 Clinical Practice in Audiology (1-4)
    Repeatability: May be repeated. Maximum 24 hours.
    (DE) Corequisite(s): 546.

515 Practicum in Aural Rehabilitation (1-4)
    Repeatability: May be repeated. Maximum 9 hours.
    (DE) Prerequisite(s): 473 and 494.

516 Language Sample Analysis (3) Methods of characterizing and describing language behaviors.
    (DE) Prerequisite(s): 320 or equivalent.

518 Adult Neurogenic Communication Disorders I (3) This course will assist students in developing basic biological, social, clinical, and theoretical understandings of commonly observed neurological impairments.
    (DE) Prerequisite(s): 506 or consent of instructor.

519 Adult Neurogenic Communication Disorders II (3) This course will assist students in developing an advanced understanding of the neural, behavioral, social, clinical, and theoretical understandings of acquired neurological cognitive-linguistic impairments.
    (DE) Prerequisite(s): 506 and 518 or consent of instructor.

522 Seminar in Speech Sound Disorders (3) Current research in diagnosis and management of speech sound disorders.
    (DE) Prerequisite(s): 435 or consent of instructor.

    (DE) Prerequisite(s): 440 or consent of instructor.

525 Counseling and Communication Disorders (3) Issues related to the role of counseling in clinical practice in speech pathology and audiology. Includes discussion of counseling needs and approaches, including multicultural issues.

526 Dysphagia (3) Clinical diagnosis, evaluation, and treatment of adult swallowing disorders and critical interpretation of research literature on dysphagia.
    (DE) Prerequisite(s): 506 or consent of instructor.

527 Language, Culture, and Communication Disorders (3) Multicultural issues across the lifespan; theoretical rationales for speech and language development and use, assessment and treatment practices.
    Comment(s): Graduate standing required.

531 Seminar on Stuttering (3) Current significant research in stuttering.
    (DE) Prerequisite(s): 431 or consent of instructor.

533 Advanced Clinical Practice in Speech-Language Pathology (1-4)
    Repeatability: May be repeated. Maximum 15 hours.
    (DE) Prerequisite(s): 434 or equivalent.
    Comment(s): Enrollment for fewer than 2 hours must have prior departmental approval.
    Registration Permission: Consent of instructor.

534 Advanced Clinical Practice in Speech-Language Pathology (1-4)
    Repeatability: May be repeated. Maximum 15 hours.
    (DE) Prerequisite(s): 434 or equivalent.
    Comment(s): Enrollment for fewer than 2 hours must have prior departmental approval.
    Registration Permission: Consent of instructor.
535 Advanced Clinical Practice in Speech-Language Pathology: Off-Campus Sites (1-4)
Repeatability: May be repeated. Maximum 15 hours.
(DE) Prerequisite(s): 100 hours clinical experience.
Comment(s): Enrollment for fewer than 2 hours must have prior departmental approval.
Registration Permission: Consent of instructor.

538 Advanced Clinical Practice in Speech-Language Pathology: Public Schools (1-4)
Repeatability: May be repeated. Maximum 15 hours.
Comment(s): Enrollment for fewer than 2 hours must have prior departmental approval.

539 Motor Speech Disorders (3) Neuromotor organization for speech production, types of motor speech disorders and associated neuromuscular symptomatology; diagnosis and management of motor speech disorders.
(DE) Prerequisite(s): 506.

540 Structural Speech Disorders (3) Etiology, diagnosis and clinical management of craniofacial and resonance disorders.
(DE) Prerequisite(s): 306 and 435.

541 Pediatric Oromotor Disorders (3) Evaluation, diagnosis, and treatment of pediatric oromotor disorders that affect normal acquisition of feeding and pre-speech skills.
(DE) Prerequisite(s): 506 or consent of instructor.

542 Hearing Disorders (3) Effects of heredity, development/aging, diseases, and physical agents on hearing.
(DE) Prerequisite(s): 473 or consent of instructor.

543 Amplification Technology (3) Description of hearing aid circuits, components and performance characteristics. Electroacoustical and real-ear analysis of hearing aids. Coupler material and geometry effects. Practical experience in troubleshooting, repair, and construction of hearing aids.
(DE) Prerequisite(s): 473 and 507 or consent of instructor.

(DE) Prerequisite(s): 473, 507, and 543 or consent of instructor.

545 Sound Measurement Techniques and Hearing Conservation (3) Techniques of measurement and analysis of sound; hearing conservation in schools and industry.
Registration Permission: Consent of instructor.

546 Audiologic Assessment (3) Theoretical bases for behavioral audiometry and acoustic immittance measurement.

547 Special Problems in Audiology (1-3)
Repeatability: May be repeated. Maximum 6 hours.
(DE) Prerequisite(s): 473 or equivalent.
Registration Permission: Consent of instructor.

552 Seminar in Speech Pathology (2-3) Current significant research in speech pathology. Topics vary.
Repeatability: May be repeated with consent of department. Maximum 9 hours.
(DE) Prerequisite(s): 9 hours in speech pathology.

555 Special Problems in Speech-Language Pathology (1-3)
Repeatability: May be repeated. Minimum 6 hours.
Registration Permission: Consent of instructor.

556 Independent Study in Speech-Language Pathology (1-3)
Repeatability: May be repeated. Maximum 6 hours.
Registration Permission: Consent of instructor.

558 Phonological Disorders (3) Current theories and approaches to assessment and intervention for individuals with difficulty acquiring or using speech sound system of English.
(DE) Prerequisite(s): 435 or consent of instructor.

561 Child Language Disorders (3) Current literature on assessment and intervention techniques for young language learners.
(DE) Prerequisite(s): 461 or consent of instructor.

563 Language Disorders: Birth to Three (3) Overview of family-focused, transdisciplinary intervention process. Assessment/treatment of infants, toddlers, and preschoolers. Description of disabilities and resulting communication disorder.
(DE) Prerequisite(s): 461 or consent of instructor.

574 Pediatric Audiology (3) Theoretical and practical considerations in evaluation and treatment of hearing loss in infants and children. Audiological intervention in case management of hearing impaired child: amplification, educational alternatives, and state and federal guidelines.

576 Physiologic Assessment of the Auditory System I (3) Otoacoustic emissions, electrocochleography, and auditory brainstem responses. Anatomical origins, principles, and applications. Use of these responses in evaluation of auditory function and determination of site-of-lesion.
(DE) Prerequisite(s): 507 and 546 or consent of instructor.

577 Vestibular Disorders (3) Anatomy, physiology, and pathophysiology of vestibular system and other systems that contribute to balance. Practice in electrophystagmography.
(DE) Prerequisite(s): 507, 542, 546, and 576 or consent of instructor.

581 Assessment of Central Auditory Processing (3) Overview of current central auditory processing disorder (CAPD) literature and assessment procedures, with emphasis on a holistic view by combining perceptual, electrophysiological, linguistic, and cognitive measurements.
(DE) Prerequisite(s): 546, 574, and 594 or consent of instructor.

582 Speech and Language Services in School (3) Organization and implementation of speech and language programs in schools.

583 Physiologic Assessment of the Auditory System II (3) Middle-latency, long-latency, and event-related potentials. Neurophysiological mechanisms, principles, and applications. Use of these potentials in evaluation of neurological and cognitive function.
(DE) Prerequisite(s): 576 or consent of instructor.

584 Amplification for Children with Hearing-Impairment (3) Study of strategies for selecting and fitting amplification systems for children; outcome measures and service coordination.
(DE) Prerequisite(s): 543, 544, and 574 or consent of instructor.

585 Cochlear Implants (3) Overview of cochlear implants, focusing on theory of auditory stimulation and cochlear implant systems; candidacy, surgical preparation, and follow-up/outcome measures; the rehabilitation process; and cochlear implant case presentations.
(DE) Prerequisite(s): 507, 576, and 583 or consent of instructor.

586 Standards and Practice Issues in Audiology (3) Overview of professional practice standards, ethics, medical/legal issues, business practices, and reimbursement procedures in audiology.
(DE) Prerequisite(s): 512 or consent of instructor.

591 Foreign Study (1-15)
Repeatability: May be repeated. Maximum 30 hours.

592 Off-Campus Study (1-15)
Repeatability: May be repeated. Maximum 30 hours.

593 Independent Study (1-15)
Repeatability: May be repeated. Maximum 15 hours.

594 Aural Habilitation/Rehabilitation of the Hearing-Impaired (3) Study of grieving process, counseling, group and individual amplification systems, classroom/speech acoustics, central auditory problems, therapy methods for habilitation and rehabilitation, speech reading, school-based programs, programs for adults and the elderly; student research reports/case studies.
(DE) Prerequisite(s): 473 and 494 or consent of instructor.

595 The Verbotonal System: Auditory/Speech Perception (3) Innovative theory, therapy procedures, and SUVAG amplification/filters for diagnosis/evaluation/remediation of spoken language/listening skills of hearing-impaired children/adults: use of rhythms, movements, and suprasegmentals; special audiometric tests, acoustic filters, correcting malarticulations through optimal listening; central auditory treatment; second (foreign) language through listening/spoken language; relationship of concepts to conventional concepts/practice; student research reports.
(DE) Prerequisite(s): 305, 473, and 494 or consent of instructor.

600 Doctoral Research and Dissertation (3-15)
Grading Restriction: P/NP only.
Repeatability: May be repeated.

601 Experimental Phonetics (3) Acoustical and perceptual analyses of speech production and overall oral communication.
Registration Permission: Consent of instructor.

602 Psychoacoustics (3) Auditory perception and reception of acoustic stimuli.
(DE) Prerequisite(s): 507 or consent of instructor.

604 Molecular Genetics and Pharmacology of Hearing (3) Study of genetics, pharmacology, and general cellular processes as they relate to hearing.
(DE) Prerequisite(s): 507 or consent of instructor.

605 Speech Perception and Hearing Impairment (3) Study of perception of speech stimuli, with particular emphases on the effects of hearing impairment on perception.

611 Experimental Design in Speech and Hearing (3) Analysis of experimental design in theses and related journals. Generation of experimental designs.
Registration Permission: Consent of instructor.
613 Externship in Audiology (1-9) Off-campus clinical training experience. Registration Permission: Consent of academic advisor.

626 Advanced Seminar in Neurologically-based Communication Disorders (3) Topics vary. Repeatability: May be repeated. Maximum 6 hours. (DE) Prerequisite(s): 520, 539, and 524 or consent of instructor.

650 Advanced Seminar in Audiology (3-6) Topics vary. Repeatability: May be repeated. Maximum 9 hours. Registration Permission: Consent of instructor.

652 Advanced Seminar in Speech and Language (2) Topics vary: aberrations of voice, articulation, speaking time and rhythm, language development or use, and language symbolization. Repeatability: May be repeated. Maximum 8 hours. Registration Permission: Consent of instructor.

655 Practicum in College Teaching (1-3) Supervised experience in college teaching. Grading Restriction: Satisfactory/No Credit grading only. Registration Permission: Consent of instructor.

656 Directed Research (1-4) Participation in ongoing or non-dissertation research. Repeatability: May be repeated. Maximum 9 hours. Registration Permission: Consent of instructor.

657 Directed Study in Speech Pathology (1-3) Repeatability: May be repeated. Maximum 9 hours. Registration Permission: Consent of instructor.

658 Directed Study in Audiology (1-3) Repeatability: May be repeated. Maximum 9 hours. Registration Permission: Consent of instructor.

659 Directed Study in Speech Science (1-3) Repeatability: May be repeated. Maximum 9 hours. Registration Permission: Consent of instructor.

660 Directed Study in Hearing Science (1-3) Repeatability: May be repeated. Maximum 9 hours. Registration Permission: Consent of instructor.

661 Advanced Seminar: Language Disorders in Children (3) Topics vary. Repeatability: May be repeated. Maximum 6 hours. (DE) Prerequisite(s): 561 or consent of instructor.

662 Advanced Seminar in Audiologic Assessment (3) Synthesis of information on audiologic and vestibular assessment and application of clinical cases. (DE) Prerequisite(s): 542, 546, 574, 576, and 577 or consent of instructor.

663 Advanced Seminar in Aural Habilitation/Rehabilitation (3) Synthesis of information on audiologic habilitation and rehabilitation cases. (DE) Prerequisite(s): 543, 544, 584, and 594 or consent of instructor.

664 Advanced Seminar in Amplification (3) Synthesis of information on amplification technology, amplification for adults with hearing impairment, and case studies. (DE) Prerequisite(s): 543, 544, 584, and 594 or consent of instructor.

Aviation Systems (169)

500 Thesis (1-15) Grading Restriction: P/NP only. Repeatability: May be repeated.

501 Aviation Systems: An Overview (3) Aviation systems, present and future. Socioeconomic base, aerospace and propulsion technology, meteorology, air traffic control, airport community interface, and technological trends and developments pertinent to present status, and future development of air transportation.

502 Registration for Use of Facilities (1-15) Required for the student not otherwise registered during any semester when student uses university facilities and/or faculty time before degree is completed. Grading Restriction: Satisfactory/No Credit grading only. Repeatability: May be repeated.

503 Air Vehicles (3) Current capabilities and future requirements for civilian and military air vehicles. Parameters significant for air vehicle type selection. Integration of air vehicle into aviation systems. (DE) Prerequisite(s): 501.

504 Airports and the Community (3) Structure of airports and their communities. Technology and economics of cargo, baggage, ticket, and passenger handling. Airport management, economics and logistics. Interfaces with community. Plans, programs and developments for collecting and distributing passengers and freight from various types of airports. Types of airport developments and their projections. (DE) Prerequisite(s): 501.

505 Governmental Policies for Aviation (3) Theoretical and legal basis for economic and governmental regulation of aviation. Historical and legislative development of aviation regulatory agencies, organizational structure, administrative and enforcement procedures. (DE) Prerequisite(s): 501.

506 Aircraft Design (3) Design process, compromise of conflicting requirements, economical, industrial, and legal aspects. Definition of mission requirements, synthesis and optimization techniques, safety and reliability, systems integration, standards and regulations, teamwork, and decision-making process.

507 Introduction to Airborne Radar (3) Theory and application of airborne radar. Radar detection and measurement techniques through aviation systems applications. Ground effects on radar signals of multipath and clutter. Pulsed operation, coding, filters, processing techniques, Doppler effects. Problems of range and range rate and tracking. Methods and techniques for reducing radar cross section.

508 Flight Test Instrumentation (3) Principles of measurement, measuring devices with views toward both ground and flight aerospace testing: measurement fundamentals, sensors for specific parameters (e.g. temperature, heat flux, flow rate, pressure, acceleration, vibration, strain, and humidity), data bus integration, signal condition, telemetry, and fabrication.

509 Introduction to Aircraft Structures (3) Design and analysis of structures: light-weight and modern materials used for aircraft structures. Topics: load determination and aviation regulations, airworthiness, ultimate loads, limit loads, load factors; simplifying assumptions to safe side; basics of stress and strain, elasticity, shear, bending, torsion; statically indeterminate systems, frames; structural instabilities, buckling of columns, thin plates; tension field beams; principles of stressed skin construction; open, closed, thin-walled beams; tapered beams, fuse-lages and frames, wings and ribs; laminated composite structures; elementary aeroelasticity.

510 Special Topics in Aviation Systems (2) Current problems. Repeatability: May be repeated with consent. Registration Permission: Consent of instructor.

511 Theory and Aviation Applications of GPS (3) Global Positioning System (GPS) for improved navigation and situational awareness for civil and military applications. GPS theory: geometric dilution of precision, satellite positioning, ionospheric delay, differential GPS, and GPS errors. Applications for navigation and aircraft flight-testing. Integration of GPS for aviation infrastructure and for air vehicle navigation, concepts of WAAS and LAAS.

512 Helicopter Performance Flight Test Techniques (3) Experimental test techniques for helicopter performance flight testing. Theoretical derivation of flight test techniques. Participation in series of flight test experiments demonstrating acquisition of flight test data. Instrumentation and data reduction techniques.

513 Helicopter Stability and Control Flight Test Techniques (3) Experimental test techniques for helicopter stability and control flight testing. Theoretical derivation of flight test techniques. Participation in series of flight test experiments demonstrating acquisition of flight test data. Instrumentation and data reduction techniques.

514 Systems Flight Testing (3) Experimental test techniques for helicopter flight systems. Approach and design for testing airborne systems. Theory and operation of typical flight systems: aircraft systems, navigation systems, communications systems, and specific mission systems.

515 Aviation Human Factors (3) Human factors pertinent to aviation: concept of human factors, human error, fatigue, body rhythms, performances, motivation, vision and visual illusions, communication, attitudes, training and devices, displays and controls, space and layout, anthropometry, flight deck design and evaluation, aircraft cabin design and evaluation, flying qualities evaluation, and performance measurement techniques. Applied aviation systems.

516 Aircraft Flight Controls (3) Feedback control concepts, root locus techniques, bode analysis, PID control design, and controller and observer design concepts applied to aircraft. Complex analysis and matrix algebra.
521 Experimental Flight Mechanics (3) Performance. Experimental techniques for flight mechanics. Specially equipped airborne laboratory: student participation in series of experiments demonstrating acquisition of flight test data. Necessary theory supports class experiments. Tests cover broad range of aircraft performance, stability and control characteristics in addition to instrumentation and data reduction methods.
(DE) Prerequisite(s): 422.

522 Experimental Flight Mechanics (3) Stability and control. Experimental techniques for flight mechanics. Specially equipped airborne laboratory: student participation in series of experiments demonstrating acquisition of flight test data. Necessary theory supports class experiments. Tests cover broad range of aircraft performance, stability and control characteristics in addition to instrumentation and data reduction methods.
(DE) Prerequisite(s): 422.

(DE) Prerequisite(s): 421.

550 Project in Aviation Systems (3) Repeatability: May be repeated. Credit Restriction: Maximum of 3 hours may be applied toward degree requirements.
Comment(s): Non-thesis aviation systems majors only.

Biochemistry and Cellular and Molecular Biology (188)

401 Biochemistry-Molecular Biology I (4) First semester of a two-course sequence providing in-depth coverage of biochemistry and molecular biology. Covers amino acid structure and chemistry, protein structure and chemistry, protein folding, enzyme behavior and function, reaction mechanisms, catabolism and energy transfer, synthetic metabolism including photosynthesis, and protein transport.
(DE) Prerequisite(s): Biology 240 and Chemistry 350, 360, and 369.

402 Biochemistry-Molecular Biology II (4) Second semester of a two-course sequence providing in-depth coverage of biochemistry and molecular biology. Covers structure of DNA and RNA, experimental methods of analyzing nucleic acids, mechanisms of RNA and protein synthesis, mechanisms of DNA replication, repair and recombination, chromosome structure and function, regulation of gene expression, genome structure and genomics, and mechanisms of biological regulation.
(DE) Prerequisite(s): Biology 240 and Chemistry 350, 360, and 369.

403 Advanced Genetics Laboratory (3) Experiments illustrating methods in modern genetics: techniques in classical, cyto-molecular, and developmental genetics. Using model organisms, especially Drosophila and mouse.
(DE) Prerequisite(s): Biology 240 and Chemistry 350, 360, and 369.

404 Plant Molecular Biology (4) Introduction to current research approaches and methodologies in plant developmental biology and molecular genetics.
Contact Hour Distribution: Laboratory and lecture.
(DE) Prerequisite(s): Biology 140 and 240.

419 Cellular and Comparative Biochemistry Lab (2) Experiments with enzymes, nucleic acids, and membranes and organelles. Chromatography, kinetics, hybridization, sequencing, and immunochromatographic methods.
(DE) Prerequisite or (DE) Corequisite: 401 or 410.

421 Cell and Tissue Structure and Function (4) Study of animal cells and tissues at light and electron microscope levels.
Contact Hour Distribution: 2 hours and 2 labs.
(DE) Prerequisite(s): Biology 140.

429 Cell Biology Laboratory (3) Series of open-ended, discovery-based exercises developed to design and test new drugs using modern cell biology and computer technologies. Experimental modules: techniques used in cell isolation, purification, culturing, fluorescent microscopy, receptor binding and signal transduction, apoptosis, cell cycle analysis, protein and steroid secretion, computer modeling, and state-of-the-art electron microscopy. Experiment design, execution, data analysis, and peer evaluation.
(DE) Prerequisite or (DE) Corequisite: 401 or 410.

440 General Physiology (3) Principles of cellular and organ-system animal physiology.
(DE) Prerequisite(s): Biology 140.
(DE) Corequisite(s): Chemistry 350 and 360. Recommended Background: Physics 221 and 222.

465 Human Genetics (3) Genetic and molecular principles and problems of human inheritance.
(DE) Prerequisite(s): Biology 240.

471 Biophysical Chemistry (3) Physicochemical principles with applications to biological systems. Thermodynamics; chemical equilibrium; solution chemistry; transport; electrochemistry; kinetics; enzyme catalyzed reactions. (Same as Chemistry 471.)
(DE) Prerequisite(s): Chemistry 350 and 360, Mathematics 125, and general biology or consent of instructor.

480 Physiology of Exercise (3) (See Exercise Science 480.)

481 Biophysical Chemistry (3) Physicochemical principles with applications to biological systems. Elementary quantum chemistry; interactions of light with biological molecules; optical and magnetic spectroscopy; light scattering; case studies of selected macromolecules. (Same as Chemistry 481.)
(DE) Prerequisite(s): Chemistry 350 and 360, Mathematics 125, and general biology or consent of instructor.

500 Thesis (1-15) Grading Restriction: P/NP only. Repeatability: May be repeated.

502 Registration for Use of Facilities (1-15) Required for the student not otherwise registered during any semester when student uses university facilities and/or faculty time before degree is completed. Grading Restriction: Satisfactory/No Credit grading only. Repeatability: May be repeated. Credit Restriction: May not be used toward degree requirements.

511 Advanced Protein Chemistry and Cellular Biology (3) Cellular structure and function at molecular and supramolecular level in progression; protein structure and function; membrane structure and function; bioenergetics and membrane proteins.
(DE) Prerequisite(s): Prior knowledge of cell biology and biochemistry.
Registration Permission: Consent of instructor.

512 Advanced Molecular Biology (3) Regulation of nucleic acid expression and protein activity. Nucleic acid structure and function; replication and repair of nucleic acids; gene expression; protein synthesis; post-translational protein modification; mitosis and meiosis; cell cycle and cell growth.
(DE) Prerequisite(s): 511 or consent of instructor.

513 Advanced Protein Biochemistry and Cell Biology II (3) Advanced topics of cellular function and regulation of cell division and growth, and structure and function of supramolecular structures: cytoskeleton and cell junctions and adhesions.
(DE) Prerequisite(s): 511.

515 Experimental Techniques I (2-4) Introduction to modern experimental methodology and instrumentation in biochemistry, molecular biology, and cell biology, including cell culture; spectrophotometry; microscopy; nucleic acid purification and analysis; protein assays; enzyme purification; electrophoresis; computer analysis of nucleic acid and protein sequences. Team-taught lecture/demonstration format. Repeatability: May be repeated. Maximum 6 hours.
Comment(s): Primarily for departmental graduate students.

516 Experimental Techniques II (2-4) Laboratory rotations. Students work in laboratory of faculty member on clearly defined project. Written proposal and oral report required. Repeatability: May be repeated. Maximum 8 hours.
(DE) Prerequisite(s): 515.
Comment(s): Primarily for departmental graduate students.

517 Physical Biochemistry (3) Physics and chemistry of biological systems and molecules. Thermodynamics; diffusion and transport; physical chemistry of macromolecules; enzyme kinetics; binding reactions; spectroscopy; electrophysiology.
(DE) Prerequisite(s): 511 or consent of instructor.

520 Special Topics (1-3) Selected directed readings or special course in topics of current interest. Consult departmental listings for offerings. Grading Restriction: Satisfactory/No Credit grading only. Repeatability: May be repeated with consent of instructor. Maximum 6 hours.

(DE) Prerequisite(s): 401 and one semester of introductory plant physiology or cell biology.

523 Advanced Plant Physiology II (3) Growth and differentiation of plants at molecular, cellular and organismal levels. Regulation of development; macromolecular interpretation of differentiation, dormancy, germination, flowering, and senescence.
(DE) Prerequisite(s): 401 and one semester of introductory plant physiology or cell biology.

525 Graduate Research Participation (3-12) Tutorial laboratory experience. Repeatability: May be repeated. Maximum 12 hours.

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582 Advanced Plant Physiology II (3) Growth and differentiation of
plants at molecular, cellular and organismal levels. Regulation of
development; macromolecular interpretation of differentiation,
dormancy, germination, flowering, and senescence.

(DE) Prerequisite(s): 401 and one semester of introductory plant physiology or cell biology.

525 Graduate Research Participation (3-12) Tutorial laboratory experi-
ence. Repeatability: May be repeated. Maximum 12 hours.
530 Experimental Design and Analysis (2) Development of skills in strategies of experimental design and interpretation of experimental results. Critical discussion of research articles illustrating issues in experimental design. Preparation of grant proposal in standard format to be read and discussed by class and by panel of faculty expert in area of proposed research.

Registration Permission: Consent of instructor.

550 Advanced Concepts in Neurobiology/Physiology (3) Concepts related to neurobiology/physiology with information taken from current literature. Predominantly lecture format with student participation. Specific subject area to be announced.

Registration Permission: Consent of instructor.

552 Physiology of Hormones (3) Cellular and organismal action of hormones in invertebrate and vertebrate animals. Contact Hour Distribution: 2 hours and 1 lab. Recommended Background: 410.

Registration Permission: Consent of instructor.

559 Biophysical Crystallography (3) Theories and practices of X-ray diffraction, neutron diffraction and neutron scattering to elucidate the structure of nucleic acids, proteins, nucleosomes, ribosomes and viruses. Application of 3-D structures in designing drugs against AIDS, cancer, cardiac disease and neurodegenerative disorders.

Recommended Background: 401 or two 300-level chemistry courses or Physics 240.

Registration Permission: Consent of instructor.

560 Advanced Concepts in Structural Biology/Biochemistry (3) Concepts related to structural biology/biochemistry with information taken from current literature. Predominantly lecture format with student participation. Specific subject area to be announced.

Repeatability: May be repeated. Maximum 12 hours.

Registration Permission: Consent of instructor.

561 Environmental Toxicology (3) (See Ecology and Evolutionary Biology 561.)


Contact Hour Distribution: Two 3-hour labs. Comment(s): Approved graduate students in department only.

564 Introduction to Electron Microscopy-Scanning Electron Microscope (3) Practical introduction to techniques of electron microscopy and to scanning electron microscope. Use of microscope, introduction to darkroom techniques and digital image processing, preparation of samples for observation, and special project.

Contact Hour Distribution: 2 hours and 1 lab. Registration Permission: Consent of instructor.

570 Advanced Concepts in Cellular/Molecular Biology (3) Concepts related to cellular/molecular biology with information taken from current literature. Predominantly lecture format with student participation. Specific subject area to be announced.

Repeatability: May be repeated. Maximum 12 hours.

Registration Permission: Consent of instructor.

580 Advanced Concepts in Genetics/Developmental Biology (3) Concepts related to genetics/developmental biology with information taken from current literature. Predominantly lecture format with student participation. Specific subject area to be announced.

Repeatability: May be repeated. Maximum 12 hours.

Registration Permission: Consent of instructor.

591 Foreign Study (1-15) Repeatability: May be repeated. Maximum 15 hours.

592 Off-Campus Study (1-15) Repeatability: May be repeated. Maximum 15 hours.

593 Independent Study (1-15) Repeatability: May be repeated. Maximum 15 hours.

600 Doctoral Research and Dissertation (3-15) Grading Restriction: P/NP only. Repeatability: May be repeated.

601 Departmental Seminar (1) Invited speakers. Topics posted in advance. Required every semester in residence. Grading Restriction: Satisfactory/No Credit grading only. Repeatability: May be repeated. Maximum 15 hours.

603 Graduate Research Colloquium (1) Seminars and lectures dealing with current advances in fields of biochemical and biophysical methods. Mechanisms of enzyme catalysis, gene expression, membrane structure and function, metabolic regulation, physical biochemistry, molecular genetics, cell biology, neurobiology, and related topics. Topics posted in advance. Required every semester in residence.

Grading Restriction: Satisfactory/No Credit grading only. Repeatability: May be repeated. Maximum 15 hours.

605 Journal Club in Neurophysiology/Physiology (1) Readings and discussion based on current literature.

Grading Restriction: Satisfactory/No Credit grading only. Repeatability: May be repeated. Maximum 12 hours.

606 Journal Club in Structural Biology/Biochemistry (1) Readings and discussion based on current literature.

Grading Restriction: Satisfactory/No Credit grading only. Repeatability: May be repeated. Maximum 12 hours.

607 Journal Club in Cellular/Molecular Biology (1) Readings and discussion based on current literature.

Grading Restriction: Satisfactory/No Credit grading only. Repeatability: May be repeated. Maximum 12 hours.

608 Journal Club in Genetics/Developmental Biology (1) Readings and discussion based on current literature.

Grading Restriction: Satisfactory/No Credit grading only. Repeatability: May be repeated. Maximum 12 hours.

610 Current Topics in Biochemistry, Cellular, and Molecular Biology (1-3) Critical reviews of research problems and methods in biochemistry, cell biology and/or molecular biology. Oral presentations, written reports, computer simulations by faculty and students.

Repeatability: May be repeated. Maximum 4 hours.

Registration Permission: Consent of instructor.

612 Advanced Topics in Environmental Toxicology (1-3) (See Ecology and Evolutionary Biology 612.)

615 Special Topics in Biochemistry, Cellular, and Molecular Biology (3) Biochemical and biophysical methods, mechanisms of enzyme catalysis, gene expression, membrane structure and function, metabolic regulation, physical biochemistry, molecular genetics, cell ultrastructure and physiology, neurobiology, and related topics.

Repeatability: May be repeated. Maximum 9 hours.

(De) Prerequisite(s): 511 and 512 or consent of instructor.

Biomedical Engineering (192)

408 Cell and Tissue Engineering (3) Mammalian cell culture. Effects of mechanical forces on cells. Tissue engineering of cardiovascular and orthopedic tissues.

(De) Prerequisite(s): 310 and Biology 140.

430 Biomedical Engineering Laboratory (4) Experience with unique problems associated with making measurements and interpreting data in living systems. Experiments may include mechanical testing of biological materials, imaging and physiological measurements (EKG, EMG, ECG, etc.).

(De) Prerequisite(s): 310 and 346 or consent of instructor.

473 Applied Biomechanics (3) Applications of biomechanics to the industrial and orthopedic area. Design of orthopedic implant devices; biomechanics of injury and protection.

(De) Prerequisite(s): Mechanical Engineering 321.

(De) Corequisite(s): 310 and Materials Science and Engineering 474.

475 Design of Artificial Internal Organs (3) Design, development and evaluation of artificial internal organs; analysis of transport processes in therapeutic devices for design optimization; current research and development needs. Ethical considerations.

(De) Prerequisite(s): Aerospace Engineering 341 and Mathematics 231.

494 Special Project in Biomedical Engineering (1-3) Problems related to recent developments and practice.

Repeatability: May be repeated. Maximum 6 hours.

495 Special Project in Biomedical Engineering (1-3) Problems related to recent developments and practice.

Repeatability: May be repeated. Maximum 6 hours.

500 Thesis (1-15) Grading Restriction: P/NP only. Repeatability: May be repeated.

502 Registration for Use of Facilities (1-15) Required for the student not otherwise registered during any semester when student uses university facilities and/or faculty time before degree is completed.

Grading Restriction: Satisfactory/No Credit grading only. Repeatability: May be repeated. Credit Restriction: May not be used toward degree requirements.
507 Application of Linear Algebra in Engineering Systems (3) (See Chemical Engineering 507.)
509 Multidisciplinary Project (1) (See Industrial Engineering 509.)
511 Biotransport Processes (3) Cellular transport and electrical properties from a combined biological, physical, and engineering point of view. Matter transport across cellular membranes involving diffusion, osmosis, coupled solute and solvent transport, carrier-mediated transport, and ion transport. Homeostatic mechanisms involved in maintaining cellular solute concentrations, volume, and potential. Electrically inexorable and excitable cells, lumped parameter and distributed-parameter cell models, linear electric properties of cells, and voltage gated ion channels.

531 Advanced Biomechanics I (3) Derivation of mathematical models of the human body using Kane’s Method of Dynamics to create system equations of motions. Mathematical models will pertain to human non-implanted and implanted joints. Models will be created by hand and using the symbolic manipulation algorithm Autolev. (Same as Mechanical Engineering 531.)
(DE) Prerequisite(s): Electrical and Computer Engineering 301 or consent of instructor.

531 Advanced Biomechanics I (3) Derivation of mathematical models of the human body using Kane’s Method of Dynamics to create system equations of motions. Mathematical models will pertain to human non-implanted and implanted joints. Models will be created by hand and using the symbolic manipulation algorithm Autolev. (Same as Mechanical Engineering 531.)
(DE) Prerequisite(s): Mechanical Engineering 231.

534 Mechanical Vibrations (3) (See Mechanical Engineering 534.)
539 Continuum Mechanics (3) (See Engineering Science 539.)
541 Fluid Mechanics I (3) (See Mechanical Engineering 541.)
552 Computational Biomechanics (3) Practical use of general-purpose commercial finite element packages for simulations related to orthopedic and sport biomechanics. Prediction of failure and performance of bone, joints and prosthetic devices.
(DE) Prerequisite(s): Mechanical Engineering 231 and 321.

555 Human Vibration Analyses and Protection (3) Concepts of whole body vibrations, background information on the development of ANSI and ISO Standards for the protections of workers from whole body vibrations; how to apply the standards to meet the EU requirements; measurement methods and signal processing requirements for whole body vibration; background information on the development of ANSI and ISO Standards for the protections of workers for vibration white finger syndrome; development criteria for current ANSI, ISO, and EU standards; measurements methods and requirements, effectiveness of anti-vibration gloves. (Same as Aerospace Engineering 555; Mechanical Engineering 552.)
(DE) Prerequisite(s): Mechanical Engineering 363 and 534.
Registration Permission: Consent of instructor.

559 Advanced Mechanics of Materials I (3) (See Mechanical Engineering 559.)
561 Finite Elements for Engineering Applications (3) (See Engineering Science 551.)
562 Computational Fluid-Thermal Systems (3) (See Engineering Science 552.)
571 Biomechanics of Hard and Soft Tissue (3) (See Engineering Science 571.)
572 Biomedical Fluid Mechanics (3) (See Engineering Science 572.)
577 Neural Networks in Engineering (3) (See Nuclear Engineering 577.)
587 Dynamic Modeling and Simulation (3) (See Mechanical Engineering 587.)

590 Selected Biomedical Engineering Problems (2-6)
Grading Restriction: Satisfactory/No Credit grading only.
Repeatability: May be repeated. Maximum 6 hours.
Comment(s): Enrollment is limited to students in the non-thesis option.
Registration Permission: Consent of instructor.

595 Seminar (1) All phases of biomedical engineering, reports on current research at UTK and UTSC. Grading Restriction: Satisfactory/No Credit grading only.
Repeatability: May be repeated.

599 Special Topics in Biomedical Engineering (1-3)
Repeatability: May be repeated. Maximum 6 hours.
Registration Permission: Consent of instructor.

600 Doctoral Research and Dissertation (3-15) Grading Restriction: P/NP only.
Repeatability: May be repeated.

610 Advanced Topics in BME (3) Current research topics of interest in biomedical engineering.
Registration Permission: Consent of instructor.

(DE) Prerequisite(s): 511 or consent of instructor.

631 Advanced Biomechanics II (3) Using the symbolic manipulation algorithm, difficult systems pertaining to the human body will be modeled. A more in depth analysis of Kane’s method of multibody dynamics will also be implemented in these models. Each student will focus on one complex model that pertains to an orthopedic complication that the orthopedic industry needs solved. (Same as Mechanical Engineering 631.)
(DE) Prerequisite(s): 531.

659 Advanced Mechanics of Materials II (3) (See Mechanical Engineering 659.)

Biosystems Engineering (196)
411 Mechanical Systems Engineering (3) Fundamentals of power delivery systems and simple mechanisms; selection and design of mechanical, hydraulic, and tractive power transmission systems. Emphasis on off-road vehicles and bioprocessing systems.
Contact Hour Distribution: 2 hours and 1 lab.
Recommended Background: Rigid-body dynamics, mechanics of materials.

416 Hydrologic and Water Quality Engineering (3) An introduction to hydrology including: hydrologic variability, precipitation, evapotranspiration, infiltration, runoff, erosion, water quality and non-point pollution, energy dissipation, streamflow measurement, hydrographs, routing, open channel flow, and urban hydrology. (Same as Civil Engineering 416.)
Recommended Background: Hydraulics or fluid mechanics.

431 Bioprocess Engineering (3) Development of interdisciplinary bioprocess engineering; basics of biology in an engineering perspective; enzymatic reaction kinetics; metabolism and bioenergetics; cell growth kinetics and product formation; engineering principles applied to bioprocess engineering including mass balance, energy balance, and reaction kinetics; reactor design and systems; introduction to bioseparations; practical aspects of bioprocess engineers and process development.
Contact Hour Distribution: 2 hours and 1 lab.

451 Electronic Systems (4) Basic electronics with biological applications. Analog and digital electronics; sensing and controlling physical and environmental parameters; sensor selection and interfacing; signal conditioning; process control. Includes laboratory experiments and design projects.
Contact Hour Distribution: 3 hours and 1 lab.
Recommended background: Electrical circuits.

500 Thesis (1-15)
Grading Restriction: P/NP only.
Repeatability: May be repeated.
Registration Restriction(s): Master of Science – biosystems engineering major.

502 Registration for Use of Facilities (1-15) Required for the student not otherwise registered during any semester when student uses university facilities and/or faculty time before degree is completed.
Grading Restriction: Satisfactory/No Credit grading only.
Repeatability: May be repeated.
Credit Restriction: May not be used toward degree requirements.

503 Seminar (1) (See Environmental and Soil Sciences 503.)

519 Modeling Techniques and Applications (3) Engineering approach to mathematical modeling of physical phenomena. Systems definitions and boundaries; types and formulation of models and solution techniques; verification and calibration techniques; model applications and case studies.
Contact Hour Distribution: 2 hours and 1 lab.
Comment(s): Graduate standing in engineering required.

525 Soil Erosion and Sediment Yield (3) (See Environmental Engineering 525.)

530 Research Problems in Biosystems Engineering (1-3) Theoretical and experimental studies relating to current problems in agricultural engineering.
Repeatability: May be repeated. Maximum 6 hours.
532 On-Site Domestic Wastewater Treatment, Dispersal and Reuse (3) Design and management of domestic on-site wastewater treatment and dispersal systems, use of the soil as a medium for final treatment and for wastewater dispersal, concepts of the decentralization of domestic wastewater management, and reuse of treated water for irrigation. (Same as Biosystems Engineering Technology 532.) Contact Hour Distribution: 2 hours and 1 lab. (DE) Prerequisite(s): 495 or consent of instructor.

541 Principles of Compost Engineering (3) Comprehensive study of composting: survey of installed systems; thermodynamics of composting; biology of composting; kinetics of heat inactivation; feed conditioning; aeration; substrate characteristics; process kinetics; and odor control. Design component. (DE) Prerequisite(s): Coursework in thermodynamics and heat and mass transfer.

543 Instrumentation and Measurement (3) Modern instrumentation techniques. Static and dynamic response of instrumentation; signal conditioning; moisture, optical radiation, displacement, strain, pressure, velocity, acceleration, and flow measurements; digital data acquisition and control. (Same as Environmental Engineering 543.) Contact Hour Distribution: 2 hours and 1 lab. (DE) Prerequisite(s): 451 or coursework in electronics and computer circuits.

545 Monitoring Hydrologic Phenomena (3) Application of instrumentation theory to monitoring hydrologic phenomena; strengths and weaknesses of current equipment and strategies; equipment operation and solution of environmental monitoring problems. (Same as Environmental Engineering 545.) Contact Hour Distribution: 2 hours and 1 lab. (DE) Prerequisite(s): 451, 454, or 541.

550 Selected Topics (1-3) Lecture/group discussion on specialized topics. Repeatability: May be repeated. Maximum 6 hours.

552 Biological Treatment Theory (3) (See Environmental Engineering 552.)

555 GIS and GPS Applications to Biosystems (3) Theory and applications of Geographical Information Systems (GIS) and Global Positioning Systems (GPS); acquiring, managing, and analyzing spatially-varying data. Systems specific to agriculture, environmental site assessment, natural resource management, and hydrology. (Same as Biosystems Engineering Technology 555.) Contact Hour Distribution: 2 hours and 1 lab. Comment(s): Students with graduate standing in engineering, biological or physical sciences only.

575 Applied Microbiology and Bioengineering (3) (See Chemical Engineering 575.)

591 Environmentally-Sensitive Spray Applications (3) Develops the concepts of spray drift causes and corrective actions to lessen the effects of pesticides in the environment. Concepts are based on factors related to dosage transfer and the competing physics of droplet delivery under a variety of atmospheric conditions. Mass balance procedures are emphasized to validate measures of spray drift. Sprayer equipment components and operation factors affecting spray drift are introduced as operator controlled measures to minimize spray drift. The role of pesticide label language is incorporated into course concepts. Best management practices are developed to ensure practical applications of course concepts are emphasized. The student will learn how to implement spray drift reduction practices as well as make objective conclusions about spray drift test data. Registration Permission: Consent of instructor.

600 Doctoral Research and Dissertation (3-15) Grading Restriction: P/np only. Repeatability: May be repeated. Registration Restriction(s): Doctor of Philosophy—biosystems engineering major.

603 Seminar (1) (See Environmental and Soil Sciences 503.)

619 Mathematical Modeling for Engineers (3) Describing physical and biological settings with mathematical expressions. Applying dimensional analysis, linear and nonlinear ordinary differential equations, partial differential equations, systems of linear equations, linearization, moving boundary problems, and series solutions to solve mathematical expressions. (RE) Prerequisite(s): 519.

636 Geospatial Methods for Environmental Research (3) Sampling and displaying the multidimensionality of environmental variables. Spatial and temporal sensing of the environment. Geostatistical mapping and interpretation; satellite imagery; precision geomatic techniques for the environmental scientist and engineer. Contact Hour Distribution: 2 hours and 1 lab. (RE) Prerequisite(s): 555.

650 Selected Topics (1-3) Lecture, group discussion, and individual study on specialized developments. Repeatability: May be repeated. Maximum 6 hours.

Biosystems Engineering Technology (194)

422 Food and Process Engineering Technology (3) Application of basic engineering principles to agricultural and food processes. Fluid handling, drying, evaporating, thermal processing, heating and cooling, refrigeration systems, and materials handling. Contact Hour Distribution: 2 hours and 1 lab. Recommended Background: General physics.

432 Agricultural Machinery and Tractors (3) Functions, selection, matching, and management of agricultural machinery systems. Tractor power ratings, engine and transmission systems, hydraulic systems, hitching, and ballasting. Field and material capacity, field efficiency, cost analysis, and machinery replacement strategies. Functional analyses of tillage operations, planters and drills, no-till systems, hay harvest systems, forage and small grain harvesting, and cotton harvesting. Crop drying processes, off-road machinery safety considerations, and operator ergonomics. Contact Hour Distribution: 2 hours and 1 lab. Recommended Background: 2 semesters of calculus.

442 Agricultural Waste Management and Pollution Control (3) Waste renovation fundamentals; characteristics of animal manure; techniques for collection, transporting, storing, and utilizing livestock waste. Contact Hour Distribution: 2 hours and 1 lab. Recommended Background: 2 semesters of calculus.

452 Small Internal Combustion Engines (3) Theory, concepts, and mechanics of small internal combustion engines; theoretical cycles; selection, operation, adjustment, troubleshooting and repair of single-cylinder engines. Contact Hour Distribution: 2 hours and 1 lab. Recommended Background: 2 semesters of calculus.

500 Thesis (1-15) Grading Restriction: P/NP only. Repeatability: May be repeated. Registration Restriction(s): Master of Science—biosystems engineering major.

502 Registration for Use of Facilities (1-15) Required for the student not otherwise registered during any semester when student uses university facilities and/or faculty time before degree is completed. Grading Restriction: Satisfactory/No Credit grading only. Repeatability: May be repeated. Credit Restriction: May not be used toward degree requirements.

503 Seminar (1) (See Environmental and Soil Sciences 503.)

506 Engineering Principles (3) Properties of materials, fundamentals of hydraulics, principles of electricity, thermal phenomena, applications in biological systems. Contact Hour Distribution: 2 hours and 1 lab.

508 Special Problems in Biosystems Engineering Technology (1-3) Individual studies of current problems. Repeatability: May be repeated. Maximum 6 hours.

514 CAD Applications to Biosystems Engineering Technology (3) Computer Aided Drafting (CAD) applications in agriculture and environmental science. Essentials of CAD software to create drawings of components, systems, flow charts, and process diagrams. Applications in mechanical, structural, and biosystems. 2-D applications with limited exposure to 3-D applications. Computer intensive course. Hands-on experience. Contact Hour Distribution: 2 hours and 1 lab. Credit Restriction: Students cannot receive credit for both 414 and 514. Registration Restriction(s): Minimum student level—graduate.

522 Processing and Environmental Systems (3) Environmental systems in plant and animal production; application of electric power, mechanical equipment, structures, crop processing and materials handling. Contact Hour Distribution: 2 hours and 1 lab. (DE) Prerequisite(s): 506.

532 On-Site Domestic Wastewater Treatment, Dispersal, and Reuse (3) (See Biosystems Engineering 532.)