

# GRADUATE CATALOG 2014-2015

Bulletin of Tennessee Technological University

*college of*  
**GRADUATE STUDIES**  
*[www.tntech.edu/graduatestudies](http://www.tntech.edu/graduatestudies)*



# Information Directory

All inquiries and correspondence concerning the following areas should be addressed to:

## **Graduate Studies**

### **College of Graduate Studies**

Tennessee Technological University  
Box 5012  
Cookeville, TN 38505-0001  
Ph: (931) 372-3233  
Fx: (931) 372-3497  
Gradstudies@tntech.edu

## **Financial Aid**

### **Office of Financial Aid**

Tennessee Technological University  
Box 5076  
Cookeville, TN 38505-0001  
Ph: (931) 372-3073 or 1-800-268-0236  
Fx: (931) 372-6309  
financialaid@tntech.edu

## **Records and Registration**

### **Office of Records and Registration**

Tennessee Technological University  
Box 5026  
Cookeville, TN 38505-0001  
Ph: (931) 372-3317 or 1-800-268-0242  
Fx: (931) 372-6111  
records@tntech.edu

## **Academic Offices**

College of Graduate Studies, Office of the Dean	(931) 372-3224
College of Agriculture & Human Ecology	(931) 372-3149
College of Arts & Sciences	(931) 372-3118
College of Business	(931) 372-3372
College of Education	(931) 372-3124
College of Engineering	(931) 372-3172
College of Interdisciplinary Studies	(931) 372-3394
Whitson-Hester School of Nursing	(931) 372-3203
International Education	(931) 372-3634
Provost and Vice-President for Academic Affairs	(931) 372-3224

Directory assistance for other offices is available through the main switchboard at (931) 372-3101. The University's web site address is [www.tntech.edu](http://www.tntech.edu).

Tennessee Technological University is a Tennessee Board of Regents institution. The Tennessee Board of Regents is the nation's sixth largest higher education system, governing 45 post-secondary educational institutions. The TBR system includes six universities, 13 two-year colleges and 26 technology centers, providing programs to over 180,000 students in 90 of Tennessee's 95 counties.

TTU /An EEO/AA/Title IX/Section 504/ADA Employer

## Message from the President

Dear Student,

Congratulations and welcome to Tennessee Technological University. As a graduate student, we offer you a place to focus on relevant work, to fearlessly pursue answers to problems that have global implications, and to diligently dedicate yourself to creating knowledge.

Universities ultimately exist to create and transfer knowledge and to identify and develop human talent. During your personal experience here, you can expect that we will offer you the tools and environment you need to succeed.

We strive to incorporate the latest technology throughout all disciplines. As our university focuses on the national priorities of science, technology, engineering and mathematics, we strengthen all our programs by infusing technological innovation across campus.

TTU is also staying responsive to the needs of industry and to society. You will work with researchers, scholars and mentors here who maintain relationships with key industrial, government and community leaders.

You have joined the company of an esteemed group – those who have chosen TTU to prepare them for success in their careers and in their life experiences. Our alumni hold positions as Fortune 500 CEOs, NASA astronauts, government leaders, renowned professors, respected researchers and other prestigious leaders.

You will make a positive impact here. Congratulations for choosing to become an important part of Tennessee Tech University.

Sincerely,

Philip B. Oldham  
President



A handwritten signature in black ink that reads "Philip B. Oldham". The signature is written in a cursive style with a long, sweeping underline.

## Mission of the Graduate School

The mission of the Graduate School is to promote, coordinate, enhance the quality of, and serve as an advocate for graduate education programs at Tennessee Technological University.

## Vision of the Graduate School

The vision of the Graduate School is to improve human knowledge through teaching, learning, research and outreach.

## Student Complaint Procedures

Students or prospective students who wish to file a complaint related to accreditation or regarding violations of state law not resolved at the institution may do so by submitting a Student Complaint Form to the Tennessee Board of Regents at 1415 Murfreesboro Road, Suite 340, Nashville, TN 37217, or by completing an online form at [www.tbr.edu/contact/StudentComplaintForm.aspx](http://www.tbr.edu/contact/StudentComplaintForm.aspx). Under Tennessee's open records law, all or parts of complaints will generally be available for review upon request from a member of the public.

Complaints regarding accreditation can also be made by contacting the Southern Association of Colleges and Schools Commission on Colleges, 1866 Southern Lane, Decatur, GA 30033-4097, telephone: 404-679-4500 ([www.sacscoc.org](http://www.sacscoc.org)).

Complaints of fraud, waste or abuse may be made by email at [reportfraud@tbr.edu](mailto:reportfraud@tbr.edu) or by calling the Tennessee Comptroller's Hotline for Fraud, Waste and Abuse at 1-800-232-5454.

## Notice

The course offerings and requirements of the institution are continually under examination and revision. This catalog (bulletin) presents the offerings and requirements in effect at the time of publication, but is no guarantee that they will not be changed or revoked. However, adequate and reasonable notice will be given to students affected by any changes. This catalog (bulletin) is not intended to state contractual terms and does not constitute a contract between the student and the institution.

The institution reserves the right to make changes as required in course offerings, curricula, academic policies, and other rules and regulations affecting students to be effective whenever determined by the institution. These changes will govern current and formerly enrolled students. Enrollment of all students is subject to these conditions.

Current information may be obtained from the following sources:

- Admission Requirements – College of Graduate Studies
- Course Offerings – Department or Division Offering Course
- Degree Requirements – Departmental Chairperson of Major
- Fees and Tuition – Business Office

The University provides the opportunity for students to increase their knowledge by providing programs of instruction in the various disciplines and programs through faculty who, in the opinion of the University, are qualified for teaching at the college level. The acquisition and retention of knowledge by any student is, however, contingent upon the student's desire and ability to learn and his or her application of appropriate study techniques to any course or program. Thus, the University must necessarily limit representation of student preparedness in any field of study to that competency demonstrated at that specific point in time at which appropriate academic measurements were taken to certify course or program completion. Any or all students may be required to take one (1) or more tests designed to measure general education achievement and/or achievement in selected major areas as a prerequisite to graduation for the purpose of valuation of academic programs. Unless otherwise provided for any individual program, no minimum score or level of achievement is required for graduation. Participation in testing and other evaluation measures are required for all students and for students in selected programs. In order to comply fully with this provision, the student must authorize the release of his or her scores to the institution. Individual student scores will be treated as confidential.

Tennessee Technological University is an Equal Opportunity/Affirmative Action institution and is in compliance with Titles VI and VII of the Civil Rights Act of 1974, Title IX of the Education Amendments of 1972, the Age Discrimination Act of 1974, the Rehabilitation Act of 1973, the Vietnam Era Veterans Readjustment Act of 1974, and the Americans With Disabilities Act of 1990. The University is nondiscriminatory on the basis of age, race, color, religion, sex, national origin, disability status, or status as a disabled veteran or veteran of the Vietnam era. Inquiries or complaints concerning these policies should be directed to the Affirmative Action Officer, Derryberry Hall, Room 314D, (931) 372-3016.

Faculty members will endeavor to make necessary accommodations for disabled persons in their courses. The Office of Disability Services is available to assist the faculty to make necessary special arrangements for disabled students. This Office should be contacted as early as possible by a student regarding assistance that may be needed for attendance at the University.

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## Academic Policy Relative to Closing Due to Inclement Weather

**GENERAL STATEMENT:** Tennessee Technological University offices will remain open during periods of inclement weather even though classes may be canceled.

In accordance with TBR policy, faculty, administrators, and staff of TTU are expected to make every reasonable effort to be at their work assignment on time, taking into consideration the personal risk involved. Administrators or staff employees who anticipate arriving late, or not arriving at work at all, should notify their immediate supervisor of this fact as soon as possible and request annual leave for the period of absence. If faculty members must be absent from assigned classes due to inclement weather, it is their responsibility to notify the appropriate chairperson and/or dean.

The decision to cancel off-campus classes will be made by the Provost in close consultation with the Dean of the College of Graduate Studies and the coordinator of the affected off-campus center. The information will then be disseminated as quickly as possible by whatever means are available in the vicinity of the affected center.

At times it may be necessary for the President to declare specific hours as emergency closing as the result of inclement weather or other emergency situations. In such cases, regular full-time and part-time employees on the active payroll who are scheduled to work during the declared times of closing will be granted time off from work with pay. Employees who are not scheduled to work will not be paid for the emergency closing. Clerical and support personnel required to work to keep essential services functioning will receive extra compensation. Administrative personnel required to work will receive equal time off for hours worked.

If classes are not canceled despite inclement weather, students are responsible for any academic work they miss as a result of inclement weather. It is the individual student's responsibility to take the initiative in making up any missed work, and it is the faculty member's responsibility to provide students a reasonable opportunity to make up missed work.

## University Calendar

This calendar is subject to change at any time prior to or during an academic term due to errors, emergencies, or causes beyond the reasonable control of the University.

Please see the University Calendar web site at [www.tntech.edu/calendar](http://www.tntech.edu/calendar) for registration, fee payment, drop/add, and other important dates. For detailed listing of dates specific to graduate students go to [www.tntech.edu/graduatestudies/calendardates/](http://www.tntech.edu/graduatestudies/calendardates/).

### Summer Semester 2014

May 26	Memorial Day Holiday
June 2	Classes begin for First and Full Term
July 3	Final Examinations for First Term
July 4	Independence Day Holiday
July 8-7	Classes begin for Second Term
August 7-8	Final Examinations for Second and Full Term

### Fall Semester 2014

August 25	Classes begin
September 1	Labor Day Holiday-No classes
October 13-14	Fall Break-No classes
November 27-28	Thanksgiving Holidays-No classes
December 5	Last day of classes
December 8-11	Final Examinations
December 13	Commencement

### Spring Semester 2015

January 19	Martin Luther King, Jr. Holiday-No classes
January 20	Classes begin
March 9-13	Spring Break
May 1	Last day of classes
May 4-7	Final Examinations
May 9	Commencement

### Summer Semester 2015

May 25	Memorial Day Holiday
June 1	Classes begin for First and Full Term
July 2	Final Examinations for First Term
July 4	Independence Day Holiday
July 6	Classes begin for Second Term
August 6-7	Final Examinations for Second and Full Term

# Accreditation and Memberships

## Tennessee Technological University

### A State University

Tennessee Technological University is accredited by the Southern Association of Colleges and Schools Commission on Colleges (SACSCOC) to award degrees at the bachelor's, master's, specialist, and doctoral. Contact the Commission on Colleges at 1866 Southern Lane, Decatur, Georgia 30033-4097: Telephone number 404-679-4501 for questions about the accreditation of Tennessee Technological University.

### Accreditation

- National Council for Accreditation of Teacher Education
- National Association of Schools of Music
- The American Chemical Society
- ABET, INC
- American Association of Family and Consumer Sciences
- AACSB--International – The Association to Advance Collegiate Schools of Business
- National Association of Industrial Technology
- American Music Therapy Association
- Commission on Collegiate Nursing Education
- National Association of Schools of Arts and Design, Associate Member

### Memberships

- American Association of Colleges of Teacher Education
- American Association of State Colleges and Universities
- Council of Graduate Schools
- Ohio Valley Conference
- Oak Ridge Associated Universities
- Putnam County Chamber of Commerce
- Southern Association of Colleges and Schools
- Teacher Education Council of State Colleges and Universities
- Tennessee College Association



# Graduate Degrees

- Master of Arts ..... MA
- Master of Business Admin ..... MBA
- Master of Education..... MEd
- Master of Professional Studies....MPS
- Master of Science..... MS
- Master of Science in Nursing..... MSN
- Professional Science Masters .....PSM
- Specialist in Education .....EdS
- Doctor of Philosophy ..... PhD

## Fields of Study

Graduate Degrees are offered by TTU in the following fields.

### College of Arts & Sciences

- Biology..... MS
- Chemistry ..... MS
- English..... MA
- Mathematics ..... MS

### College of Business

- Business Administration ..... MBA

### College of Education

- Curriculum & Instruction .... MA, EdS
- Ed. Psy & Counselor Ed.... MA, EdS
- Exceptional Learning ..... PhD
- Exercise Sci., Phys Ed ..... MA
- Instructional Leadership .... MA, EdS

### College of Engineering

- Chemical Engineering ..... MS
- Civil Engineering..... MS
- Computer Science..... MS
- Electrical/Computer Engr..... MS
- Engineering ..... PhD
- Mechanical Engineering ..... MS

### College of Interdisciplinary Studies

- Adv. Studies in Teaching/Lrng\* .MEd
- Environmental Sciences ..... PhD
- Master of Professional Studies\*MPS
- Professional Science Masters ..PSM

### Whitson-Hester School of Nursing

- Nursing\* ..... MSN

\*RODP Programs

# General University Information

## History

Tennessee Technological University was established by an act of the General Assembly in 1915 and opened its doors to students the following year. The University began operation on the campus that had belonged to Dixie College, a private institution founded in 1911. The purchase of the Dixie campus property and the erection of two dormitories, East and West Halls, were funded by Putnam County and the City of Cookeville. Since then, the growth of the institution has been closely interwoven with the development of the Upper Cumberland region.

From 1916-24 Tennessee Polytechnic Institute offered work only on a high school and junior college level. By 1929, however, the Tennessee Board of Education authorized a complete college program and the first class of four-year graduates received the B.S. degree in June.

In 1938 the instructional program was reorganized into two main divisions, the Arts and Sciences and the Professional and Technical Subjects. These divisions were renamed schools nine years later. In 1949 the administrative structure was expanded into five schools consisting of Agriculture and Human Ecology, Arts and Sciences, Business Administration, Education, and Engineering. The five undergraduate schools were designated as colleges in 1965 when Tennessee Polytechnic Institute gained university status and changed its name to Tennessee Technological University.\*

The Master of Arts degree was authorized in 1958, and the Master of Science degree in 1964. The Specialist in Education degree was authorized in 1970, the Doctor of Philosophy in engineering in 1971, the Master of Business Administration in 1976, the Doctor of Philosophy in Environmental Sciences in 1997, and the Doctor of Philosophy in Exceptional Learning in 2000. The University granted its first three Master's degrees in August 1959.

Since its inception in 1958, the Graduate School has striven to provide the highest quality of graduate

programs and to maintain its rich heritage.

## The University Campus

Cookeville, Tennessee, the site of Tennessee Technological University, is located on Interstate 40, Highway 70 North, and Highway 111. Modern highways radiate in all directions and bus lines furnish convenient transportation from any point in Tennessee. Major airlines' services are available through Nashville, Knoxville, and Chattanooga.

The City of Cookeville has a population of more than 26,000 and is located on the eastern Highland Rim of Tennessee at an elevation of 1,140 feet. The local public schools, civic clubs, and churches have a friendly and cooperative relationship with students, faculty, and patrons. The surrounding area, enhanced by three major lakes, abounds in natural beauty and is served by several state parks.

The campus consists of a tract of 235 acres made attractive by shrubbery, native trees, and a system of driveways and walks; the buildings are arranged to make a compact and convenient university plant.

## Statement of Mission

Tennessee Technological University's mission as the state's only technological university is to provide leadership and outstanding programs in engineering, the sciences, and related areas that benefit the people of Tennessee and the nation. The University also provides strong programs in the arts and sciences, business, education, agriculture and human ecology, nursing, music, art, and interdisciplinary studies. Tennessee Tech serves students from throughout the state, nation, and many other countries, but it retains a special commitment to enrich the lives of people and communities in the Upper Cumberland region of Tennessee.

The University is committed to the lifelong success of students in its undergraduate, master's, specialist,

and doctoral degree granting programs through high quality instruction and learning experiences. The University is engaged in scholarly activity, especially basic and applied research, creative endeavors, and public service, with special emphasis on community and economic development. The University supports student participation in a broad array of extracurricular activities as an integral component of its commitment to student life and success.

The University's three interdisciplinary Accomplished Centers of Excellence in Energy Systems Research, Manufacturing, and Water Resources and Chairs of Excellence in Business Administration strengthen the instructional, research, and service mission of the University.

The University is as supportive of women as of men and as supportive of those in the minority as of those in the majority. The University provides educational opportunities to all eligible persons without regard to age, gender, ethnicity, race, religion, national origin, disability, or sexual orientation.

Tennessee Technological University is a member of the State University and Community College System of Tennessee and is governed by the Tennessee Board of Regents. Approved by the Tennessee Board of Regents on December 3, 2004.

## Vision Statement

TTU will be one of the best universities in the nation through a commitment to the lifelong success of our students.

## Alumni Association

The purpose of the Alumni Association is to promote the educational, social, and economic interests of Tennessee Technological University, its alumni, faculty, friends, and current students. All former students of Tennessee Technological University who earned a degree are recognized as alumni.

The Director of Alumni Relations coordinates the activities of the Alumni Association. The work of the Association is administered through

## Student Support Services

the Office of Alumni Relations in consultation with the Association's Advisory Board. The advisory board consists of alumni representatives appointed by the Director of Alumni Relations and the current Advisory Board; it also includes a delegate from the Student Alumni Ambassadors.

### Career Services

The Office of Career Services, located on the third floor of the University Center, provides a variety of career resources for graduate students. Advice and suggestions to maximize interviewing strategies and resume preparation are also provided. As the University's centralized recruiting facility, candidates for a graduate degree should register with the office two (2) semesters prior to their anticipated graduation date for assistance with their job search. Registration is required for students and alumni in advance of their participation in campus interview activities.

Recognizing the benefits to be gained through the use of cutting-edge technology, Career Services maintains a full service web site at <http://www.tntech.edu/career/>. Students, alumni, and employers can access information about campus recruiting activities including the ability to post and obtain resumes online. Electronic links have been set up as a quick resource tool to use when searching the Internet for career resources and opportunities. Interactive videoconferencing software enables students and alumni to interview with employers worldwide.

### Computer Facilities

The D. W. Mattson Computer Center is equipped with a large-scale, modern digital computer, together with peripheral equipment for the rapid input, output, and storage of information. Although the Center satisfies the general administrative, instructional, and research needs of the University, there are numerous minicomputers and time-sharing

terminals located throughout the campus for instructional and research purposes. Many graduate students utilize computer facilities in their research pursuits.

### Counseling Center

The Tennessee Tech Counseling Center, located in the Roaden University Center, provides a wide range of services. Counseling offers an opportunity for students to develop more effective means of resolving problems and acquiring strategies for achieving personal and professional goals. The Center also administers a number of standardized tests including the GRE (subject only) and MAT for students interested in or planning to attend graduate school. Outreach and consultation services on a variety of topics of interest to students are available.

Students experience varying degrees of difficulty related to the challenges of graduate school. Transition issues, stress management, interpersonal relationships, family issues, depression, and anxiety are among the concerns that students discuss in counseling. Strict confidentiality is maintained in the counseling process.

There is no fee for this service. Registered, enrolled students are eligible and may make appointments by calling the Counseling Center (931) 372-3331.

### Financial Aid

The Office of Financial Aid is located on the third floor of the Roaden University Center. See page 11 for detailed description of services provided by this office.

Graduate assistantships constitute the primary source of financial aid for students enrolled in the Graduate School. Information concerning appointment of graduate assistants is found in the section entitled Organization of the College of Graduate Studies.

### Angelo and Jennette Volpe Library

The Angelo and Jennette Volpe Library is a centralized location for students to find information for academic development. In recent years, the library has undergone renovations to establish the 30,000 square-foot Learning Commons, transforming the traditional library into a collaborative learning environment for students.

Library resources include both print and electronic collections with librarians to help students find the information they need. Students also have access to materials from other libraries through Interlibrary Loan. Individual desks, large study tables, private group study rooms, and practice presentation rooms are available to students for work on any project. The library offers computers, laptops, and multimedia equipment for student use.

### Multicultural Affairs

Our mission is to provide personal, cultural, social, and academic growth and development for students of color. We provide and encourage opportunities for all students of color to learn about their history, take pride in their heritage, and explore their potential. We promote cultural awareness by providing an environment that embraces diversity.

Our office provides programs designed to encourage cultural awareness, as well as, educational opportunities outside the classroom. In addition, we provide tutoring, academic counseling, scholarships and internships to improve academic performance.

The Office of Multicultural Affairs is located in the Leona Lusk Officer Black Cultural Center, which houses a computer lab, conference room, and a library of African-American authors. We hope you will come visit and relax. It is a great place to meet new friends and become involved with student organizations

### Residential Life

Tennessee Tech has 15 residence halls and a 304-unit apartment complex--called Tech Village Apartments--which provides housing accommodations for enrolled students--both undergraduate and graduate.

Residence hall rooms are designed for double occupancy; however, a few single rooms are available. Rooms are furnished to include standard twin beds and mattresses, desks, chairs, dressers, telephone, smoke detector, mini blinds, closets and a wastebasket. Additionally, all rooms receive expanded basic cable service at no additional charge. All residence halls have laundry facilities located in each building. Students may provide their own personal items to make their room more unique and comfortable.

Tech Village apartments are assigned to students in the following priority: married students, single students with child(ren), graduate students, students with disabilities, senior undergraduate students, and faculty/staff. Each apartment has a telephone, stove, refrigerator, garbage disposal, smoke detector, fire extinguisher, expanded basic cable service and mini blinds. Tech Village has a laundry facility, and a community center with ice machine. Your monthly rent includes expanded basic cable service, local telephone service, water service, and garbage removal. Occupants pay for electric utilities and long-distance phone calls.

All residence halls are connected to ResNet. ResNet is short for Residence Hall Computer Network. Each of these residence hall rooms has a ResNet connection for each occupant, providing the student has a personal computer. Residents also have access to VAX labs in designated residence hall lobbies and the Tech Village community center. Additionally, all residence halls and Tech Village students will have a voice mailbox assigned to them to be used in conjunction with their telephone service.

To secure an assignment on campus, simply request either a residence hall or Tech Village application packet by contacting the Office of Residential Life by calling (931) 372-3414 or toll free 1-800-255-8881 or in writing at Office of Residential Life, Box 5016, Cookeville, TN, 38505-0001,

or online at [www.tntech.edu/reslife/](http://www.tntech.edu/reslife/). Once you receive the application packet, it is important for you to complete the application and return with your prepayment as soon as possible. Applicants for residence hall assignments will be notified by the third week of July for a fall semester assignment, the second week of December for a spring assignment and the first week of May for a summer assignment. Applicants for Tech Village assignments will be notified as apartment space is available. Tech Village applicants are not guaranteed an apartment assignment; therefore, you should look into other housing options in the event an apartment does not become available.

### **Services for Students with Disabilities**

The Office of Disability Services program is designed to improve the educational opportunities of students with disabilities and to create an accessible physical environment so that students may obtain their educational objectives. The Office also provides the University community with information pertinent to the successful integration of students with disabilities into the environment, as well as within the community at large.

All students with disabilities are urged to come by the Office of Disability Services to discuss their educational plans and any special needs they might have. Official documentation of a disability is necessary to determine the level of services that may be needed. The Office is located in Room 112, University Center. Students may also call for an appointment at (931) 372-6119.

### **Campus Health Services**

Tennessee Technological University has a campus health service which provides medical services for minor illnesses or injuries to any student enrolled at the University on a walk-in basis during hours of operation. The health service staff includes nurses, a nurse practitioner, physician, and pharmacist who plan and implement care for students during daytime hours Monday through Friday. The only charge made to a student is for

medications, treatments, supplies, or laboratory work.

The student is responsible for expenses incurred for ambulance service, calls at a local physician's office, emergency services, and other services provided at Cookeville Regional Medical Center. Health and accident insurance is available to each student upon his/her registration at Tennessee Tech. This insurance coverage is authorized and approved by the Tennessee Board of Regents. Coverage provides hospital, surgical, and in-hospital medical protection on a year-round basis beginning with the first day of fall registration and continuing until the first day of fall registration the following year. Students may enroll in the plan during registration or at any time during the year by picking up an application at the Health Services Office (Infirmary).

Two (2) plans of coverage are available at reasonable rates. Optional maternity coverage is offered under both plans. Details concerning this insurance are available at the Student Health Service and during registration. Students are encouraged to participate in one (1) of the insurance plans, as it supplements the above services offered by Campus Health Services.

## Fees and Financial Aid Options

For the most complete and up-to-date fee and refund policy information, go to <http://www.tntech.edu/bursar/fees>.

No student may enroll or receive a diploma, transcript of records, or grade report until all matured debts or obligations to the University, or any phase of its program, have been cleared.

### Financial Aid

Graduate assistantships constitute the primary source of financial aid for students enrolled in the Graduate School. Information concerning appointment of graduate assistants is found in the section entitled "Organization of the Graduate School."

Students who have been admitted as regular students in a degree-seeking program should complete the Free Application for Federal Student Financial Aid (FAFSA). Recipients of federal direct loans or work-study must be U.S. citizens or eligible noncitizens enrolled for at least five (5) semester hours (for federal aid purposes, halftime status is defined as enrollment for five [5] hours, three-quarter time status is defined as enrollment of six to eight [6-8] hours, and full-time is defined as enrollment of nine [9] hours). The interest on these loans is a variable amount (set by the federal government each year); interest and principal repayment may be deferred while the student is enrolled. The FAFSA is available online at [fafsa.ed.gov](http://fafsa.ed.gov). You may also wish to review our website at [www.tntech.edu/financialaid/](http://www.tntech.edu/financialaid/) for further information about aid programs and procedures. In addition, you can use this site to link to the online version of the Free Application for Federal Student Aid FAFSA.

In some instances graduate students may qualify for positions as head residents in the University's housing program. Inquiries should be sent to the Director of Residential Life, P.O. Box 5016, Cookeville, TN 38505.

### Assistantship Stipends & Other Financial Aid

All full assistantships which are supported by University funds provide tuition and fee payments in addition to a salary stipend during the period

of appointment. Full stipend range varies depending on the major field of study. Doctoral students and research assistants in the Centers of Excellence may receive additional compensation.

Full assistantships which are funded from sources outside the University, such as in projects underwritten by grants and contracts, provide a salary stipend consistent with the above; tuition and fees are also paid if provided for by the source of the assistantship. If tuition and fees are not provided by the source of the assistantship, the monthly stipend may be proportionately increased when project funds are available.

Other forms of financial aid—including loans, workshops, internships, and positions as head residents in dormitories—may be available through the Office of Student Financial Aid. Additional information may be obtained by writing to the Director of Student Financial Aid, Box 5076, Cookeville, TN 38505, Room RUC 208, 931-372-3073.

### Veterans' Benefits

Many students enroll for graduate study with financial benefits provided by the Veterans Administration. A student who anticipates receiving VA benefits should keep in mind that enrollment cannot be verified until the student files with the Graduate School an approved program of study or teacher licensure plan. Certificate of satisfactory process can be verified for no more than two (2) semesters of academic probation.

# University Policies

## Student Responsibility

All students are required to have knowledge of rights, responsibilities, and regulations pertaining to campus life which are published in the Student Handbook. Each student is responsible for maintaining communication with the University, by keeping officials informed at all times of current address (including zip code) and telephone number.

Students are responsible for the proper completion of their academic programs; for familiarity with requirements of the University Catalog; for maintaining the grade average required; and for meeting all other degree requirements. A student may receive counsel from an academic advisor; however, the final responsibility remains that of the student.

The course offerings and requirements of the institution are continually under examination and revision. This catalog (bulletin) presents the offerings and requirements in effect at the time of publication, but is no guarantee that they will not be changed or revoked. However, adequate and reasonable notice will be given to students affected by any changes. This catalog (bulletin) is not intended to state contractual terms and does not constitute a contract between the student and the institution. The University reserves the right to make changes in rules and regulations concerning admission, student conduct, degree requirements, and course descriptions subject to the concurrence and approval of its governing authorities.

The institution reserves the right to make changes as required in course offerings, curricula, academic policies, and other rules and regulations affecting students to be effective whenever determined by the institution. These changes will govern current and formerly enrolled students. Enrollment of all students is subject to these conditions.

The University provides the opportunity for students to increase their knowledge by providing programs of instruction in the various disciplines and programs through faculty who,

in the opinion of the University, are qualified for teaching at the college level. The acquisition and retention of knowledge by any student is, however, contingent upon the student's desire and ability to learn and his or her application of appropriate study techniques to any course or program. Thus, the University must necessarily limit representation of student preparedness in any field of study to that competency demonstrated at that specific point in time at which appropriate academic measurements were taken to certify course or program completion.

The regulations and policies established by the Graduate School Executive Committee are intended to provide guidance to faculty and students. Should an individual believe that there is sufficient justification for an exception to any requirement, written requests (with any suitable statements or other supporting documents) may be submitted to the Associate Vice President for Research and Graduate Studies for consideration by the committee. The committee has regular meetings three times during each semester of the academic year and once during the summer.

The graduate catalog is a supplement to the undergraduate catalog (general catalog) and is published to provide information for graduate students, prospective graduate students, and members of the faculty. Students enrolling for graduate study at Tennessee Technological University are responsible not only to the provisions of the graduate catalog but also to the undergraduate catalog. Whenever a student's welfare or progress may be impeded or impaired by any conflict of information presented in the two (2) publications, resolution of such conflict will be determined by the appropriate standing committees of the University. When a person is admitted to graduate study, it is presumed that person accepts responsibility for learning and observing the regulations and policies of the University; therefore, ignorance of a regulation or policy does not constitute a basis for waiving that

regulation or policy. Graduate students are subject to the usual procedures and regulations of the University as listed in the undergraduate catalog, except as they apply to undergraduate students only.

Tennessee Technological University is an Equal Opportunity/Affirmative Action institution and is in compliance with Titles VI and VII of the Civil Rights Act of 1974, Title IX of the Education Amendments of 1972, the Age Discrimination Act of 1974, the Rehabilitation Act of 1973, Vietnam Era Veterans Readjustment Act of 1974, and The Americans With Disabilities Act of 1990. The University is nondiscriminatory on the basis of age, race, color, religion, sex, national origin, disability status, or status as a disabled veteran or veteran of the Vietnam Era. Inquiries or complaints concerning these policies should be directed to Dr. Rachel Rader, Affirmative Action Officer, in Derryberry Hall, Room 314D, (931) 372-3016.

Faculty members will endeavor to make necessary accommodations for disabled persons in their courses. The Office of Disability Services should be contacted as early as possible by a student regarding assistance that may be needed for attendance at the University.

## Official Notice to Report

A notice to report to any administrative office of the University takes precedence over all noninstructional activities, and must be answered immediately or, if received during a class, as soon as the class is over. Failure to respond to such a notice will require satisfactory explanation to the Administrative Council before the student is allowed to continue in residence.

## Academic and Classroom Conduct

The instructor has the primary responsibility for control over classroom behavior and maintenance of academic integrity, and can order

the temporary removal or exclusion from the classroom of any student engaged in disruptive conduct or conduct violative of the general rules and regulations of the institution. Extended or permanent exclusion from the classroom or further disciplinary action can be effected only through appropriate procedures of the institution.

Plagiarism, cheating, and other forms of academic dishonesty are prohibited. Students found guilty of academic misconduct, either directly or indirectly through participation or assistance, are immediately responsible to the instructor of the class. In addition to other possible disciplinary sanctions which may be imposed through the regular institutional procedures as a result of academic misconduct, the instructor has the authority to assign an F or a zero (0) for the exercise or examination, or to assign an F in the course.

If the student believes that he or she has been erroneously accused of academic misconduct, and if his or her final grade has been lowered as a result, the student may appeal the case through the appropriate institutional procedures.

The instructor shall send a copy of the charge to the Office of the Vice President for Student Affairs. The student shall have up to seven (7) days to request a hearing by signing a "Request for Hearing" form in the Office of the Vice President for Student Affairs. The student waives his/her right to a hearing by signing a "Waiver of Hearing" form or by neglecting to sign a "Request for Hearing" form within seven (7) days.

### **Judiciary Procedures**

Judiciary procedures at the University do not constitute legal actions, and the decisions are not to be equated with verdicts reached by courts of law. These procedures simply involve the fact-finding and decision-making processes of an educational institution.

Detailed procedures for the disciplinary system are printed in the "Disciplinary System Manual." Copies of the manual are located in the Office of Student Affairs.

### **Unofficial Withdrawal**

Tennessee Technological University will, through forms of documentation deemed acceptable by federal guidelines, determine the date of unofficial withdrawal for any student who leaves the University without officially withdrawing. In compliance with federal guidelines this date will be used to calculate the University's financial liability to the federal government in the recovery of funds.

### **Official Withdrawal From The University**

Students who desire to withdraw from the University before the end of an academic term must make formal application for withdrawal either in the Office of Student Affairs at the time of withdrawal. Those who complete withdrawal procedures will receive a grade of W in courses they are passing and a grade of WF in courses they are failing if official withdrawal is after the last date for dropping a course. Refunds which may be due will depend upon the date of formal withdrawal. Applications for withdrawal will not be considered if received after final examinations begin in any term.

### **Privacy Rights Of Students**

On May 20, 1975, Tennessee Tech approved a statement of policy that includes provisions for the release of information about students and the rights of students and others to have access to Tech's education records. The complete policy statement of "Privacy Rights of Students" is available in the Records and Registration Office and in the Student Handbook.

A student may obtain a transcript of his or her academic records by making a written request to the Office of Records and Registration, Tennessee Technological University, P. O. Box 5097, Cookeville, TN, 38505 Fax (931) 372-6111.

### **Use of Social Security Number**

In accordance with the Privacy Act of 1974, applicants for admission and enrolled students are advised that the requested disclosure of their Social Security numbers is voluntary. The Social Security Number is not used as a student ID number. Each applicant is assigned a special nine (9) character (T#) ID. This ID will be used: (a) to identify such student records as applications for admission, registration and course enrollment documents, grade reports, transcript requests, certification requests, and permanent academic records and (b) to determine eligibility, certify school attendance, and report student status. Students are notified, however, that only the Social Security number may be used as an identifier for grants, loans, and other financial aid programs according to federal regulations. The student's Social Security number will not be disclosed to individuals or agencies outside Tennessee Technological University except in accordance with the institutional policy on student records.

### **Inclement Weather Policy**

All Tennessee Technological University offices will remain in operation during inclement weather to ensure continuity of services and to meet the needs of our students. In extreme weather conditions, classes and exams on campus and at off-campus locations may be rescheduled or cancelled while the university is open.

In accordance with TBR policy, faculty, administrators and staff of TTU are expected to make every reasonable effort to be at their work assignment on time, taking into consideration the personal risk involved. Administrators or staff employees who anticipate arriving late, or not arriving at work at all, should notify their immediate supervisor of this fact as soon as possible and request annual leave for the period of absence. If faculty members must be absent from assigned classes due to inclement weather, it is their responsibility to notify the appropriate chairperson and/or dean.

### **Off-Campus Classes**

**28.1.2** The decision to cancel off-campus classes will be made by the Vice President for Academic Affairs in close consultation with the Vice President of Extended Programs and Regional Development and the coordinators of the off-campus centers. The information will then be disseminated by the coordinators as quickly as possible by whatever means are available in the vicinity of the affected center.

### For Employees / Working Hours

At times it may be necessary for the President to declare specific hours as emergency closing as the result of inclement weather or other emergency situations. In such cases, regular full-time and part-time employees on the active payroll who are scheduled to work during the declared times of closing will be granted time off from work with pay. Employees who are not scheduled to work will not be paid for the emergency closing. Clerical and support personnel required to work to keep essential services functioning will receive extra compensation. Administrative personnel required to work will receive equal time off for hours worked.

### Academic Work

If classes are canceled due to inclement weather, missed classes should be made up in a manner chosen by the individual faculty member involved. If classes are not cancelled despite inclement weather, students are responsible for any academic work they miss as a result of inclement weather. It is the individual student's responsibility to take the initiative in making up any missed work, including but not limited to examinations, presentations and projects, and it is the faculty member's responsibility to provide the student with a reasonable opportunity to make up missed work, including but not limited to examinations, presentations and projects.

### Delays & Early Closings

The President of the University may choose a delayed opening or early closing.

In the event of the delayed opening, all faculty and staff are expected to report to their specific work location

by the set opening time. Students are expected to report to regularly scheduled class only if there are 30 or more minutes remaining in the session. (Ex.: If the delayed opening is set for 10:00 a.m., students who have classes from 9:30 a.m. to 10:50 a.m. should report to that class at 10:00 a.m.). All classes scheduled prior to the delayed opening time and those that have less than 30 minutes remaining after the set opening time are cancelled for the day.

When time is announced for an early closing, it applies to all classes that begin on or after that hour. Ex. "Classes cancelled at 3:00 p.m." means all classes starting at 3:00 p.m. or later are cancelled. Classes that started before 3:00 p.m. will meet.

### Procedures for Canceling Classes

In those instances when weather conditions require a decision by the President of the University to authorize canceling classes, delaying the start of classes or suspending selected activities, the following procedures will be in effect:

**28.2.1** The Director of Facilities and Business Services and Director of Safety and Environmental Services will monitor official weather reports, contact appropriate state, county and local Public Safety Officials and check local roads for hazardous driving conditions. They will review campus roads, walkways and parking lot conditions. The Director of Facilities and Business Services will advise the Vice President for Business and Fiscal Affairs of the findings. After receiving this information, the Vice President for Business and Fiscal Affairs will inform the Vice President for Academic Affairs, who will consult with the other vice presidents and recommend to the President whether the University should cancel classes or declare an emergency closing. If the Vice President for Business and Fiscal Affairs is unavailable, the Director of Facilities and Business Services and Director of Safety and Environmental Services will contact the Vice President for Academic Affairs.

Once the decision is made to cancel classes or close offices and facilities or buildings on campus or at extended education sites, the President or Vice

President for Academic Affairs will notify:

- Associate Vice President for Communications and Marketing (or representative of that office)
- TTU Police
- University Vice Presidents (Each University Vice President will be responsible for notifying the appropriate personnel in the division).

The Office of Communications and Marketing will prepare an official statement and notify the campus community and public through the following ways:

- University website homepage
- Broadcast e-mail to students, faculty and staff
- Text alert (written by OCM, distributed by University Police)
- Facebook and other social media
- Switchboard operator
- Local media (including Channel 7)
- Metro Nashville network TV stations and select radio stations
- Upper Cumberland Radio
- Campus media (Oracle/WTTU)
- Metro Knoxville network TV stations and select radio stations

Many media outlets require private passwords or codes for weather notifications. These codes will be kept confidential and maintained annually by the Office of Communications and Marketing. Access to a listing of codes will be limited to designated OCM staff members and the Vice President for University Advancement.

No notice will be sent to media if the University continues to operate on a normal schedule. (The University homepage and social media may be used to communicate to students, parents, faculty, staff and administrators that a normal schedule will be followed).

# University Drug & Tobacco Policies

## Drug Free Policy

The Tennessee Technological University community (Faculty, Staff, and Students) complies with the policies and penalties relative to controlled substances (illicit drugs) and alcohol, as required by the Drug Free Workplace Act of 1988 and the Drug Free Schools and Communities Act Amendments of 1989. As an employee and/or student at Tennessee Technological University, you are required to be knowledgeable of and comply with the Drug Free Campus/Workplace Policy, the applicable provisions of which are summarized below:

It is the policy of this institution that the unlawful manufacture, distribution, possession, use, or abuse of alcohol and/or illicit drugs on the Tennessee Technological University campus or on property owned or controlled by the University is strictly prohibited. All categories of employees and students are subject to this policy and to applicable federal, state, and local laws related to this matter. Additionally, any violation of this policy will result in disciplinary actions as set forth in the applicable sections of this policy.

## No Smoking & Tobacco-free Campus Policy

Tennessee Tech University (TTU) agrees with the U.S. Surgeon General that tobacco use in any form, active and/or passive, is a significant health hazard. TTU further recognizes that environmental tobacco smoke has been classified as a Class-A carcinogen, and that the State of Tennessee is actively dissuading its employees from smoking. TTU supports the American College Health Association Position Statement on Tobacco on College and University Campuses ([www.acha.org](http://www.acha.org), Feb 2005). Due to these health risks, TTU has adopted a NO SMOKING AND TOBACCO-FREE CAMPUS policy.

### 7.1 Policy

Effective January 1, 2010, TTU is a No Smoking and Tobacco-Free Campus, with all smoking ('herbal' and tobacco)

and all other tobacco usage permitted only in private vehicles. This policy applies to all university buildings and grounds; TTU-affiliated off-campus locations and clinics; and any buildings or properties owned, leased or rented by TTU in all other areas. Smoking & tobacco use continues to be prohibited in all state vehicles. This no smoking and tobacco-free campus policy is in effect 24 hours a day year-round.

**Background** - The University promotes a healthy, sanitary environment free from all smoke ('herbal' and tobacco) and tobacco-related debris. The TTU community acknowledges that long-term health hazards may accrue to people who use tobacco products or who are subjected to second-hand smoke. The failure to address the use of tobacco products on campus would constitute a violation of the Americans with Disabilities Act, the Vocational Rehabilitation Act and Tennessee law.

**Support** - Understanding the addictive nature of tobacco products, TTU will make every effort to assist those who may wish to stop using tobacco. TTU Human Resources, Health Services and Counseling Center offer current information about available resources. The State offers toll-free assistance at 1-800-QuitNow (1-800-784-8669). The American Cancer Society offers free counsel to individuals wanting to quit.

### 7.2 Compliance and Enforcement

It is the responsibility of all members of the TTU community and visitors to comply with this no smoking and tobacco-free campus policy. Violations of the policy will be dealt with in a manner that is consistent with university procedures. There shall be no reprisals against anyone reporting violations of this policy.

## Research Opportunities

Research is an integral part of the University and is broadly defined to include studies, investigations, and other scholarly and creative pursuits. Faculty involvement may be on an individual basis or as members of interdisciplinary teams. Many faculty include students in their research activities and are encouraged to do so.

The University's membership in research oriented organizations compliments and enhances both faculty and student research opportunities. Among the organizations is Oak Ridge Associated Universities (ORAU).

Since 1981, students and faculty of Tennessee Technological University have benefited from its membership in Oak Ridge Associated Universities (ORAU). ORAU is a consortium of 96 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 operates, 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, physics, geological sciences, pharmacology, ocean sciences, biomedical sciences, nuclear chemistry, and mathematics. Appointment and program length range from one (1) month to four (4) years. Many of these programs are especially designed to increase the numbers of underrepresented 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 [www.orau.gov/orise/educ.htm](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 Office of Research at (931) 372-3374 or the web site at [www.tntech.edu/research](http://www.tntech.edu/research). You may also contact the ORAU Corporate Secretary, at (865) 576-

3306 or visit the ORAU Home Page at [www.orau.org](http://www.orau.org).

There are identified units within the university that have a research component, and in some instances these units provide opportunities for student research focused in a particular area. One example is the Upper Cumberland Humanities and Social Sciences Institute. This interdisciplinary institute is designed to promote humanities and social sciences in the University and in the institution's service area through the Upper Cumberland Studies Program, funded research projects, and public service activities. Of particular interest are activities that deal with the Upper Cumberland region, promote interaction between various disciplines, and encourage cooperation between the community and the University.

Research is conducted in each division of the University, including the Centers of Excellence, and there are numerous opportunities for student involvement either directly on contracts and grants or on research assistantships. The University maintains an Office of Research which assists in the procurement of funds to support research.

## Centers of Excellence

By authority of the General Assembly of the State of Tennessee, the Tennessee Higher Education Commission, and the Tennessee Board of Regents, three Centers of Excellence have been established at Tennessee Technological University. These accomplished Centers of Excellence focus on advanced interdisciplinary scholarship, including basic and applied research. Each center strives to utilize more efficiently the resources of the

University in order to improve the general economic development of the State of Tennessee; improve the state's research base; and enhance the intellectual, cultural, and social activities of its citizens.

Among its priorities, each center attempts to attract internationally recognized faculty, as well as both undergraduate and graduate students who have strong scholarly backgrounds and a commitment to

academic excellence.

Graduate students who become affiliated with a Center of Excellence must first qualify for admission into one of the University's graduate programs. Thereafter, in cooperation with the chairperson of the student's major department and the director of the center, the student may gain an assignment in research or similar scholarly activity; in most cases, the student will be appointed to a

graduate assistantship or be given some remuneration for successful participation.

### Center for Energy Systems Research

The Center for Energy Systems Research was established to advance and apply scientific and engineering knowledge associated with the generation, transmission, distribution, and use of electric power while supporting the instructional program of the University in academic areas related to electric power. In pursuing its goals, the Center works with electric utilities, state and federal agencies, private industries, nonprofit organizations, and other universities on a wide spectrum of projects. Research efforts, both theoretical and experimental, are focused on solving problems currently faced by the electric power industry. Specific research projects involve:

1. developing integrated software packages for the simulation and analysis of electric power systems to improve performance and reduce costs,
2. implementing innovative techniques to improve the utilization of fossil fuels in power plants, and
3. participating in basic research on emerging technologies to ensure that future electric power needs are met in an environmentally acceptable manner.

The Center, which is administered through the College of Engineering, provides opportunities for interdisciplinary research by involving faculty, staff, and students throughout the University. The Center has a positive impact on many facets of the electric power industry in the State of Tennessee and the nation.

### Center for the Management, Utilization, and Protection of Water Resources

The Center for the Management, Utilization, and Protection of Water Resources focuses interdisciplinary scientific research on water

resources issues in Tennessee, the surrounding region, and the nation. Its team approach to environmental research strengthens the University's educational program by combining faculty, professional staff, and students from agriculture, biology, chemistry, the Cooperative Fisheries Research Unit, earth sciences, engineering, and the social sciences into problem-solving groups. Center-supported graduate students pursuing degrees in one of these academic areas become important members of professional research teams. The Center is administered through the Office of Research & Economic Development. It maintains a staff with expertise in geographic information systems (GIS), modeling, and database management, and a professionally staffed laboratory, capable of general wet chemistry/physic parameter analyses, organic analyses, metal analyses, and biological/mutagenicity/toxicity testing. Basic techniques on solid-liquid phase interactions, chemistry, and the biological sciences provide support for fundamental and applied research. Current faculty research emphasizes:

1. biodiversity;
2. surface and ground water protection, use, and availability;
3. domestic, industrial, and recreational water use;
4. conservation and reuse of finite water supplies;
5. public education and the examination of socioeconomic problems of water treatment and distribution;
6. wastewater treatment and disposal;
7. water pollution and the protection of aquatic organisms and other wildlife from point and nonpoint sources.

### Center for Manufacturing Research

The Center of Excellence for Manufacturing Research was created to draw together resources of the State of Tennessee, the University, industries from Tennessee and abroad, and government funding agencies into a cooperative effort to be on the leading edge of the latest technological

advances in manufacturing. The Center has a twofold mission:

1. to advance and support scientific and engineering knowledge in areas related to manufacturing, and
2. to enhance the University's instructional program in manufacturing-related areas.

The Center draws upon expertise from throughout the College of Engineering and various other colleges, departments, and the University, as appropriate, as well as resources outside the University. In addition, the Center employs dedicated faculty and staff that are responsible for enhancing and supporting our strategic research program. The Center for Manufacturing Research has concentrated on four (4) strategic research areas:

1. Intelligent Control of Processes and Equipment,
2. Integrated Product and Process Realization,
3. Next Generation Materials and Manufacturing Processes, and
4. Pervasive Modeling and Simulation.

The Center for Manufacturing Research also has a significant extension component with a focus on quality services provided to industry. Service activities can include externally funded research projects, small laboratory testing projects, an industry work-study program that matches industry needs for engineering assistance with engineering student capabilities, and small business support through a TSBDC that is partially supported by the Center.

# Organization of the Graduate School

The Graduate School is comprised of the

- Graduate School Executive Committee,
- Graduate Faculty, and
- Graduate Assistants.

The following defines each group and their functions and responsibilities.

## Graduate Studies Executive Committee (GSEC)

Policies that govern the organization and administration of the College of Graduate Studies are developed by the Graduate Studies Executive Committee. As authorized by the Administrative Council of the University, the membership of this committee includes a minimum of nine (9) faculty members, representing the six (6) colleges in which graduate programs are offered; a minimum of eight (8) administrators, to include representation from each of the six (6) colleges; a minimum of four (4) student members, also representing the six (6) colleges; and such nonvoting advisory members as may be determined by the President of the University. The Dean of the College of Graduate Studies serves as executive officer. All appointments are made by the President. The chairperson of the committee is elected annually.

The Dean of the College of Graduate Studies, in collaboration with the Executive Committee, exercises overall review and supervision of graduate programs and provides leadership in developing new programs and in improving standards for existing programs.

## Graduate Faculty

### Appointment and Qualifications of Graduate Faculty

Status	Minimum Eligibility Criteria	Responsibilities	Term *
<p>FULL</p> <p>-full-time faculty member or academic administrator holding faculty rank;</p> <p>-rank of assistant professor or higher</p> <p>-tenured or tenure-track</p>	<p>-holds an earned doctorate or equivalent terminal degree in an appropriate discipline from an appropriately accredited institution;</p> <p>-achieved an appropriate level of scholarship or creative activity and erudition characterized by peer reviewed publications, conference publications, recitals, exhibitions, externally funded research grants;</p> <p>-demonstrated (by institutional involvement) commitment to the academic community, the University, his or her students, and academic discipline</p> <p>-criteria for reappointment are based on evidence of continued pattern of scholarly or creative activity of the quality expected for initial membership.</p>	<p>-may serve as a student's academic advisor for the Doctor of Philosophy degree;</p> <p>-may teach graduate courses for Master's, Specialist, and Doctoral degrees</p>	6 Years

Status	Minimum Eligibility Criteria	Responsibilities	Term *
ASSOCIATE -full-time faculty mem- ber who is not eligible for full membership	-holds at least a master's degree or equivalent; -demonstrated competence to carry out the departmental needs for graduate teaching, advisement, or research	-may serve as a student's academic advisor for Master's and Specialist degrees  -may teach graduate courses for Master's and Specialist degrees -may serve as a student's academic advisor and/or teach for Doctoral degree if they hold a doctorate or equivalent terminal degree	3 Years
ADJUNCT -part-time faculty who are employed for gradu- ate teaching, advisement, or research	-holds at least a master's degree or equivalent terminal degree in an appropriate discipline from an appropriately accredited institution; -if master's degree or equivalent must also possess appropriate experience in profession	-may serve as a committee mem- ber for Master's and Specialist degrees;  -may teach graduate courses for Master's and Specialist degrees -may teach graduate courses for Doctoral degree if they hold a doc- torate or equivalent degree	2 Years

\* Eligibility for renewal is based on a review of credentials during the years of their appointment period listed.

All appointments to memberships on the graduate faculty are made by the President based upon recommendations submitted by departmental chairpersons with suitable endorsement from the dean of the college, the Dean of the College of Graduate Studies, and the Vice President of Academic Affairs. The appropriate forms may be obtained from the College of Graduate Studies website.

#### Responsibilities of the Graduate Faculty

An instructor of any course for which students receive graduate credit must be a member of the graduate faculty. When students are enrolled in undergraduate classes (4000/5000) for graduate credit, the faculty member has the responsibility of making appropriate additional assignments to ensure students receive proper value from the courses. A general description of the extra work required of students taking a 4000/5000 level course for graduate credit must be included in the description of the course approved

by the Graduate School Studies Executive Committee. Instructors of undergraduate courses are provided class rolls that show the names of those students seeking graduate credit for work in their classes.

A faculty member may not direct independent study/research courses taken by a student who is a relative of the faculty member and may not be a member of a relative's graduate advisory committee. For the purposes of this policy, "relative" means a parent, foster parent, parent-in-law, child, spouse, brother, foster brother, sister, foster sister, grandparent, grandchild, son-in-law, brother-in-law, daughter-in-law, sister-in-law, or other family member who resides in the same household.

#### Responsibilities of Departmental Chairperson

Primary responsibility for determining that a faculty member meets the above requirements rests with the departmental chairperson and those faculty members in the department who are members of the graduate

faculty; with oversight being provided by the dean of the college, the Dean of the College of Graduate Studies, and the Vice President for Academic Affairs. Service as a graduate student's academic and/or research advisor must be reviewed and approved by the student's departmental chairperson, the dean of the college, and the Dean of the College of Graduate Studies. At the discretion of the departmental chairperson, responsibilities of an associate member may be any of those normally given to a full member of the graduate faculty, except service on the Graduate Studies Executive Committee, or serving as a doctoral-level academic or research advisor.

The chairperson of any department offering a graduate degree may act in any capacity open to a graduate faculty member and has certain administrative responsibilities pertaining to the graduate program. The chairperson will oversee the process of reviewing applications of prospective graduate students including working with faculty in the

department to develop admission criteria and an application review process; and nominating qualified faculty members for appointment to the graduate faculty. The departmental chairperson also provides direction and coordination in supporting departmental faculty members in the development of research projects and in the appropriate utilization of facilities.

**Organization and Appointment of Advisory Committee**

The advisory committee may be appointed during the student’s first term but no later than the term in which 15 credits of course work are to be completed. The student, in consultation with the departmental chairperson or academic advisor, will determine a minimum of three (3) (four [4] in the doctoral program in Education; five [5] in the doctoral programs in Engineering and Environmental Sciences) suitable graduate faculty members who are willing to serve as voting members of the committee. Members shall represent each of the areas in which the student expects to study, with two (2) members having background in the major area. Each area in which the student presents as many as six (6) credits should be represented by one (1) member. At least one (1) member of the advisory committee should have adequate background and research interests in the area in which the student has proposed a research objective.

Role	Eligibility Criteria	Responsibilities
ACADEMIC	-experienced faculty member; -demonstrated ability to effectively mentor students	-may serve as a student’s academic advisor; -shall chair or co-chair the student’s advisory committee
RESEARCH	-demonstrated significant research capability; -experienced in directing independent study;	-may hold rank in a department other than that in which the student is majoring -research capability in a discipline closely related to a discipline associated with the student’s department -may serve as a student’ academic advisor for Master’s and Specialist degrees

Changes to the advisory committee must be requested by the student and approved by the departmental chairperson, the dean of the college, and the Dean of the College of Graduate Studies. Except in unusual circumstances such as extended campus leave, change of teaching fields, or inappropriate advisement loads, a faculty member enjoys the prerogative of accepting or relinquishing an appointment on a student’s advisory committee.

Professionals who are not employed by the University may serve as a Consultant on a graduate student’s committee after approval by the regular committee members. Consultants are allowed to participate in all committee meetings, oral examinations, and theses defenses. However, they are not allowed to vote on any aspect of the graduate students’ academic program. In

some cases, it is desirable that non-university personnel become voting members of graduate committees. These individuals must have earned a doctorate or equivalent terminal degree in an appropriate discipline and completed all procedures necessary to be appointed as an Adjunct Member of the graduate faculty. Only one (1) such member can serve on an individual student’s committee, and this member may not serve as academic or research advisor.

Each member of a graduate student’s advisory committee is expected (1) to review the student’s proposed plan of study and to approve it or make recommendations to improve it; (2) to consider the student’s application for candidacy including both the proposed plan of study and the research proposal and, with other members of the committee, to approve, approve with change, or disapprove the program; (3) to review the student’s

thesis (if one is required) prior to the comprehensive examination; and (4) to assist in the conduct of an examination to insure that the student has at least a satisfactory knowledge of the subject matter covered in the program of study and that the thesis (when required) is of suitable caliber and presents a valid investigation properly completed. The minimum required majority for all actions of the advisory committee at the master’s and specialist levels is three (3) positive votes, or three-fourths of the committee members eligible to vote. At the doctoral level, four-fifths is required as the minimum for programs in Engineering and Environmental Sciences; a unanimous vote is required for the program in Exceptional Learning.

**Responsibilities of Thesis Advisor**

The chairperson of an advisory committee assists the student in the selection of a course of study and

works with the student in choosing a suitable thesis topic. The chairperson is expected to furnish appropriate assistance and encouragement when excessive difficulties arise in the investigation of the problem. At the request of the student, the chairperson schedules the comprehensive examination and is responsible for its administration and conduct, as well as the reporting of the examination results to the Dean of the College of Graduate Studies. The chairperson is responsible for assisting the student in ensuring the thesis is error-free in regards to format, grammar, spelling, punctuation, and content thereby meeting the standards of excellence expected by the advisory committee, department, and the College of Graduate Studies. Only grades of SP and NP shall be used to indicate a student's progress in thesis or dissertation credit.

### Turnitin Use Guidelines & Self-Study Materials

We are pleased that you have chosen to utilize the TurnItIn software as part of your teaching activities. This resource has been made available to the graduate school faculty and offers you an excellent mechanisms for education students about the nature of academic integrity, as well as the mechanics of proper citation of sources. Before you begin using TurnItIn, we strongly recommend that you go through a brief set of selfstudy training materials that we have assembled for you. Also, please familiarize yourself with the current policies regarding academic integrity that are listed in the student and faculty handbooks.

Student Handbook:

<https://www.tntech.edu/handbooks/ttustudenthandbook/>

Faculty Handbook:

<https://www.tntech.edu/handbooks/facultyhandbook>

If you have any questions regarding TurnItIn, please contact Information Technology Services at 931-372-6526.

Self-Study Checklist

Read the Faculty Advisory Statement

provided below and approved by the TBR Office of Legal Counsel regarding TurnItIn use by you and your students. You should also include this statement in your student syllabus if appropriate.

### Faculty Advisory Statement

The faculty and staff at TTU are committed to the lifelong learning of students and thus providing an environment for learning that fosters the highest academic conduct. To this end, TTU and its faculty reserve the right to use electronic means to detect and help prevent the inappropriate use of intellectual property. Student agrees and understands that by taking this course, his or her work may be subject to originality check through Turnitin, and student thereby grants any necessary copyright permission required to do so. Personally identifiable information (such as student name, social security number, student i.d. number, etc.) should NOT be included in the work submitted to TurnItIn. This work will be encoded and stored in the TurnItIn database where it will also be used for originality checks on other works submitted by the student or anyone else using the system. The faculty may require that the students submit their work through TurnItIn or questionable text may be submitted by the faculty for the student. The terms that apply to TTU's use of the TurnItIn service are described on the TurnItIn.com website.

- View the Instructor Quick Start Video--Demo 1. You will not need the user ID or password in order to view the video. (Approximately 7 minutes long) <http://www.turnitin.com/static/trainingsupport/instructortrainingintro.html>
- View the Originality Report Video. (Approximately 8 minutes long) <http://www.turnitin.com/static/trainingsupport/orfullmovie.html>
- Download and read the first two (2) sections of the TurnItIn Instructor Manual.
  - o Section 1: Getting Started
  - o Section 2: Plagiarism Prevention <http://www.turnitin.com/static/training.html>.

html.

Scroll down to User Manuals and select the "Instructor User Manual" link

- Faculty must inform students of links to on-line educational resources that provide information for understanding plagiarism and proper ways to cite the work of others. Two (2) such resources are available at: <http://www.turnitin.com/researchsite/ehome.html>; <http://education.indiana.edu/~frick/plagiarism/> [1]

## Graduate Assistants

### Appointment and Qualification of Graduate Assistants

There are four (4) classifications of graduate assistantships:

1. Graduate Teaching Assistant
2. Graduate Teaching Associate
3. Graduate Support Assistant
4. Graduate Research Assistant

Appointment is made by the President of the University, upon unit recommendation of the department in which the assistantship is available, provided the recommendation is appropriately endorsed by the Dean of the College and the Dean of the College of Graduate Studies. Unless other arrangements are specified, it is assumed the graduate assistant will pursue a degree objective in the department where the assistantship assignment is made. Applications for assistantships are found on the Graduate College website.

Special assistantship and fellowship awards are available for qualifying graduate students. Consideration is given on the basis of academic preparation, major area of study, and the availability of funds. Additional information may be found on the Graduate College website.

Appointment to a graduate assistantship can be made for either Full or Provisional Standing graduate students subject to approval of the individual department. The period

of appointment is normally for one (1) academic year at a stipend determined by the department in which the assistantship is available. The graduate assistant is required to maintain a minimum quality point average of 3.0, except that the student may be permitted to retain the assistantship on probation for one (1) semester should the average fall below the minimum requirement.

### **Overview of Duties of Graduate Assistants**

The three (3) pillars of higher education are teaching, research, and service, all of which are valuable to graduate students' education and training for their future careers. To pursue these opportunities of higher education, graduate students can choose from a variety of financial package options, including a combination of loans, grants, scholarships, fellowships, and fixed stipends. Assistantships are also an option for graduate student funding for higher education and are a form of graduate student employment, providing a compensation package that includes both a salary and a scholarship used for tuition and fees. The assistantship allows students to perform research, teaching or other support services for the University as part of their academic professional training and development. Assistantship students will be appointed as a Research Assistant (RA), Teaching Assistant (TA), Graduate Teaching Associate (GTA), or Graduate Support Assistant (GSA) with a maximum of 20 hours per week of assigned duties. The majority faculty advisor (or other assigned departmental faculty, in the instance of a TA, GTA, and GSA) determines the duties of the appointment. In extenuating circumstances, the student's major advisor, department chair, college dean, and the Dean of the College of Graduate Studies may approve increasing the workload of a full-time assistantship graduate student by 10 hours per week, for a total of 30 hours. This may only occur four (4) times within any one (1) academic year. Graduate students may also hold multiple concurrent assistantships,

subject to the limit of 20 hours per week. No vacation or sick benefits are applicable. Arrangements for any variation in work hours, including time off for vacation, holidays, or illness, should be made individually with the major advisor (or other assigned faculty, in the instance of a TA, GTA, and GSA). Graduate assistants receiving teaching, research, or support assignments are expected to devote sufficient hours per week as may be required to perform all duties necessary to satisfactorily complete all degree requirements. Students holding full assistantships are assigned duties which require approximately one-half the workload of a full-time faculty member.

An international graduate student, who is on an F-1 or J-1 visa, can work no more than 20 hours per week while school is in session. On-campus employment may exceed 20 hours per week during the summer for eligible international students who plan to register for the following semester if approval is granted by their major advisor, department chair, college dean, International Education, and the Dean of the College of Graduate Studies. Under federal regulations, volunteering by an international graduate student for teaching, research, or other support activity is regarded as employment that must be compensated at a fair wage.

Each academic college and/or department may have requirements in addition to the University. Graduate students are required to become knowledgeable of college and/or departmental policies concerning RAs, TAs, GTAs, and GSAs.

Teaching assistants may be given classroom teaching assignments, may work during laboratory or similar periods with undergraduate students, or may devote time to laboratory development projects determined by the departmental chairperson. Except for instruction in physical education activities, laboratory assignments, and discussion groups, graduate assistants will not be given primary responsibility for teaching a course unless they have achieved appropriate professional

and scholarly preparation. This preparation must include at least 18 semester credits of graduate study in the subject area which would be taught by the graduate assistant. Research assistants are assigned to graduate faculty members to assist with specific research projects. All graduate assistants are expected to complete their assignments in a professional manner. When a graduate assistant resigns or is terminated or withdraws from the University during a semester, remuneration for the assistantship (including tuition and fees) will be made by the student on a prorated basis.

#### **1. Graduate Teaching Assistant**

Graduate Teaching Assistants work under the direct supervision of a regular faculty member in activities such as helping to prepare lectures, teaching or conducting discussion sections or groups, assisting in conducting laboratory exercises, grading papers and keeping class records, or teaching physical education activities. In consultation with the supervisor, the Teaching Assistant works to gain teaching skills and an increased understanding of the discipline. Appointments are normally on a one-half to full-time basis. A full-time graduate assistant may be assigned to work for up to eight (8) contact hours per week. If a graduate teaching assistant works only non-contact hours, such as grading papers, keeping class records, helping to prepare class lectures, then the assistant is assigned 20 clock hours a week. If a graduate teaching assistant performs contact and non-contact work, the average number of hours of work per week assigned is based on the proportion of contact and non-contact hours.

#### **2. Graduate Teaching Associate**

Exceptionally experienced graduate students, as explained elsewhere, may be assigned primary responsibility for teaching undergraduate courses, including the assignment of final grades. The Teaching Associate usually carries one-fourth to one-half of a normal teaching load. A full-time graduate teaching associate may

be assigned to a maximum of six (6) contact hours per week in the classroom or laboratory instruction.

### **3. Graduate Support Assistant**

Graduate Support Assistants are appointed to perform various types of duties other than those related directly to teaching or research. Most commonly, these duties relate to supervisory or administrative functions of the University. Appointments are normally on a one-half to full-time basis. A full-time Graduate Support Assistant may be assigned a maximum of 20 clock hours per week in the department or unit of their employment.

### **4. Graduate Research Assistant**

Graduate research assistantships are generally financed by grant or contract funds. Persons holding such appointments pursue a work and study program like that expected under the other types of awards. A full-time Graduate Research Assistant may be assigned to 20 clock hours per week in research activities in the department or unit of their employment.

### **Eligibility and Employment Status**

A degree-seeking student must be admitted and/or enrolled in the College of Graduate Studies in full or provisional standing to be eligible for appointment as a graduate assistant.

1. A student employee who is one whose primary purpose for being at the institution is to be enrolled in an academic program of the institution. Thus, the first priority of all graduate assistants must be satisfactory progress in their scholastic programs. Collaborative efforts between graduate assistants and their supervisors should be focused on the goal of satisfactory performance in their academic program and assigned work. If, however, this is not possible for the student, the graduate assistantship must be relinquished.
2. Graduate assistants shall be classified as in-state students for purposes of fees and tuition at the institutions where they are pursuing graduate studies as graduate

students. Accordingly, in order for a graduate student to be classified as a graduate assistant, the student must have a minimum of 50% assistantship. A full-time graduate assistant is assigned to 20 clock hours per week, unless specified in other parts of the document, and receives a stipend and a waiver of out-of-state fees. A half-time assistant is assigned 10 hours of work per week and receives 50% stipend and pays 50% of in-state fees.

3. A graduate student may be offered a scholarship to cover fees and, if the student wishes to work, the student may be employed as a student worker. However, the scholarship and/or employment do not change the student's status from out-of-state to in-state for fee-paying purposes.
4. Graduate assistantships are not eligible for employee benefits. The only deduction made from a graduate assistant's pay is the withholding tax. Graduate assistants must complete a W-4 form (Employee Withholding Exemption Certificate) which is available in the Office of Human Resources Services.

### **Qualifications of Graduate Assistants**

The Southern Association of Colleges and Schools (SACSCOC) specifies that Graduate Teaching Associates who have primary responsibility for teaching a course for credit and/or assigning final grades for such a course must have earned at least 18 graduate semester hours in their teaching fields, be under the direct supervision of a faculty member, have teaching experiences in the teaching discipline, receive regular in-service training, and be regularly evaluated.

The 18-hour requirement does not apply to Graduate Teaching Assistants who are engaged in assignments such as laboratory assistance, teaching physical education activities, attending or helping prepare lectures, grading papers, keeping class records, and conducting discussion groups.

The appropriate departmental chairperson has responsibility for certifying that the 18-hour requirement is met either through coursework or by documentation that the graduate assistant meets the requirement as an exception. The appropriate notation must be placed on the Personnel Action Form (PAF) and routed through the appropriate channels.

Tennessee Technological University requires all who teach to be competent in spoken English.

Each assistant (whose competency has not already been certified) will be evaluated for oral English ability by the departmental chairperson or his/her designee prior to the start of classes. Those who have been identified as not able to communicate effectively in the English language will have their assistantship revoked or will be assigned other duties. Those who have been identified as being able to communicate effectively in the English language will be so certified by the departmental chairperson (or designee) on the Personnel Action Form.

### **GPA Requirements for Graduate Assistants**

A graduate assistant is required to maintain a minimum quality point average of 3.0 each semester. Upon the recommendation of the appropriate departmental chairperson and academic dean, the student may be permitted to retain the assistantship on probation for one (1) semester should the average fall below the minimum requirement.

### **Permissible Loads of Graduate Assistants**

In order to insure sufficient time for necessary reading and study, certain restrictions are placed on permissible credit loads that graduate assistants may carry each semester. Students who are appointed to full graduate assistantships are limited to a maximum of 12 credits each semester. Students holding half assistantships may carry 14 credits.

In the case of full assistantships, it shall be the prerogative of the

department to further restrict the credit load of a graduate assistant when the nature of the student's work or when class requirements are unusually demanding.

Since graduate assistants are expected to make normal progress toward a degree, a minimum credit load of six (6) graduate hours per semester is required. Any exception to this regulation must be approved by the Dean of Graduate Studies. Loads may vary from a minimum of six (6) hours per semester to a maximum of 12 hours depending upon individual programs and residency. A full graduate assistant who is classified as out-of-state may gain in-state residency if a semester credit load of at least six (6) semester hours is maintained. A student holding a full assistantship and registered for at least six (6) graduate hours is considered to be full-time (three [3] graduate hours for Summer Semester), except that an international master's level student will be required to earn nine (9) hours per semester during the academic year in compliance with federal laws.

A graduate assistant is classified as

an in-state resident ONLY while he/she is an assistant. Residency will be reviewed when assistantship ends.

#### **Assistantship Stipends**

All full assistantships which are supported by University funds provide tuition and fee payments in addition to a salary stipend during the period of appointment. Full stipend range varies depending on the major field of study. Doctoral students and research assistants in the Centers of Excellence may receive additional compensation.

Full assistantships which are funded from sources outside the University, such as in projects underwritten by grants and contracts, provide a salary stipend consistent with the above; tuition and fees are also paid if provided for by the source of the assistantship. If tuition and fees are not provided by the source of the assistantship, the monthly stipend may be proportionately increased when project funds are available.

#### **Other Financial Aid**

Other forms of financial aid--including loans, workshops, internships, and positions as head residents in

dormitories--may be available through the Office of Student Financial Aid. Additional information may be obtained by visiting the

Director of Student Financial Aid  
P. O. Box 5076  
RUC Room 208  
931-372-3073  
Cookeville, TN 38505  
[www.tnitech.edu/em/financialaid](http://www.tnitech.edu/em/financialaid)



# Admission to the Graduate School

## Procedures

Applications for admission to the College of Graduate Studies must be submitted at least 4 weeks prior to the anticipated date of registration. (International students must submit applications at least 6 months in advance.) Applications for readmission should be filed not later than 2 weeks before the first day of registration. All applicants for admission into the following programs must submit satisfactory official scores on the required admission test.

Each application must be supported by official transcripts of undergraduate and graduate credit from an accredited institution (for a list of accrediting agencies recognized, refer to the U.S. Department of Education website) and letters of recommendations if required by the major department from persons acquainted with the applicant's scholastic and professional accomplishments. If admission is granted pending receipt of application credentials, the student must submit the required items before the end of the first semester during which the student is enrolled. Within the limits of academic reason, either the departmental chairperson or the Director of Graduate Studies may require additional information and verification of credentials submitted in support of an application for admission.

The requirement of minimum test scores either for admission, readmission, or candidacy is determined by individual departments or divisions, subject to approval by the respective college-level committees, college dean, and the Graduate Studies Executive Committee.

All application materials become the property of the University and will not be returned to the applicant regardless of whether admission is approved or denied.

It is a Class A misdemeanor to misrepresent academic credentials. A person commits the offense of misrepresentation of academic credentials who, knowing that the statement is false and with the intent

College Test	
College of Arts & Sciences	General Test of the Graduate Record Exam (GRE)
College of Business	General Management Admission Test (GMAT) <b>or</b> General Test of the Graduate Record Exam (GRE)
College of Education (MA & EdS)	Miller Analogies Test (MAT) <b>or</b> General Test of the Graduate Record Exam (GRE) (See specific major/concentration to determine)
College of Education (PhD)	General Test of the Graduate Record Exam (GRE)
College of Engineering	General Test of the Graduate Record Exam (GRE)
School of Nursing	Successful completion of the NCLEX-RN licensing examination (to be verified by the School of Nursing)
All International Students	Test of English as a Foreign Language (TOEFL) <b>or</b> International English Language Testing System (IELTS) <b>or</b> International Language School (FLS) <b>or</b> Person Test of English (PTE) and appropriate test as required by college.

to secure employment at or admission to an institution of higher education in Tennessee, represents, orally or in writing that such person:

1. Has successfully completed the required course work for and has been awarded one (1) or more degrees or diplomas from an accredited institution of higher education;
2. Has successfully completed the required course work for and has been awarded one (1) or more degrees for diplomas from a particular institution of higher education; or
3. Has successfully completed the required course work for and has been awarded one (1) or more degrees or diplomas in a particular field or specialty from an accredited institution of higher education.

## International Students

International students having adequate preparation for graduate study may apply for admission, but applications should be filed at least six (6) months prior to the anticipated date

of enrollment. Midyear enrollment is strongly discouraged. In addition to the requirements mentioned in the paragraphs above, all students from non-English-speaking countries must submit proof of adequate training and ability in the use of English as evidenced by a satisfactory score on recognized and acceptable tests administered in the student's home country.

Normally, it is expected that an applicant will submit a score of at least 525 (71 internet-based or 197 computer-based) on the Test of English as a Foreign Language (TOEFL) or base score of 5.5 on the International English Language Testing System (IELTS) or 48 on the Pearson Test of English (PTE). A TOEFL score of at least 550--79 internet-based or 213 computer-based or a PTE score of 53 is required for Engineering, M.B.A. and Nursing. If admitted to the Graduate School such students shall have as a condition attached to their admission the requirement of the English Placement Test, prior to enrollment, at Tennessee Technological University. If the examination reveals that the student does not possess an adequate command of English, the student

COLLEGE/SCHOOL	TOEFL-Test of English as a Foreign Language			IELTS-International English Language Testing System	FLS-International Language School	PTE-Pearson Test of English
	Paper-based Test	Computer-based Test	Internet-based Test			
Arts & Sciences, Education	525	197	71	5.5	Level 8 or 9*	48
Business, Nursing, Engineering	550	213	79	5.5	Level 8	53

\* Check requirements of the specific college or department to determine level needed for admission.

will be required to enroll in noncredit remedial English courses (ESL 1010-20) and will be required to reduce the graduate course load accordingly.

Applicants must also give satisfactory proof of sufficient funds to cover all of their expenses including travel.

The Graduate School will not knowingly consider for admission any person who has entered the United States via an immigration visa issued for another university until that person has been enrolled in that university; thereafter, the usual transfer procedures would be implemented. International students who wish to transfer from another university to Tennessee Tech must submit the usual materials required for initial admission; additionally, each applicant must furnish:

1. official transcripts from the current institution;
2. a verification statement from that institution's international student advisor;
3. photocopies of Form I-20-ID (front and back), the passport, the visa, and Form I-94.

Only transfer credit from an accredited university is permitted; each student is expected to complete a full program of study at Tennessee Technological University.

In cases where the undergraduate record may furnish insufficient evidence of any applicant's potential for success in graduate study, additional qualifying examinations may be administered by the department in which the applicant proposes to study. The cost of the tests will be borne by the applicant.

If admission is approved, Form I-20 will be issued as follows: not later than June 1 for the fall term, November 1 for the spring term, and April 1 for the summer term. These dates are consistent with immigration regulations and apply to all F-1 nonimmigrant students including those transferring from other U.S. institutions and those who are already enrolled at Tennessee Tech who wish to change from one degree program to another.

International students who are deficient in either written or spoken English are required to enroll in ESL 1010-1020 and to earn a grade of at least "C" in each course; waiver of this requirement may be permitted on the basis of satisfactory scores on the English Placement Test.

**Resident Alien**

A lawful permanent resident of the United States (holder of a "green card") may be required to take the English Placement Test or other tests to determine proficiency in English and the necessity for taking courses in English.

**Resident Classification**

The residence of a dependent student is presumed to be that of his/her parents. Residence (for fee-paying purposes) is interpreted to mean where the parents are domiciled. Unless the contrary appears from clear and convincing evidence, it is presumed that an emancipated person does not acquire domicile in Tennessee while enrolled as a full-time student at any public or private institution of higher

education in the state. A student once classified as an out-of-state student will continue to be so classified unless a review of classification is requested. An emancipated individual who is working full time (30 hours per week or more) in Tennessee may register for up to seven (7) hours per term at in-state rates while establishing permanent residency.

A graduate assistant is classified as an in-state resident for fee-paying purposes only while he/she is an assistant. Residency will be reviewed when assistantship ends.

Change of residence status for tuition purposes is never automatic. A request for review must be made to the Associate Director of Graduate Studies and adequate information must be provided by the student to warrant a review of resident status. Many factors, such as full-time employment for an extended period, are taken into consideration when a student's resident status is reviewed. If the review is negative, a request for exception may be filed with the Associate Director of Graduate Studies and, then, the Graduate Studies Executive Committee.

If Tennessee residency is approved, the classification change shall be effective at the next registration after the approval has been granted.

**Admission Classifications**

Students admitted to a master's program will be placed in one (1) of the following categories:

**Full Standing**

This category indicates that in

the opinion of the appropriate department and the Associate Dean of Graduate Studies the student has an adequate background for pursuing graduate work, and that all minimum requirements for admission to graduate standing have been met. The minimum requirements for Full Standing are:

- an overall undergraduate quality point average of 2.5 upon completion of a baccalaureate degree program. The degree grade point average used for admission purposes, for those students who have transferred schools, will be the one presented on the transcript by the degree-granting institution.
- three (3) letters of recommendation for graduate study, if required by major department, from faculty members or other persons who have adequate knowledge of the applicant's professional qualities or potential for success as a graduate student.
- scores on an admission test, as described under the college and/or department. Specific tests are:
  - the Graduate Record Examination General Test for the College of Arts and Sciences, the College of Engineering, and the Ph.D. program in the College of Education;
  - the Graduate Management Admission Test for the College of Business;
  - the Miller Analogies Test or the Graduate Record Examination General Test for the Master's and Ed.S. programs for the College of Education.

### Provisional Standing

This category indicates that in the opinion of the appropriate department and the Associate Director of Graduate Studies the student does not qualify for full standing and that before Full Standing can be granted certain deficiencies must be removed prior to the completion of 15 graduate hours. Deficiencies may be either (1) insufficient undergraduate grade average or (2) insufficient background preparation for the specific field, indicating the necessity for certain prerequisite courses as preparation

for pursuing the proposed graduate program. If admitted in provisional standing due to lack of acceptable test scores, the student will not be permitted to register for more than nine (9) credit hours or beyond the first term of enrollment. The student must apply for reclassification after having satisfactorily removed all deficiencies and met any special conditions or requirements. The minimum requirements for Provisional Standing are:

- an overall quality point average of 2.25 upon completion of a baccalaureate degree program. The degree grade point average used for admission purposes, for those students who have transferred schools, will be the one presented on the transcript by the degree-granting institution.
- three (3) letters of recommendation for graduate study, if required by major department, from faculty members or other persons who have adequate knowledge of the applicant's professional qualities or potential for success as a graduate student.
- scores on an admission test as described under the college and/or department.

### Special Standing

Students who declare a nondegree graduate objective or transient students who have been admitted to graduate schools of other institutions are assigned to Special Standing. This classification enables a student to enroll for graduate credit in certain academic areas but it does not guarantee that such credit will be counted toward a degree objective. When a student in Special Standing has been reclassified to Provisional or Full Standing (at Tennessee Tech), a maximum of nine (9) semester credits earned in Special Standing may be counted toward a degree objective provided approval is given by the department in which the student wishes to major and the Associate Dean of Graduate Studies. Special Standing is reserved for graduate students and should not be confused with Special Student or Additional Bachelor's status which are explained in the undergraduate

catalog. (Students registered in "Special Student" or "Additional Bachelor's" categories are enrolled at the undergraduate level; credit earned in either of these categories cannot be counted for graduate credit.) Since students who are admitted into Special Standing are not at that time potential degree candidates, they may be denied permission to enroll in certain courses.

Admission to the College of Graduate Studies in any of the categories described above does not imply acceptance to candidacy for a graduate degree. The requirements for candidacy are explained elsewhere in this publication.

Individuals who wish to enroll in graduate level courses and who do not wish to seek graduate degrees (nondegree graduate students under the category of Special Standing), must submit an application, application fee, and proof of having earned the baccalaureate degree. Students admitted under this category of Special Standing must submit official transcripts of degree conferrals no later than the end of the first semester of enrollment, or will be denied registration in subsequent semesters.

### Change of Classification

Students who have been admitted to graduate study with Provisional Standing may, upon the approval of the departmental chairperson (or Program Director for students in the Ph.D. programs) and the Associate Vice President for Research and Graduate Studies, request and be granted Full Standing after removing any entrance deficiencies noted at the time their applications for admission were approved. Deficiencies may be removed by:

- establishing credit in the courses recommended by the departmental chairperson as necessary to remove a deficiency, or any group of courses which the departmental chairperson may approve as a suitable substitute for the listed courses; the courses used for removal of deficiencies must be passed with a grade of "C" or better and these courses will not be counted in the graduate program nor in the computation of the

graduate quality point average;

- the completion of at least nine (9) semester credits of graduate work, including six (6) semester credits in the major field, with a minimum quality point average of 3.0 for students who entered with a questionable undergraduate background; and obtaining satisfactory scores on admission tests.

In any instance, a student must apply for reclassification to Full Standing prior to the completion of 15 graduate hours. Students who have been admitted to graduate study with Special Standing are not eligible for reclassification until their graduate and undergraduate records have been evaluated by the department in which they wish to major. Credit earned while in Special Standing may not be counted toward a degree until approved by the major departments but in no case will more than nine (9) semester credits be counted.

## Special Admissions

### Admission of Faculty Members to Graduate Studies

Any faculty member may register for credit courses offered by the University. Faculty members with full-time responsibilities to the University may not register for more than six (6) credit hours per semester. No member of the faculty who holds tenure or professorial rank is eligible to become a candidate for a graduate degree; however, an instructor on temporary appointment may qualify for candidacy. Exceptions to this policy must be approved by the Graduate Studies Executive Committee; such approval will be granted only in unusual circumstances.

### Admission of Seniors to Graduate Courses

A senior who needs less than a normal semester's work to complete the requirements for the bachelor's degree, and who gives indication of being able to achieve Full Standing in the Graduate School at the conclusion of the undergraduate program, may take sufficient graduate credit (6000

level or below) to fill out a normal schedule, subject to the approval of the departmental advisor, course instructor(s), chairperson of the department(s), and the Associate Dean of Graduate Studies. If the student would not qualify for Full Standing but would qualify for Provisional Standing, he/she may take such 5000-level courses for graduate credit as may be approved by his/her departmental advisor, chairperson of the department(s), and the Associate Dean of Graduate Studies. A Tentative Graduate Advisory Committee and a program of study must be developed prior to the completion of 9 credit hours of graduate work to be counted toward degree requirements.

A senior who gives indication of being able to achieve Full Standing in the Graduate School may elect up to nine (9) hours of graduate courses (6000 level or below) for undergraduate credit upon approval of his/her departmental advisor, course instructor(s), chairperson of the department(s), and the Associate Dean of Graduate Studies. Credit earned in this manner may not later be counted as graduate credit. If the senior would not qualify for Full Standing but would qualify for Provisional Standing, he/she may elect up to nine (9) hours of 5000-level courses upon approval of his/her departmental advisor, course instructor(s), chairperson of the department(s), and the Associate Dean of Graduate Studies.

When a senior earns graduate credit, that credit falls under the Special Standing regulation that is described in a previous section of this catalog regarding "Admission Classification." Specifically, the student is cautioned to remember that not more than nine (9) semester credits earned in Special Standing can be counted for graduate degree purposes.

### Admission of Transfer Students

An applicant for admission who has begun a graduate program at another college or university may be considered for admission to the College of Graduate Studies of Tennessee Technological University on a transfer basis. Coursework transferred or accepted for credit toward a graduate degree must

represent graduate coursework relevant to the degree, with course content and level of instruction resulting in student competencies at least equivalent to those of students enrolled in the institution's own graduate degree programs. It is anticipated that such an applicant will have maintained a "B" average in prior graduate study and will be in good standing at the institutions previously attended. If transfer admission is approved, the student's credit hours and grades that are accepted for transfer will be included in this institution's GPA calculations. The number of transfer credits utilized for degree purposes is limited to nine (9) semester credits in a master's program (12 semester credits in the RODP Master of Education program) and six (6) semester credits in an Ed.S. program and is approved by the appropriate officials in the college. The number of transfer credits permitted in the doctoral programs must be determined by officials in the appropriate college. In certain instances a competency examination may be administered to validate credit.

International students who wish to transfer to Tennessee Tech from another Graduate School must submit the usual materials required for initial admission. Additionally, each applicant must furnish official transcripts from the current institution as well as a statement from that institution's international student advisor. The applicant must also submit a bank statement verifying that sufficient funds are available for the applicant's living and collegiate expenses, as well as photocopies of the passport, visa, I20-ID and I-94.

### Admission of Nondegree Graduate Students

Admission to some graduate courses is available to persons who do not seek a graduate degree. Each applicant must submit to the College of Graduate Studies an application, application fee, and proof of having earned the baccalaureate degree. Students admitted under this category of Special Standing must submit official transcripts of degree conferrals no later than the end of the first semester of enrollment, or will be denied registration in subsequent

semesters.

International students on an F1 Visa are not eligible for admission as nondegree students.

Nondegree graduate students are placed in Special Standing (see Special Standing section) and are permitted to take such undergraduate and graduate courses as are approved by individual advisors. Not all courses offered at the University are available for nondegree students. Information concerning the availability of specific courses can be obtained from individual departments. Nondegree students who later decide to seek a degree must satisfy all regular admission requirements. Not more than nine (9) semester credits earned while a nondegree graduate student may be used for degree purposes and only then when approved by the major department and the Associate Vice President for Research and Graduate Studies.

Admission as a nondegree graduate student is not the same as admission as an "additional bachelor's" student. The admission status of an additional bachelor's student is explained in the following section of this catalog.

#### **Admission as an Additional Bachelor's Student**

An additional bachelor's student is a postbaccalaureate student but is not a graduate student and should not be confused with a nondegree graduate student. An additional bachelor's student is usually working toward a second undergraduate degree or taking undergraduate or graduate courses for undergraduate credit with no degree objective in mind. Additional Bachelor's students Apply through the undergraduate admissions office and are not counted as graduate students. An additional bachelor's student should not register for a graduate course without prior consultation with the Associate Dean of Graduate Studies; graduate credit will not be granted for graduate courses taken while in the additional bachelor's status. A student who wishes to pursue a graduate degree should make application in the College of Graduate Studies Office.

#### **Admission to Class as an Auditor**

An auditor is one who enrolls in classes on a noncredit basis, is expected to attend class, but is not required to hand in assignments or to take examinations. If the instructor is not satisfied with the attendance, the instructor may assign a grade of "W." A student who audits must be admitted to the University as a regular or special student.

Admission to class as an auditor requires the consent of the instructor and the approval of the Director of Records and Registration. The applicant should secure the Audit Registration form from the Office of Records and Registration. Fees for audit courses are the same as those for credit courses.

#### **Readmission of Former Students**

A former graduate student at Tennessee Technological University who is not currently enrolled at the University must file an application for readmission. The application may be obtained here and should be filed no later than two (2) weeks before the first day of registration of the semester of anticipated enrollment.

#### **Veterans' Benefits**

Many students enroll for graduate study with financial benefits provided by the Veterans Administration. A student who anticipates receiving VA benefits should keep in mind that enrollment cannot be verified until the student files with the College of Graduate Studies an approved program of study or teacher licensure plan. Certificate of satisfactory process can be verified for no more than two (2) semesters of academic probation.

# Registration and Enrollment Requirements

## The School Year

Tennessee Technological University is organized on the semester basis. When the term hour or credit is used, it refers to a semester-hour credit. A semester hour is one (1) hour of class, recitation, or a two (2) or more hours of laboratory work, per week through one (1) semester of approximately 15 weeks. Laboratory hours per credit are determined by department or college.

The school year consists of two (2) semesters of approximately 15 weeks each, and a summer term of 10 weeks with some courses offered in two (2) five-week sessions.

The summer term is considered equivalent to other semesters at Tennessee Technological University. The student on probation in summer is subject to the regular probation stipulations, including load and requirements for removing probation.

## Graduate Courses

- 5000-5990 Graduate Level
- 6000-6990 Graduate
- 7000-7990 Advanced Graduate

(Restricted to Graduate Students)

Graduate courses are numbered at the 5000, 6000, and 7000 levels and are offered in the College of Agriculture and Human Ecology, College of Arts and Sciences, College of Business, College of Education, College of Engineering, and College of Interdisciplinary Studies. These courses are described on the following pages and are listed by departments. Numerous senior-level courses are permitted for graduate credit when offered dually as 4000 (5000) and taken at the 5000 level.

A graduate student may be permitted to register for any course which appears in the Schedule of Classes; however, only those courses taken at the 5000, 6000, and 7000 levels may be counted for graduate credit.

Courses which are dually numbered, i.e., 4000 (5000), are essentially undergraduate courses in which graduate students may earn graduate credit on the basis of required additional work defined by the instructor in the course syllabus. Graduate credit will not be given for a course numbered at the 4000 level or below. A course taken at the 4000 level may not be taken later at the 5000 level without special permission from the departmental chairperson, college dean, and the Director of Graduate Studies

Graduate courses may be taken for undergraduate credit when prior approval is obtained (see "Admission of Seniors to Graduate Courses"). When undergraduate credit is received, it will not later be converted to graduate credit. Unclassified students will not receive graduate credit for graduate courses; however, Nondegree graduate students may receive graduate credit when such has appropriate approval.

The University reserves the right to change course numbers and course descriptions after the date of publication of the catalog, or to refuse to offer the course as described when circumstances warrant such action. A Schedule of Classes is listed online each semester and available approximately one (1) month in advance of the beginning of the semester.

## Grading and Grading System

On September 1, 1951, the University adopted a 4.0 quality point scale, changing from the 3.0 scale.

### Grading System

Grades are indicated by letters.

- A--Excellent
- B--Good
- C--Satisfactory
- D--Passing
- F--Failure
- I--Incomplete
- NF--Fail, Never Attended
- X--Absent from Examination
- W--Withdrew Passing
- WF--Withdrew Failing
- S--Satisfactory
- U--Unsatisfactory
- SP--Thesis (Satisfactory Progress)
- NP--Thesis (No Progress)

(NOTE: Only grades of A, B, C, S, and SP are considered satisfactory at the graduate level, with not more than two [2] grades of C allowed for graduate degree purposes.)

### Quality Points

Quality points are assigned to each semester-hour credit as follows:

- For a grade of A, 4 quality points
- For a grade of B, 3 quality points
- For a grade of C, 2 quality points
- For a grade of D, 1 quality point
- For grades of F, I, X, NF, W, S, SP, NP, U, and WF, no quality points.

### Quality Point Average

The quality point average for the semester is determined by dividing the total quality points earned by the total semester hours attempted (excluding courses in which grades of I, W, S, SP, NP, and U were earned). The cumulative quality point average is determined by dividing the total quality points for all semesters by the cumulative hours (excluding courses in which grades of I, W, S, SP, NP, and U were earned). Noncredit courses are disregarded in computing the quality point average.

When a course is repeated, the

grade on repeated work as well as the original grade will be included in calculation of the quality point average. Credits attempted with a grade of I, W, S, NP, and SP are disregarded, but credits attempted with grades of X, WF, NF, and U are counted as F's.

### Course Repetition Policy

Each college in which graduate programs are offered may permit courses to be repeated, provided the cumulative repeat credit does not exceed nine (9) semester hours. If the repetition is for courses taken for graduate credit either before or after admission to the Graduate School at Tennessee Technological University, the grade on repeated work as well as the original grade will be included in calculation of the quality point average and in hours attempted. Credit used to satisfy the requirements of one (1) degree cannot be used to satisfy the requirements of another degree.

A nursing course may be repeated ONE (1) time, and no more than TWO (2) nursing courses may be repeated.

### Grade of I (Incomplete)

An "I" is assigned when a student's performance has been satisfactory, but for reasons beyond the student's control, he/she has not been able to complete course requirements within the allotted time as determined by the instructor. Students are not required to register for the course again but must complete the original course requirements with the instructor. With approval of the instructor, a student has one (1) calendar year or until the time of graduation, whichever comes first, to remove the "I" during which time the "I" is excluded from calculation of the student's QPA. If the "I" is not removed within the above time limits, it remains on the student's record permanently and is calculated as "F" in the student's QPA. If the "I" is not in a required course, the student may be permitted to graduate if permission is granted by the advisor. In such cases, the "I" is computed as an "F" and the cumulative QPA must be at least 3.0. In extenuating circumstances, such as ill health, a student may request an exception to the one-year policy to the Graduate Studies Executive Committee, and must provide detailed and documented evidence of the

circumstance that necessitated the delay in removing the "I" grade. The request must be approved by the instructor, advisor, departmental chair, and the dean of the college/school, in that order. The student's advisor or departmental chair must be present when the Graduate Studies Executive Committee deliberates the request.

In order to remove an outstanding incomplete (I) grade for those students graduating, the instructor must submit the grade change to the Office of Records and Registration by the Friday before exam week each term.

## Quality of Work

### Required QPA

A graduate student is required to maintain a cumulative grade average of at least B (3.0) on all courses taken for degree purposes. Credit toward a degree objective will be granted for any graduate course in which a grade of A, B, C, S, or SP (for thesis or dissertation) is assigned; however, not more than six (6) hours of C credit will be accepted. If a grade of D, U, F, WF, or NF is assigned in a degree-related course, the course must be repeated; and both the original grade and the grade for the repetition will be counted in the cumulative average.

### M.B.A. Requirements

An MBA student is required to maintain a cumulative grade average of at least B (3.0) on all courses taken for degree purposes. Not more than six (6) hours of credit below a B grade will be allowed. If a grade of C is assigned in an MBA degree-related course, the course must be repeated, and both the original grade and the grade for repeat will be counted in the cumulative average. An MBA course may be repeated only one (1) time and no more than two (2) MBA degree courses may be repeated. In addition, any student receiving a D or an F in an MBA degree course shall be dismissed from the program.

### Nursing Requirements

Required GPA: A graduate nursing student is required to maintain a cumulative grade average of at least B (3.0) on all courses taken for degree purposes. Credit toward a degree

objective will be granted for any graduate course in which a grade of A, B, or S is assigned; however, not more than six (6) hours of credit below a B grade will be allowed. If a grade of D, U, F, WF, or NF is assigned in a nursing degree-related course, the course must be repeated; and both the original grade and the grade for the repeat will be counted in the cumulative average. A nursing course may be repeated only one (1) time and no more than two (2) nursing courses may be repeated.

### Background Courses

Additionally, a graduate student must achieve a grade of at least C on each course taken for nondegree purposes, that is, courses taken for background preparation, certification, or personal enrichment. A student will be required to repeat each nondegree course in which a grade of D, U, F, WF, or NF is assigned except that, with approval of the student's advisory committee, repetition of a course will not be required if a student's cumulative grade average on all courses (degree and nondegree) is at least B (3.0).

### Graduate Assistant GPA Requirements

A graduate assistant is required to maintain a minimum quality point average of 3.0 each semester. Upon the recommendation of the appropriate departmental chairperson and academic dean, the student may be permitted to retain the assistantship on probation for one (1) semester should the average fall below the minimum requirement.

### Probation for Unsatisfactory Performance

A graduate student is required to maintain a cumulative grade point average of at least "B" on all graduate courses taken as a graduate student. When a student's cumulative average on courses falls below 3.0, but not less than 2.00, the student will be placed on probation. If the cumulative average falls below 2.00, the student will be dismissed.

If the term average, on all courses presented as part of the hours required for graduation, during any semester

is less than 2.00, the student's record will be reviewed and may be placed on probation.

#### Dismissal for Unsatisfactory Performance:

A graduate student will be dismissed from the graduate program if any one (1) of the following conditions occurs:

- a. Two (2) consecutive semesters of probation and recommendation by the student's advisory committee. Summer semester is not included as one of the consecutive semesters if no courses are taken during this term in which a grade of "A" through "F" is assigned.
- b. Two (2) "F" grades in courses presented as part of the hours required for graduation
- c. Two (2) consecutive semesters of "No Progress" grades assigned in thesis or dissertation courses and recommendation by the student's advisory committee.
- d. "D" or "F" in a 6000-level course (MBA students only)
- e. Grade less than "B" in the repetition of a Nursing course as the course may be repeated only once (Nursing students only)
- f. Two (2) "C" grades in the Ph.D. in Exceptional Learning program.
- g. One (1) "F" in a course in the Ph.D. in Exceptional Learning program.

A student who has been dismissed for unsatisfactory performance may request reinstatement, provided he/she produces evidence of extenuating circumstances that would prevent dismissal. The request must be approved by the department chair, director of the student's graduate program, the dean of the college, and the Graduate Studies Executive Committee. The decision of the Graduate Studies Executive Committee is final.

### Change of Major

A student is admitted into a degree program only upon a declaration of a major area of study. This major area can be changed if the department of the original major releases the student, if the department of the new major is willing to accept the student, and if the change of major is approved by the Director of Graduate Studies. A student who wishes to change the major should obtain appropriate forms from the Graduate Studies website at [www.tntech.edu/graduate-studies/forms](http://www.tntech.edu/graduate-studies/forms).

### Graduate Academic Fresh Start

Graduate Academic Fresh Start is a plan of academic forgiveness provided for graduate students who have gained maturity in learning through extended experience outside higher education institutions. The Academic Fresh Start allows the calculation of the quality point average and credit hours toward graduation to be based only on work done after returning to college.

The terms of Fresh Start are:

1. Once the student has satisfied the described requirements below, the institution may grant the Academic Fresh Start. The student may be granted Academic Fresh Start only once.
2. The student's permanent record will remain a record of all work; however, the student will forfeit the use for degree or certification purposes all college or university degree credit earned.
3. The student must change graduate program, not just concentration.
4. The student must provide written justification for the request.
5. The student must submit a change of major and any required admission documents for the new program.
6. The student's file will be evaluated by the new program.
7. The approval is contingent upon acceptance by the department, academic dean, and the Office of Research and Graduate Studies.
8. The student must maintain at least a 3.0 GPA in all courses and must adhere to all policies and procedures indicated in the Graduate Catalog.
9. All previous attempted courses taken as a graduate student will be marked as Fresh Start. None of these courses, including transfer credit, will be used in the calculation of the GPA or for completion of another degree.
10. Prior courses cannot be used to satisfy requirements for the new program.

### Permissible Loads

Nine (9) credit hours per semester constitute a minimum full load for a graduate student. During the Summer Semester, six (6) hours is considered full-time for a graduate student. The maximum permissible load is 16 hours of credit during the Fall, Spring, and Summer semesters for students not on a graduate assistantship. These are inclusive totals of credits earned at all institutions. An overload of graduate credit is not permitted in these semesters. Students who are serving as graduate assistants are limited to course loads appropriate to the extent of their service. A fulltime assistant may not exceed 12 hours of credit per semester. In extenuating circumstances, a full-time assistant may take up to 14 hours per semester if approval is granted by the major advisor, the departmental chairperson, and the Dean of Graduate Studies.

An international student must be a full-time student at Tennessee Technological University August through May. Each semester except summer, an international student must earn a minimum of nine (9) credit hours if a Master's candidate and six (6) credit hours if a Ph.D. candidate.

### Permissible Loads of Graduate Assistants

In order to insure sufficient time for necessary reading and study, certain restrictions are placed on permissible credit loads that graduate assistants may carry each semester.

Students who are appointed to full graduate assistantships are limited to a maximum of 12 credits each semester. Students holding half assistantships may carry 14 credits.

In the case of full assistantships, it shall be the prerogative of the department to further restrict the credit load of a graduate assistant when the nature of the student's work or when class requirements are unusually demanding.

Since graduate assistants are expected to make normal progress toward a degree, a minimum credit load of six (6) graduate hours per semester is required. Any exception to this regulation must be approved by the Associate Vice President for Research and Graduate Studies. Loads may vary from a minimum of six (6) hours per semester to a maximum of 12 hours depending upon individual programs and residency. A full graduate assistant who is classified as out-of-state may gain in-state residency if a semester credit load of at least six (6) semester hours is maintained. A student holding a full assistantship and registered for at least six (6) graduate hours is considered to be full-time (three [3] graduate hours for Summer Semester), except that an international master's level student will be required to earn nine (9) hours per semester during the academic year in compliance with federal laws.

A graduate assistant is classified as an in-state resident ONLY while he/she is an assistant. Residency will be reviewed when assistantship ends.

## General Degree Requirements

### Time Limits on Completion of Requirements

A graduate student in a master's or specialist program must complete all degree requirements within a period of six (6) consecutive years and in a doctoral program within a period of eight (8) consecutive years. Time limits shall be computed from and including the first term in which credit applied to the degree is earned. When coursework taken at Tennessee Technological University has expired according to the established time limits for completing a graduate program, the academic unit may allow the student to validate that coursework by examination. See Course Validation section.

If a masters degree student has not graduated by the end of his/her initial 18 semesters (24 semesters for a doctoral student) and has not been granted special approval to continue to take graduate courses and satisfy

requirements within the most recent 18 semesters (or 24 semesters for a doctoral student), the student's status will change to nondegree graduate student and all regulations pertaining to nondegree graduate students will apply. When the change to nondegree status occurs, the student's graduate committee will be considered to be dissolved and the special responsibilities of the faculty member who chaired the committee are terminated. Nondegree students will not be eligible to register for thesis/dissertation credit.

If the student subsequently reapplies and is admitted as a degree-seeking master's or doctoral student, the time limit for completion will be computed in the same way as for others, with the period beginning with the first term in which credit applied to the degree is earned. At readmission, the student's committee is not reinstated; instead, the procedures for forming a committee are to be followed.

All requirements for the degree must be completed in six (6) years, or eight (8) years in programs that require 36 hours or more. Courses older than these limits will not be allowed as credit toward the degree. A student requesting an extension to complete a degree must make such request in writing to GSEC through the advisory committee, chair and dean. The student must provide justification for the request and specifically state what action is requested. A standing subcommittee of GSEC has been formed to review such requests and consists of one faculty member from each college that has a graduate program and one student representative. The subcommittee will review the request and make a recommendation at the next GSEC meeting if the action should be approved, denied, or modified. GSEC will vote on the recommendation, and the student will be notified of the decision. The student may be required to validate expired courses.

Grades earned in courses that are older than program time limits will be shown on the transcript but will not be included in the computation of the GPA for graduation purposes.

## Course Validation

The University sets time limits on students to ensure that they have reasonably current knowledge in those courses that comprise the graduate program and for which a graduate degree is awarded. When coursework taken at Tennessee Technological University has expired according to the established time limits for completing a graduate program, the academic unit may allow the student to validate that coursework by examination, subject to the following regulations. The necessary form is available here.

- Only students fully admitted to and enrolled in graduate programs and who are in good standing are eligible.
- The grade on the original course must be an "A" or "B."
- Not more than 12 hours of the total credits in a master's program may be validated. Not more than one-third of the total credits in a doctoral program may be validated.
- Only courses with fixed content are eligible for validation. (Independent study, research, and workshops are ineligible.)
- Only courses comparable to those still being taught are eligible for validation.

## Advisory Committee

A graduate student is required to have an advisory committee and is responsible for its formation and maintenance. There will be a hold placed on any student's registration if an official request for appointment of an advisory committee has not been filed in the Graduate College Office by the time 15 semester hours have been earned. If changes in membership of the student's advisory committee are desired or required, the student is responsible for submitting a request for such changes. The request, which must include an explanation of the proposed changes, consists

of a memorandum from the student to the Associate Dean of Graduate Studies, via the departmental chairperson and the dean of the college. The signatures of faculty leaving or being added to the committee are required to be on the memorandum, as well as the signature of the chairperson of the committee, even if this is not changing. Unless an exception has been granted by the departmental chairperson, the dean of the college, and the Associate Dean of Graduate Studies, a graduate student who has earned at least 15 semester hours of course credit who does not have an appropriate advisory committee will not be permitted to register. After 15 semester hours have been earned, failure to be able to form or to maintain an appropriate committee is cause for transfer of the student to nondegree status. After the transfer occurs, all regulations pertaining to nondegree graduate students will apply, the remainder of the student's advisory committee (if such exists) is considered to be completely dissolved, and the special responsibilities of the faculty member who chaired the committee are terminated. Nondegree students are not eligible to register for thesis or dissertation credit.

For a student transferred to nondegree status (as above) who subsequently submits an application for readmission to the degree program in which previously enrolled, such application must include a request for appointment of a committee signed by all proposed committee members, the departmental chairperson and the dean of the college. Such application for readmission will not be evaluated until an appropriate request for appointment of a committee has been submitted. For a student transferred to nondegree status who subsequently applies to a degree program different than that in which previously enrolled, the usual timing for forming a committee applies.

A faculty member may not direct independent study/research courses taken by a student who is a relative of the faculty member and may not be a member of a relative's graduate advisory committee. For the purposes of this policy, "relative" means a parent, foster parent, parent-in-law, child, spouse, brother, foster brother, sister, foster sister, grandparent, grandchild, son-in-law, brother-in-law, daughter-

in-law, sister-in-law, or other family member who resides in the same household.

Further regulations concerning membership, appointment, and responsibilities of an advisory committee are given in other sections of the catalog, including the section on "Organization of the Graduate School."

## Program of Study

A graduate student is required to file a program of study with the College of Graduate Studies by the time 15 semester hours are earned. If the 15-hour deadline is not met, a hold will be put on the student's registration until it is met. If changes in an approved program of study are required or desired, a substitution form should be filed by the student with the College of Graduate Studies. Further regulations concerning programs of study are given in other sections of the catalog.

## Comprehensive Examination

At or near the completion of the course requirements for the graduate degree, each candidate must pass a comprehensive examination conducted by the candidate's graduate advisory committee. The examination may be oral or written or both. In the examination the student should demonstrate the breadth of knowledge in the discipline, depth in specific areas, and the ability to integrate what has been learned. The case study accumulation in BMGT 6950 serves as the comprehensive examination for MBA candidates. The professional project in PRST 6998 serves as the comprehensive examination for MPS candidates. The scholarly synthesis in NURS 6990 serves as the comprehensive exam for MSN candidates.

## Thesis/Dissertation Defense

Serving as a comprehensive examination for students pursuing a thesis track master's or doctorate, a formal defense of the thesis or dissertation is required.

Scheduling of the defense is the candidate's responsibility. The defense

will be attended by the candidate's advisory committee and other designees as the individual degree defines.

## Master's Degree General Requirements

### Programs of Study

Programs of study toward advanced degrees are less formal than for undergraduate degrees. Individual programs are planned for each student on the basis of educational background and career objective. Graduate degrees are not only awarded on the basis of completion of specific courses, but also on the basis of evidence of proficiency, scholarship, reasoning and investigation, and high attainments in the field of the student's specialization.

Although the minimum number of credits required in any degree program is determined in accordance with the formalized program approved for each student, a candidate for the master's degree must complete at least 30 semester hours of credit. At least 70% of the credit to be counted toward a master's degree must be at the 6000 level or above. In addition to the minimum course credits required for the advanced degree, other courses may be required as prerequisites depending upon the student's educational background, preparation, and objectives; however, credit earned below the 5000 level will not be counted toward a graduate degree. Courses listed as 4000 (5000) may be taken only at the 5000 level for graduate credit, and graduate credit is earned on the basis of additional work required by the instructor. Courses taken at the 4000 level may not later be taken at the 5000 level without special permission from the departmental chairperson, dean of the college, and the Associate Dean of Graduate Studies. Credit earned for one (1) degree program cannot be used in another degree program.

Non-thesis options may be permitted by departments when approved by the Graduate Studies Executive Committee. Any non-thesis program

which is considered for approval by the GSEC must demonstrate that it fosters independent learning.

A student desiring to pursue study for the master's degree in a field which may be different from the field of his undergraduate degree, and in which the necessary prerequisites are lacking, may do so by including in the program of study (as background courses) all the necessary undergraduate prerequisites for the area of specialization in addition to the required number of hours for the degree.

Each proposed program of study must be approved by the student's advisory committee, the departmental chairperson, the college dean or program director, and the Associate Dean of Graduate Studies.

There will be a hold placed on each student's registration if the program of study has not been filed in the College of Graduate Studies by the semester in which 15 semester hours will be earned.

### Admission to Candidacy

Graduate students in a program leading to the master's degree, except those in Special Standing, should make application for admission to candidacy immediately following the completion of nine (9) semester hours of graduate credit. If application is not made by the time 15 hours are completed, the student may not be permitted to register for subsequent work until the application is approved. The requirements which must be met before approval of admission to candidacy are:

1. the achievement of Full Standing.
2. the completion of at least nine (9) semester hours of graduate

credit with a minimum quality point average of 3.0.

3. the written approval by the student's advisory committee.
4. the written approval of the chairperson of the major department.
5. successful completion of any examination which may be required by the student's department.

If the student's application for admission to candidacy is not approved due to academic deficiencies, the student cannot continue graduate study with a major in any of the departments of the college in which he/she is studying.

### Credit Requirements

A candidate for the master's degree must normally complete at least 30 semester hours of credit in a program requiring a thesis and at least 33 semester hours in a non-thesis program. Individual programs may vary. For the number of degree credit hours required, refer to the detailed program information outlined by major and concentration in the College and Departments section of the catalog.

At least 21 semester credits including the thesis shall be required at the 6000 level in a 30-hour program for the master's degree; at least 23 semester credits at the 6000 level shall be required in a 33-hour master's program. The remainder of the courses in the program of study may be at the 5000 level; however, not more than 30% of the courses in a student's program of study may be in dually numbered 4000 (5000) courses. Courses below the 5000 level will not be counted toward a graduate degree; and, although they may appear on the written program as background

requirements, these courses are not figured into degree requirements.

## Requirements for a Major

A student's program of study must reflect a reasonable concentration in related or interrelated courses. A department may require that all of the courses in a student's program be taken in that department; or it may require that a major portion be taken in that department and allow for one or more minor areas of collateral study in other departments.

## Transfer and Other Credit

A maximum of nine (9) semester hours of graduate credit in acceptable areas of study may be transferred from other accredited institutions to a master's program (except in the Master of Education in Advanced Studies in Teaching and Learning which shall have a maximum of 12 hours of graduate credit transferred into that program). For a list of accrediting agencies recognized, refer to the U.S. Department of Education website.

Credit by special examination is not permitted at the graduate level; however, special examinations to determine competency or proficiency in courses where credit has already been earned but is currently out-of-date may be permitted during a period of up to three (3) consecutive semesters immediately following the six-year time limitation. Special examinations may also be permitted to validate transfer credit, but the credit must be originally earned as graduate credit and not undergraduate credit.

Graduate credit will not be given for correspondence courses.

## Thesis

When a thesis is required in a student's program of study, no more than six (6) semester hours credit of 6990 will be counted towards the degree. Thesis (and dissertation) credit is made available in increments of 3, 6, or 9 semester hours during any given semester (and in some departments as one (1) hour credit). A graduate student

shall be required to be registered for at least one (1) course appropriate to the student's degree objective in order to have access to computer equipment, laboratories, library, and other university facilities and resources even if the student is working in absentia on research and thesis. A graduate student shall be enrolled during the term in which the degree is awarded. When a student makes satisfactory progress in research and thesis, a grade of SP (Satisfactory Progress) will be assigned for credit earned. When satisfactory progress is not achieved, a grade of NP (No Progress) will be assigned; however, a grade of NP shall not be counted as having satisfied either program or degree requirements, and the student must register again for additional thesis (or dissertation) credit. Only grades of SP and NP shall be used to indicate a student's progress in thesis or dissertation credit.

The Graduate School has published the *Guide to the Preparation of Theses and Dissertations* which serves as the official guide for all theses or dissertations. Also provided is a "Thesis/Dissertation Checklist" which outlines formatting requirements.

Although examples in this manual are recommended for making footnotes, endnotes, and giving bibliographical references, each department is encouraged to use those systems of citations that are most commonly used in its own discipline or profession. Any other departure from this manual must have the prior approval of the Associate Dean of Graduate Studies. The manual may be accessed online.

A student must submit the final error-free copy of his/her thesis or dissertation electronically (through eTD ProQuest) to the Graduate School at least two (2) weeks prior to the close of the semester in which the degree is to be conferred (or at an earlier date if such is specified in the University calendar). Please see the College of Graduate Studies website regarding requirements for electronic submission. Any thesis/dissertation that does meet the required standards will be returned to the student who will have one (1) week maximum to make corrections and resubmit. Failure

to do so will result in ineligibility for graduation. All theses/dissertations that meet the required standards will be forwarded on for publication and the students will be eligible for graduation.

If bound thesis/dissertation copies are desired, the copies shall be submitted unbound in separate containers to Graduate Studies. The title page of the thesis/dissertation shall carry the date (month and year) of the actual conferral of the degree. Also, check the website for a current listing of bindery fees.

The graduate student is expected to consult frequently with the major advisor during thesis preparation. At the time the final rough draft has been completed, the thesis should be in electronic form. The only revisions to be made should be those suggested by the advisory committee. The student should allow ample time for the committee to study the thesis.

Students in the College of Education who are permitted to write a research report in partial fulfillment of the research requirement should rely upon their major professors for specific instructions.

## Non-thesis

Non-thesis options may be permitted by departments when authorized by the Graduate Studies Executive Committee. Any non-thesis program that comes before the Graduate Studies Executive Committee for consideration for approval must foster independent learning. Non-thesis options are available in all master's degree majors with the exception of Biology, Chemistry, and Chemical Engineering.

## Second Master's Degree

A student holding an earned master's degree from an accredited institution may qualify for a second master's degree by completion of a minimum of 21 semester hours of graduate work approved by the student's advisory committee, except that:

- if a thesis is not required for the second master's degree, the minimum requirement shall

be increased to 24 semester hours;

- all requirements prescribed in the specified curriculum must be satisfied;
- if the student has not previously earned a graduate degree at Tennessee Tech, a minimum of 24 semester hours taken at Tennessee Tech must be completed (27 if non-thesis);
- a student who has earned a master's degree from an institution not approved by an agency member of the Council on Postsecondary Accreditation (COPA) shall be required to complete a minimum of 30 semester hours at Tennessee

Tech to satisfy requirements for the second master's degree;

- credit used to satisfy the requirements of one (1) degree cannot be used to satisfy the requirements of another degree.

## Specialist in Education Degree General Requirements

### Program of Study

The program of study leading to the Specialist in Education degree (Ed.S.) will be designed for each student so as to achieve proper balance between the experiences required for training as a specialist and those required for development as a professional educator working with other educators. The program will therefore be tailored to serve the needs and objectives of the individual student.

If a student lacks not more than 12 semester credits on the master's degree, the student may accumulate a maximum of nine (9) semester credits to be counted toward the Ed. S. degree provided the student (i) has been approved for tentative Ed.S. admission by the Graduate School, (ii) has a departmentally approved program of study, and (iii) fulfills all requirements for the master's degree within two (2) consecutive semesters.

The specialist program is a terminal program. Courses offered to satisfy program requirements do not necessarily lead to or prepare the student for further advanced degrees.

A minimum of 30 semester hours beyond the master's degree, in approved upper-level courses, will be required in the Ed.S. program. At least 15 semester hours must be taken in courses numbered at the 7000 level; no course below the 6000 level shall be counted for credit unless written approval is obtained from the student's advisory committee, the chairperson of the department in which the student is majoring, and the Dean of Graduate Studies.

Students pursuing work leading to the Ed.S. degree will complete a common core of nine (9) hours which shall include the following:

- CUED 6010-Curriculum Development and Evaluation<sup>1</sup>, Cr. 3  
EDPY 7200-Advanced Educational Psychology<sup>2</sup>, Cr. 3

FOED 7020-Philosophy and Public Policy<sup>3</sup>, Cr. 3

<sup>1</sup>CUED 6020 not required of Ed.S. programs in the major of Reading and by the Department of Counseling and Psychology.

<sup>2</sup>EDPY 7200 not required of Ed.S. programs in Instructional Leadership and the majors of Reading and Curriculum and by the Department of Counseling and Psychology.

<sup>3</sup>FOED 7020 no required of Ed.S. programs in Instructional Leadership, the majors of Reading and Curriculum, and by the Department of Counseling and Psychology.

Although a thesis is not required in the specialist program, the student is expected to become well acquainted with research in the field of specialization and to demonstrate competence in research methodology. In order to satisfy these expectations, the student must earn at least three (3) semester hours in courses of a laboratory and/or field experience nature and three (3) semester hours in an independent study project.

### Admission to Candidacy

Admission to candidacy for the Ed.S. degree requires that the student complete successfully a comprehensive written examination administered by the advisory committee. The examination shall be administered after the completion of 15 semester hours of the program. In addition to a written examination, an oral examination may be required at the discretion of the student's advisory committee.

Students in the counseling program within the Department of Counseling and Psychology will take the national Counselor Preparation Comprehensive Examination (CPCE) during their first semester of study. This examination will be diagnostic in nature and must be passed to graduate from a counseling Ed.S. program.

Final clearance for candidacy will be achieved only upon recommendation by the department in which the student is majoring, subject to approval of the Dean of Graduate Studies.

Prior to admission to candidacy the student may be required to remove certain deficiencies resulting from insufficient background preparation for the specific field or from the absence of certain prerequisite courses essential in preparation for pursuing the proposed specialist program. The candidacy step should not be confused with the final comprehensive examination which is required of all degree candidates and which has been explained previously in the general regulations section of this catalog.

### Transfer and Other Credit

Each candidate for the Ed.S. degree must complete a minimum of 24 semester hours credit at Tennessee Technological University.

A maximum of six (6) semester hours of transferred work with a minimum grade of "B" in each course may be included in the student's program of study. Such work must have been completed at an accredited institution which offers the Specialist's and/or Doctor's Degree (for a list of accrediting agencies recognized, refer to the U.S. Department of Education website). Credit earned through correspondence or extension courses will not be accepted toward the Ed.S. Degree.

Credit by special examination is not permitted at the graduate level; however, special examinations to determine competency or proficiency in courses where credit has already been earned but is currently out-of-date may be permitted during a period of up to three (3) consecutive semesters immediately following the six-year time limitation. Special examinations may also be permitted to validate transfer credit, but the credit must be originally earned as graduate credit and not undergraduate credit.

### Other Regulations

In addition to these specific requirements for the Specialist in Education Degree, all candidates will be expected to comply with general regulations of the College of Graduate Studies. (See Regulations and Degree Requirements in previous sections of this catalog.)

## Doctor of Philosophy Degree General Requirements

See doctoral degree granting departments (Engineering, Environmental Science (Biology and Chemistry), and Education (Exceptional Learning)) for Ph.D. degree requirements.



# Graduation

## Application for Graduation

In addition to satisfying all degree requirements, a candidate for a degree must file an Application for Graduation at the beginning of the semester in which the degree is expected to be conferred. The deadline for the filing of the application is the second Friday after classes begin. A graduate student shall be enrolled for a course approved by the graduate advisor during the term in which the degree is awarded unless all requirements have been completed by the last day to register for the term.

If a student applies for graduation but fails to satisfy graduation requirements, the student must reapply; this must be done by the date appearing in the online calendar. The candidate is expected to be present at the Commencement Exercise for the conferral of the degree unless written authorization to graduate in absentia is granted.

All forms and memorandums required for graduation must be filed in the Graduate School Office no later than one (1) week prior to commencement, with the exception of the defense form and comprehensive exam form which are due three (3) weeks prior to commencement. Transcripts from other universities used as transfer credit on a program of study must be received no later than two (2) weeks after the commencement date.

The advisory committee approved copy of the thesis/dissertation must be submitted through the eTD Administrator (ProQuest) for format review no later than two (2) weeks prior to commencement. It is advisable that the student make an appointment with a Graduate School staff member for format review consultation prior to the deadline. The final copy for publication through ProQuest must be submitted via the eTD Administrator one (1) week prior to commencement.

## Commencement

Rehearsal for the commencement ceremony is on the Thursday before the Saturday ceremony date. The

College of Graduate Studies will email specific details to the graduating student. The candidate is expected to be present at the commencement ceremony for the conferral of the degree, in the term in which it is conferred, unless written authorization to graduate in absentia is granted.

There will not be a commencement ceremony for those graduating in August. Students who wish to participate will be allowed to return to the University for the December commencement ceremony. Exceptions may be made to this policy under monumental circumstances and require that a Request for Exception to University Requirement form be filed by the student. The completed form must be signed by the student's department chair, dean, and the Dean of Graduate Studies before a final ruling is made by the Committee on Commencements, Convocations, and Academic Ceremonies. Students may participate in only one (1) commencement ceremony for each degree earned at Tennessee Tech University.

## Absentia Graduation

Graduate students who have been approved to graduate in absentia may have their diplomas mailed to them or they may be picked up in the College of Graduate Studies after the actual conferral of the degrees; however, the University cannot accept responsibility for incorrect addresses, faulty postal service, or diplomas damaged en route. Any student who fails to pay all indebtedness to the University may not be issued a diploma or a transcript.

## College of Agriculture and Human Ecology

### Lizabeth Self-Mullins, Dean

#### School of Agriculture

**Thomas Dwight Riley, Interim**

##### Director

Graduate Faculty:

Douglas L. Airhart

C. Pat Bagley

James Baier

Michael Best

David Frazier

B. Bruce Green

G. Kim Stearman

#### School of Human Ecology

**Melinda Anderson, Director**

Graduate Faculty:

Melinda Anderson

C. Sue Bailey

Jeff Plant

Melinda Swafford

No graduate degrees are offered in the College of Agriculture and Human Ecology, but courses may be used (with advisory committee approval) as

electives in other fields of study.

### School of Agriculture

Although a graduate degree is not available in the School of Agriculture, certain senior-level courses have been so designed as to generate graduate credit and these courses are dually listed as 4000 (5000). A student must register for the 5000-level course in order to get graduate credit and additional assignments will be required. Students are warned that graduate credit will not be given for a 4000-level registration.

### School of Human Ecology

A graduate degree is not available in the School of Human Ecology, certain senior-level courses have been so designed as to generate graduate credit and these courses are dually listed as 4000 (5000). A student must register for the 5000-level course in order to get graduate credit and additional assignments

## College of Arts and Sciences

### Paul Semmes, Dean

### Kurt Eisen, Associate Dean

#### Departments in the College of Arts and Sciences

Department of Art

Department of Biology

Department of Chemistry

Department of Earth Sciences

Department of English

Department of Foreign Languages

Department of History

Department of Mathematics

Department of Physics

Department of Sociology and Political  
Science

#### Degrees available in the College of Arts and Sciences

Master of Science, Biology

Master of Science, Chemistry

Master of Arts, English

Master of Science, Mathematics

The College of Arts and Sciences offers the Master of Arts degree in English, the Master of Science degree in biology, chemistry, computer science, and mathematics. Students who have adequate academic qualifications may obtain graduate minors or pursue collateral study in such areas as geology, certain foreign languages, history, journalism, and sociology.

Specializations exist in each of the major areas of study, with course selection made according to a student's undergraduate background and proposed graduate research.

The program of study for a master's degree normally requires the completion of a minimum of 30 semester hours of graduate credit, including the research and writing of a thesis; however, prerequisite courses or collateral study may expand program requirements.

Graduate assistantships are available in each of the departments offering graduate degrees. Specific information concerning assistantships and degree requirements for the master's degrees may be obtained from the respective departments.

The Departments of Earth Sciences, Foreign Languages, History, Physics and Sociology and Political Science do not offer graduate degrees but do offer courses which may be used (with advisory committee approval) as electives in other fields of study.

## Department of Art

No degree is offered in Art but courses may be used (with advisory committee approval) as electives in other fields of study.

**Department of Art**  
**Ward Doubet, Chairperson**  
 Graduate Faculty:  
 Carol Ventura

## Department of Biology

The purpose of the Master of Science degree program in the Department of Biology is to prepare graduates for high-level careers in various areas of biology. The department offers the M.S. degree with the option of selecting from a variety of thesis research topics based on individual research interests of the faculty.

### Departmental Admission Requirements for the M.S. Degree

Guidelines for full admission into the program include a minimum overall undergraduate grade-point average of 3.0 (on a 4-point scale) and a minimum combined score of 1500 on the verbal, quantitative, and analytical writing (converted score\*) portions of the Graduate Record Examination.

\*Converted score=(Analytical writing score/6) x 800.

Applicants should be aware that meeting these minimum requirements does not guarantee admission to the program, since:

1. The Department may not be able to financially support the research of the student, regardless of whether or not a student receives a stipend in the form of teaching or research assistantship. Additional resources must be provided to Biology graduate students in order to conduct their thesis research. The cost to conduct graduate research in the Department of Biology varies widely between and within disciplines and is affected by factors such as:
  - a. whether the study will be conducted in a laboratory or the field (or both);
  - b. whether or not specialized equipment is required;
  - c. the amount of travel that may be necessary;
  - d. wages of full-time or part-time assistants
2. The Department may have more students than the faculty can reasonably guide. Prospective Biology graduate students should contact a potential faculty advisor in their research area prior to applying for admission. A student will not be admitted without being accepted by a faculty advisor. The advisor will serve as the student's thesis advisor during the student's pursuit of the graduate degree. Acceptance of a student by the faculty advisor is dependent upon:
  - a. similarity of research interests;
  - b. experience;
  - c. recommendations;
  - d. admission standards;
  - e. number of graduate students that the faculty member is currently advising;
  - f. available funding for research.

Although the Department of Biology has no strict deadlines for application, complete applications for students being considered for teaching assistantships should be received no later than November 1 for enrollment the following Spring Semester, and February 15 for enrollment the following Fall Semester. Applicants being considered for research assistantships will be evaluated as extramural funding becomes available.

For more detailed requirements and thesis research options, contact the department chair.

**Department of Biology**  
**Robert Kissell, Chairperson**  
 Graduate Faculty:  
 S. K. Ballal  
 David L. Beck  
 Sharon G. Berk  
 Phillip W. Bettoli  
 Christopher A. Brown  
 Brian D. Carver  
 Daniel L. Combs  
 Steven Bradford Cook  
 John H. Gunderson  
 Steven E. Hayslette  
 James B. Layzer  
 Hayden T. Mattingly  
 Justin N. Murdock  
 J. Michael Redding  
 Thomas H. Roberts

## Provisional Admission Procedures

Students who do not meet departmental GPA and GRE requirements can be admitted provisionally by appealing the initial rejection decision to the Department of Biology Graduate Policies Committee. This committee will only consider appeals that are presented by the applicant's potential faculty advisor. Criteria commonly used by the Graduate Policies Committee regarding appeals are previous experience in the area of research and work history following graduation. Absolute minimum requirements for appeal consideration will consist of the following:

A minimum overall undergraduate grade point average of 2.5 (minimum requirement of Graduate School for non-provisional admission) AND a minimum combined GRE score of 1400 on the verbal, quantitative, and analytical writing (converted score\*) portions of the examination.

*\*Analytical Writing Score Conversion:*

*Converted Score = (Analytical Writing Score / 6) X 800.*

The Graduate Policies Committee will make the final decision for all appeals.

## Provisional Status Requirements

All applicants who do not meet the minimum requirements established for admission to the Master of Science Program within the Department of Biology, and who are granted an appeal by the Department of Biology Graduate Policies Committee, will be admitted with provisional standing. Provisions for achieving full standing will be determined by the Graduate Policies Committee in consultation with the student's faculty advisor and departmental chair.

## Departmental Degree Requirements

In addition to the Graduate School requirements, the student must:

- Submit a thesis research proposal.
- Complete an appropriate statistics course.
- Present a seminar over thesis research during the final semester.

## Department of Chemistry

The Department of Chemistry offers a program of study leading to an Master of Science in Chemistry designed to prepare graduates for a successful career in industry or to continue their education in a doctoral program or professional school. By offering courses in the five (5) major areas of chemistry, the students have an opportunity to reinforce their background and expand their knowledge in areas not covered by their undergraduate degree. The faculty maintains a wide variety of research programs, which gives each student a chance to conduct, evaluate, and report on original research. A low student-to-faculty ratio allows for individual attention and produces a stimulating intellectual atmosphere conducive to learning.

### Fast-Track M.S. Program

The Fast-Track M.S. Chemistry program is designed for chemistry majors in the A.C.S.-certified concentration, enabling them to earn the M.S. degree in Chemistry by staying at TTU one (1) additional academic year and two (2) summers. A senior who opts for the fast-track program will take nine (9) hours graduate coursework as a senior. These hours can include either 4000/5000 dually-listed chemistry courses taken at the 5000-level OR can include 6000-level chemistry and 7000-level environmental science courses. Up to six (6) hours of this graduate coursework, exclusive of directed study, taken during the student's senior year can be used to satisfy both undergraduate and graduate degree

### Department of Chemistry

#### **Jeffrey O. Boles, Chairperson**

Graduate Faculty:

Jeffrey O. Boles

Andrew Callender

Jesse D. Carrick

David J. Crouse

Dale D. Ensor

Robert J. Glinski

John J. Harwood

Barbara Albers Jackson

Xiaohua Jiang

Edward C. Lisic

Scott H. Northrup

Daniel J. Swartling

Hong Zhang

requirements. These courses must be taken at Tennessee Tech University and must be approved as appropriate substitutions in the undergraduate curriculum for senior CHEM electives. The admission requirements are:

1. Subject to approval by the chair and the chemistry graduate committee
2. Overall GPA = 2.8 or above, 3.0 or above in upper-division chemistry courses
3. Application allowed once Junior Standing is earned
4. Can begin Fast-Track Program as a Senior
5. Final B.S. must include a minimum of:
  - o two (2) semesters of calculus
  - o two (2) semesters each of general, organic, and physical chemistry
  - o one (2) semester each of analytical chemistry and biochemistry

Entrance to the Fast-Track program can be granted if the student has met requirements 1 and 2 above.

TTU seniors who do not fully qualify for the Fast-Track program but who plan to seek an M.S. Chemistry degree at TTU may take up to nine (9) graduate-level coursework hours as a senior. Subject to instructor approval, these hours can include either 4000/5000 dually-listed chemistry courses taken at the 5000-level OR can include 6000-level chemistry and 7000-level environmental science courses. Up to six (6) hours of this graduate coursework taken during the student's senior year can be used to satisfy both undergraduate and graduate degree requirements.

### **Departmental Admission Requirements**

Students seeking admission to full standing in the M.S. program in Chemistry are required to have a Bachelor's degree in Chemistry that has been certified by the American Chemical Society or course work equivalent of this degree. The minimum requirement is one (1) year each of general, analytical, organic, and physical chemistry; and one (1) semester each of inorganic and instrumental analysis. Students are required to take the general portion of the Graduate Record Examination. To be admitted with full standing a student must score on the old GRE at least 1000 pts combined between the verbal and quantitative exams and must score at least 3.0 on the analytical writing portion. Students lacking any of the prerequisites may be admitted to provisional standing and required to take the prerequisites before being admitted to full standing. Foreign students are required to take the TOEFL examination and a minimum score of 550 (213 computer-based) is required to be considered for a teaching assistantship.

### **Departmental Degree Requirements**

The program of study for the M.S. in Chemistry includes satisfactory completion of a thesis, with a maximum of six (6) semester hours of CHEM 6990 counted toward the degree requirements. Completion of CHEM 6900 and other 6000-level course work provides a total of 21 hours. Participation in the seminar program is mandatory, including the presentation of two (2) seminars: CHEM 6910 and CHEM 6911. In addition, nine (9) hours of 5000-level classes in chemistry or related fields as prescribed by the student's program of study may be taken to make an overall total of 30 hours. The student must also satisfactorily complete a comprehensive oral examination administered by the student's graduate committee.

## Department of Earth Sciences

No graduate degree is offered in Earth Sciences, but courses may be used (with advisory committee approval) as electives in other fields of study.

### **Department of Earth Sciences**

**Michael Harrison, Chairperson**

Graduate Faculty:  
Michael J. Harrison  
Evan A. Hart  
Larry W. Knox  
H. Wayne Leimer  
Peter Li

### **Department of English**

**Ted Pelton, Chairperson**

Graduate Faculty:  
Halina Ablamowicz  
Anthony D. Baker  
Michael L. Burdick  
Kevin E. Christianson  
Mark H. Creter  
Kristen Deiter  
Yun Ding  
Kurt Eisen  
Graham S. Kash  
Shirley D. Laird  
Josephine A. McQuail  
Linda J. Null  
Michael O'Rourke  
Kristin Pickering  
Thomas Saya  
James Monroe Stewart  
Brian Williams  
Brenda Wilson  
Russell Y. Witcher

## Department of English

The Master of Arts degree program in the Department of English and Communications prepares graduates for success in any further graduate and professional education which might require superior analytical and communication skills. It prepares them for Ph.D. programs in English by increasing their knowledge of literary history and improving their skills in writing, literary analysis, and research. Graduates can become effective high-school or college-level teachers by improving their knowledge of writing pedagogy and theory. They will also be prepared for careers outside the academic world wherever superior analytical and communication skills and knowledge of literary and cultural traditions are essential.

### **Departmental Admission Requirements**

1. An official transcript of undergraduate work reflecting an overall QPA of 2.5 or above.
2. Graduate Record Examination Verbal and Writing Score
3. A Writing Sample (should be an 8-page minimum, critical essay appropriate for submission in an upper-division, undergraduate English class).
4. For students seeking a Graduate Teaching Assistantship: three (3) letters of recommendation.

### **Evaluation Criteria**

The Graduate Committee shall admit to the program those students whose applications (based on the Evaluation Criteria) either:

- a minimum of 10 points each in the Transcript and Writing Sample scores, and a combined total of at least 10 points for the two (2) GRE scores
- OR have a total score of 40 points or higher.

Students admitted to the program who possess an undergraduate degree (either major or minor) in English will be given Full Standing. Students who qualify for admission but who have no degree in the discipline will be given Provisional Standing in order to account for any deficiencies identified in their background. When the student is informed that he/she has been given Provisional Standing, he/she shall also be informed of the specific courses which he/she needs to take in order to qualify for Full Standing. Once these deficiencies have been rectified, that student must then apply to the Graduate Committee for a change to Full Standing.

A student with an undergraduate degree in English who does not meet the minimum points score but has reasonable chance of success based on the quality of his/her writing sample may be admitted with provisional status.

A student who is granted Provisional Standing will, upon completion of nine (9) hours of graduate study, be evaluated by the Graduate Committee in consultation with the faculty members who have taught him/her. At that point, the graduate committee will decide whether to grant the student Full Standing or to deny admission to further study.

The Graduate Committee will evaluate each application using the following criteria ratings:

Transcript: based on QPA in Major	2.7 - 2.999	10 pts.
	3.0 - 3.499	20 pts.
	3.5 - 4.000	30 pts.
GRE Verbal Score	500 - 599	5 pts.
	600 - 699	10 pts.
	700 - 800	15 pts.
GRE Analytical Writing Test	3.50 - 4.00	5 pts.
	4.50 - 5.00	10 pts.
	5.50 - 6.00	15 pts.
Writing Sample Score*	9 - 10 total	10 pts.
	11 - 12 total	20 pts.
	13 - 15 total	30 pts.

\*Writing Sample Evaluation: Each writing sample will be read by three (3) individuals, either members of the graduate committee or their designees (who themselves must be graduate faculty members).

### Departmental Degree Requirements

In addition to Graduate School degree requirements, the student must complete:

- One (1) graduate course in British Literature before 1800.
- One (1) graduate course in British Literature after 1800.
- One (1) graduate course in American Literature.
- English 6000.

The Master of Arts degree program in English has both thesis and non-thesis options. In addition, non-thesis option students will be required to take ENGL 6890, for which they will develop and present a research project of 20-30 pages.

Some courses listed below are offered every other year. The symbol (O) is used to designate courses offered during academic years beginning with an odd number and (E) for those during academic years with an even number.

## **Department of Foreign Languages**

### **Mark Groundland, Interim Chairperson**

Graduate Faculty:  
Debbie Barnard  
Julia K. Baker  
Mark Groundland  
Colleen B. Hays  
Marketta Laurila

## **Department of History**

### **Jeffery Roberts, Chairperson**

Graduate Faculty:  
Michael E. Birdwell  
Kent T. Dollar  
Paula K. Hinton  
Wali R. Kharif  
Susan D. Laningham  
C. Elizabeth Propes  
Patrick D. Reagan  
Jeffery J. Roberts  
George E. Webb

## **Department of Mathematics**

### **Allan Mills, Chairperson**

Graduate Faculty:  
Rafal F. Ablamowicz  
Michael R. Allen  
Amy Chambers  
Andrzej Gutek  
Andrew Hetzel  
Damian Kubiak  
Richard C. Le Borne  
Yung-Way Liu  
Motoya Machida  
Jeffrey Norden  
Brian M. O'Connor  
Tonya Riddlesworth  
Alexander Shibakov  
David Smith

## Department of Foreign Languages

No degree is offered in Foreign Languages but courses may be used (with advisory committee approval) as electives in other fields of study.

## Department of History

No degree is offered in History but courses may be used (with advisory committee approval) as electives in other fields of study.

## Department of Mathematics

The Department of Mathematics offers a comprehensive program leading to a Master of Science degree in Mathematics. The program of study provides suitable preparation for further study at the doctoral level or for a career in teaching, government, or industry. The moderate size of the program encourages faculty-student interaction and allows the student an opportunity to tailor a program of study based on individual background, interest, and goals. Graduate students attend a weekly Graduate Seminar and develop teaching skills through participation in the weekly Teaching Seminar. For more information, please contact the Mathematics Department at (931) 372-3441, or visit the departmental web page at <http://www.tntech.edu/math>.

### **Integrated B.S./M.S. Program**

The "Accelerate to Masters" (ATM) program is designed to provide an opportunity for promising undergraduate students at TTU to begin their pursuit of an M.S. degree in Mathematics during their senior year at TTU. Although program participants in the ATM program will technically not be admitted as mathematics graduate students, participants will be permitted to enroll for up to nine (9) hours of graduate level Mathematics courses. Because these courses will not count toward their Bachelor's degree, they will be applied to their Master's degree at Tennessee Tech University or transferred to another institution as graduate credit.

Admission criteria will be similar to the traditional graduate program, except that the students will not yet have earned their Bachelor's degree. To be eligible, students must meet the following minimum criteria:

- Have an over GPA of at least 3.00;
- Must have satisfactorily completed at least 18 hours of upper-division (3000 or 4000 level) work in Mathematics. This total may include currently enrolled courses.
- Must have a "B" or better in all upper division Mathematics courses.

Fulfilling the above minimum requirements does not guarantee admission to the ATM program. Students who meet the above minimum admission requirements must apply to the Mathematics Department for admission to the ATM program under the status governed by "Special Standing." The department's graduate committee will review the application and make a decision for approval.

### **Departmental Admission Requirements**

Subject to review by the Mathematics Graduate Committee, a student who meets each of the following requirements can potentially be admitted to the graduate mathematics program with full standing:

- a B.S. degree in Mathematics (preferred) or a related field of study with no academic deficiencies (an academic deficiency is the lack of an undergraduate prerequisite course for any introductory 6000-level mathematics course;
- a minimum undergraduate grade point average of 2.5 on a 4.0 scale;
- a minimum total GRE (Verbal + Quantitative) score of 1000 and a minimum score of 2.5 on the analytical writing portion; and
- a minimum TOEFL score of 525 (71 internet based) or a minimum IELTS score of 5.5 (foreign applicants only)

Applicants who do not fully meet the above requirements may be admitted with provisional standing. Subject to review by the Mathematics Graduate Committee, a student whose mathematics background reveals a few academic deficiencies, or whose grade point average is below 2.5 but at least 2.25, or whose total GRE (Verbal + Quantitative) score is below 1000 but at least 750 may be admitted with provisional standing.

Please note, the Mathematics Graduate Committee evaluates all applicant transcripts for background deficiencies in mathematics and will design a preliminary program of study for an applicant, if provisionally admitted. After the successful completion of these prerequisite courses, the student will be granted full standing. The following is a list of courses most commonly required by the committee for a student to complete before reclassification to full standing is granted. These and/or other courses may be required.

MATH 3400--Introduction to Concepts of Mathematics

MATH 4010 (5010) and/or MATH 4020 (5020) --Modern Algebra I and II

MATH 4110 (5110) and/or MATH 4120 (5120) --Advanced Calculus I and II

Subject to review by the Mathematics Graduate Committee, special standing (more specifically, nondegree seeking status) can potentially be granted to applicants who lack GRE scores but who would otherwise qualify for provisional or full standing. Please refer to the admission policy as stated in the TTU Graduate Catalog for further information.

## Departmental Degree Requirements

Requirements for the M.S. degree in Mathematics are:

Thesis Option:

- Three (3) credit hours of 6000-level Algebra.
- Three (3) credit hours of 6000-level Analysis.
- Two (2) one-year approved sequences totaling 12 credit hours.
- A written thesis and six (6) credit hours of thesis credit.
- A total of 30 credit hours, including at least 21 at the 6000 level.

Non-Thesis Option:

- Three (3) credit hours of 6000-level Algebra.
- Three (3) credit hours of 6000-level Analysis.
- Three (3) one-year approved sequences totaling 18 credit hours.
- A comprehensive examination on two (2) of the three (3) one-year approved

sequences used to fulfill the 18 credit hour requirement. The selection of the two (2) areas of examination will be left to the graduate student and to the graduate student's advisor, subject to the approval of the student's Graduate Advisory Committee. The exam will test both the student's knowledge of the subject areas and ability to independently solve problems and prove theorems.

- Three (3) credit hours of MATH 6991 Research and Independent Study
- A total of 33 credit hours, including at least 24 will be at the 6000 level.

### List of Approved Sequences

MATH 6010 - Functional Analysis I Cr. 3., and  
MATH 6020 - Functional Analysis II, Cr. 3.

MATH 6070 - Applied Linear Statistical Methods I, Cr. 3. and  
MATH 6080 - Applied Linear Statistical Methods II, Cr. 3.

MATH 6110 - Abstract Algebra I, Cr. 3. and  
MATH 6120 - Abstract Algebra II, Cr. 3.

MATH 6170 - Experimental Design I, Cr. 3. and  
MATH 6180 - Experimental Design II, Cr. 3.

MATH 6210 - Topology I, Cr. 3. and  
MATH 6220 - Topology II, Cr. 3.

MATH 6310 - Complex Analysis I, Cr. 3. and  
MATH 6320 - Complex Analysis II, Cr. 3.

MATH 6370 - Probability Theory and Stochastic Processes I, Cr. 3. and  
MATH 6380 - Probability Theory and Stochastic Processes II, Cr. 3.

MATH 6410 - Real Analysis I, Cr. 3. and  
MATH 6420 - Real Analysis II, Cr. 3.

MATH 6450 - Advanced Theory of Computation, Cr. 3. and  
MATH 6460 - Computational Methods for Graphics and Modeling, Cr. 3.

MATH 6910 - Special Topics in Mathematics, Cr. 1-3. and  
MATH 6920 - Special Topics in Mathematics, Cr. 1-3.

Any TWO (2) of the following courses:

(four [4] must be taken to complete two [2] sequences)

MATH 6510 - Finite Difference Solutions of Partial Differential Equations, Cr. 3.

MATH 6520 - Finite Element Solutions of Partial Differential Equations, Cr. 3.

MATH 6810 - Partial Differential Equations, Cr. 3.

MATH 6540 - Calculus of Variations and Applications, Cr. 3.

MATH 6610 - Operational Mathematics, Cr. 3.

## Department of Physics

No graduate degree is offered in Physics but courses may be used (with advisory committee approval) as electives in other fields of study.

**Department of Physics**  
**Stephen J. Robinson, Chairperson**  
 Graduate Faculty:  
 Sakir Ayik  
 Paula Engelhardt  
 Raymond L. Kozub  
 David P. Murdock  
 Stephen J. Robinson  
 John F. Shriner, Jr.

## Department of Sociology and Political Science

No degree is offered in Sociology or Criminal Justice but courses may be used (with advisory committee approval) as electives in other fields of study.

**Department of Sociology and Political Science**  
**James Raymondo, Chairperson**  
 Graduate Faculty:  
 Ada Haynes  
 Henry W. Mannle  
 Gwendolyn Lachelle Norris  
 James Raymondo  
 Gretta Stanger  
 Michael Gunter

## College of Business

The College of Business offers an MBA program that is fully accredited by the AACSB International--the highest attainable level of accreditation. The program includes the following concentrations: Accounting, Finance, General Management, Human Resource Management, International Business, Management Information Systems, and Risk Management and Insurance. The MBA degree may be obtained through the regular, full-time program or by distance learning.

The MBA program offers students the option to complete their degree 100 percent online, without any differentiation between the final degree regardless of the channel (online or on campus) by which it was pursued. The online approach delivers course content (lectures, presentations, external media, literature, etc.) strictly through a Learning Management System (LMS) and features a variety of instructional techniques consistent with each faculty member's vision for the course and associated content. The learning environment includes communication between students and faculty members via iLearn, and includes case discussions, virtual project teams, and other active-learning approaches. Heavy in experiential learning, the online MBA program uses approaches that are designed to make a strong connection between academic subjects and the issues facing managers in today's global, highly technology business environment.

To obtain application materials for the MBA or the distance-based MBA, write or call: Tennessee Technological University, College of Business, Division of MBA Studies, P. O. Box 5023, Cookeville, TN 38505, Telephone: (931) 372-3600, Fax: (931) 372-6544, E-mail: mbastudies@tntech.edu or online at [www.tntech.edu/mba](http://www.tntech.edu/mba).

The MBA program at Tennessee Technological University includes a practical and an interactive student learning approach. The interactive teaching methods encompass cases, competitive computer simulation, field research, experimentation, applied problem solving, team building exercises, cross functional activities, scenario planning, business mentoring, workshops, field trips, role playing, primary data collection, feasibility projects, and/or consulting assignments. The MBA program provides a sound business theoretical foundation including the latest and most progressive intellectual thinking. Moreover, the theories and tools are applied so as to be relevant to current and futuristic business applications. The program is designed to serve both short

**Thomas H. Payne, Dean**

**Degrees available in the College of Business**

Master of Business Administration

and long term needs of all types of private and public organizations. The MBA program recognizes the impact of our global economy, the entrepreneurial demands of society, and ethical expectations. In essence, it takes a normative approach that will serve MBA students both today and in the future.

## Departmental Admissions Requirements

Admission is open to qualified students with a bachelor's degree from an accredited institution. Applications are accepted for fall, spring, and summer semester admission. The application for admission should be received at least one (1) month before the semester in which the student plans to enroll (six [6] months for international students).

To be considered for admission, the applicant's file must be complete including: a Graduate School Application, official transcripts of prior college work, one (1) letter of recommendation, and an official Graduate Management Admission Test (GMAT) score or the general Graduate Record Examination (GRE). Additional information is required by The Graduate School for international students.

For admission to the MBA program, consideration is given to the applicant's academic record, the AACSB formula score, the TOEFL or IELTS score, work experience and other activities that demonstrate potential for leadership, as well as recommendations from professors and work supervisors. A minimum GMAT score of 450 or minimum GRE scores of 146 (Verbal) and 150 (Quantitative) is required for admission to the MBA program. A minimum undergraduate grade point average (GPA) of 2.50 on a 4.0 scale is required. A minimum AACSB formula score of 1,000  $[(\text{GPA} \times 200) + \text{GMAT}]$  or 1,050 for the last two (2) years of undergraduate degree is required. A score of 550 (79 internet-based) on the TOEFL or a band score of 5.5 on the IELTS is required for all students whose native language is other than English. Students must be proficient in the use of word processing, spreadsheet, and presentation software including the integration of all three of the above.

Applicants may request to waive the GRE/GMAT requirement under the following circumstances:

- They have completed an advanced terminal degree (e.g., Ph.D., J.D., M.D., Pharm.D., DBA) from a regionally accredited U.S. college or university.
- They have completed a master's degree in a scientific, technical, quantitative, or other field with a substantial quantitative component (e.g., math, engineering, computer science, statistics, economics) from a regionally accredited U.S. college or university with a graduate GPA of at least 3.0.
- This waiver is not guaranteed and the request must be made in writing. The decision will be made by the MBA Exceptions Committee.

An applicant who does not meet the GMAT, GRE, GPA or Admission Index criteria may be admitted provisionally by a majority vote of the MBA Admissions Exception Committee whose members are the Director, the Dean of the College, and the Departmental Chairs in the College of Business. Provisional admission requires that the applicant maintain a 3.0 GPA for the first nine (9) hours of graduate credit or the applicant will be dismissed from the program.

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## Fast-Track MBA

This will allow selected undergraduates to enroll for up to six (6) hours of graduate courses prior to formal admission to the MBA program. These courses will not count toward the bachelor's degree. Students completing the combined B.S. and MBA program will earn at least 150 semester hours of credit. Participation does not change the requirements for either the undergraduate or graduate program in business. Graduate classes counted toward the MBA may not be used to satisfy undergraduate degree requirements. Once admitted to this program, the student will be allowed to enroll in appropriate MBA courses in the senior year with the consent of the student's undergraduate advisor and the Director of MBA program.

### Admission to Fast-Track

Minimum requirements for admission are:

- 90 hours of undergraduate work in an AACSB accredited College of Business and successful completion of the required prerequisites
  - Recommendation of a faculty member in the student's major
  - Overall GPA of 3.2
- 

## Business Administration, M.B.A.

### Degree Requirements

The MBA program is intended for business and nonbusiness majors and experienced leaders. The program consists of seven (7) three-hour common courses (21 hours) and nine (9) hours of electives. It is intended that the full-time student can complete the 30-hour program in one (1) calendar year.

The 21 credit hours of common business studies are broad in scope for the purpose of developing general managerial competence through extensive use of various pedagogies such as case studies, simulations, and research projects. These case courses are taught in an active learning and frequently team-based environment. The nine (9) credit hours of electives are used to develop special competencies of interest to the student. With permission of the Director of MBA Studies and the appropriate academic department chair, a student with 18 hours in the appropriate academic area may omit the common course from that area and substitute another approved course. This will allow accounting track students to meet the 12-hour AACSB track requirement as well as allow other track students to further concentrate their course of study.

An MBA student is required to maintain a cumulative grade average of at least B (3.0) on all courses taken for degree purposes. Not more than six (6) hours of credit below a B grade will be allowed. If a grade of C is assigned in an MBA degree-related course, the course must be repeated, and both the original grade and the grade for repeat will be counted in the cumulative average. An MBA course may be repeated only one (1) time and no more than two (2) MBA degree courses may be repeated. In addition, any student receiving a D or an F in an MBA degree course shall be dismissed from the program.

A general management MBA student may take elective courses in such areas as international business, entrepreneurship, quality management, technology management, e-business, and others as determined by demand. The general management MBA allows students to pursue a wide variety of business careers.

Students in the accounting concentration will take four (4) required accounting courses. A seven (7) course undergraduate accounting core that can be taken at Tennessee Tech is required before accounting concentration students can take 6000-level accounting courses. The undergraduate accounting core that is

### Kathryn Nicewicz, Interim MBA

#### Director

Graduate Faculty:  
 Ismet Anitsal  
 M. Meral Anitsal  
 Curtis P. Armstrong  
 Bonita B. Barger  
 Ferdinand Difurio  
 Dan Robert Fesler  
 Tor Guimaraes  
 Mary Howard  
 Brian Hugeuenard  
 Steven Isbell  
 Brian Jones  
 Deryl Winston Martin  
 Jack Matson  
 Christine Miller  
 Ramachandran Natarajan  
 Mary Pashley  
 Julie M. Pharr  
 Rodley Pineda  
 Richard Rand  
 Magdalena Rappl  
 Robert Seay  
 Mark A. Stephens  
 Thomas Timmerman  
 F. Stuart Wells III  
 Kenneth Wiant

required must include six (6) hours of Intermediate Accounting, three (3) hours of Cost Accounting, three (3) hours of Tax Accounting, and three (3) hours of Auditing. Students in the accounting track are not required to take ACCT 6010, therefore there are six (6) common courses (18 hours) that are required instead of seven (7). The accounting concentration MBA qualifies students to sit for the Tennessee CPA examination and can fulfill one (1) year of the CPA experience requirement.

For students seeking a specialized knowledge base in finance, the concentration in finance is specifically designed to meet this need. With courses in corporate finance, investments, international finance, and insurance and risk management, the student will be able to select courses that will enhance their ability to perform both in their current position and in future desired positions. The concentration in finance requires the student to take nine (9) hours of electives.

Recent research on the value of human resource management suggests that the human resource function can be a significant source of competitive advantage for organizations that use evidence-based practices. Because the strategic value of the human resource function is often ignored in undergraduate business programs, the TTU MBA Program offers an ideal place to offer such instruction. The Human Resource Management Concentration offers education on the strategic importance of competent human resource management and the opportunity for students to complete professional certification exams. To earn a concentration in Human Resource Management, students must complete nine (9) hours of electives.

In the increasingly global economy, many of our graduates will be seeking employment in the field of international business with hopes of traveling and working abroad in a variety of countries and cultures. This type of employment requires graduates to have specialized knowledge of the unique economic, cultural, political, and social differences among countries and how these affect business practices relative to general business practices of firms operating in the United States. Students are required to complete nine (9) hours of electives.

The management information systems (MIS) concentration provides students with focused study of several important subjects in the current business information technology environment. It has the primary objective of strengthening current and future managers' ability to manage information technology. Students in the MIS concentration are required to take three (3) of the four (4) MBA level MIS courses offered in addition to the Common Courses. The MIS Concentration courses are available through distance-based delivery as well as on-campus, in-class delivery.

## Curriculum

### Core Courses (May be waived by consent of the Director)

Any or all courses in this group may be waived if the MBA Studies Director determines that the student has equivalent background in prior course work.

ACCT 5010 - Basic Accounting, Cr. 3.

FIN 5020 - Basic Finance, Cr. 3.

ECON 5030 - Fundamentals of Economics, Cr. 3.

DS 5050 - Quantitative Techniques for Business, Cr. 3.

LAW 5100 - Business Law and the Legal Environment, Cr. 3.

BMGT 5150 - Management and Organization, Cr. 3.

MKT 5200 - Basic Marketing, Cr. 3.

**Total Hours for Core Courses: 21**

### Required Common Courses (Required of all students)

Each course in this group will be required of all MBA candidates. As many as nine (9) semester hours may be transferred from other AACSB accredited schools. Credit will not be allowed for courses taken more than five (5) years prior to application to Tennessee Tech. Enrollment in required common courses

requires the permission of the MBA Director. All core courses should be complete prior to any 6000-level work. With permission of the Director of MBA Studies and the appropriate academic department chair, a student with 18 hours in the appropriate academic area may omit the common course from that area and substitute another approved course.

ACCT 6010 - Accounting Information for Management Decisions, Cr. 3.  
 FIN 6020 - Financial Management, Cr. 3.  
 ECON 6050 - Analytical Decision Making, Cr. 3.  
 MKT 6100 - Strategic Marketing, Cr. 3.  
 BMGT 6200 - Organizational Leadership, Cr. 3.  
 DS 6220 - Management of Information Technology, Cr. 3.  
 BMGT 6950 - Business Strategy, Cr. 3.

**Total Hours for Common Courses: 21**

### **Elective Courses for the General Management MBA**

Three (3) courses/nine (9) semester hours must be selected based on the student's chosen curriculum, from the following courses:

ACCT 6110 - Financial Accounting Reporting Standards, Cr. 3.  
 ACCT 6250 - Governmental Not-for-Profit, and Healthcare Accounting, Cr. 3.  
 ACCT 6300 - Financial Accounting and Reporting, Cr. 3.  
 ACCT 6310 - Tax Research and Strategy, Cr. 3.  
 ACCT 6320 - Management Control Systems, Cr. 3.  
 ACCT 6360 - Tax Consequences of Business Decisions, Cr. 3.  
 ACCT 6620 - Auditing and Attestation, Cr. 3.  
 ACCT 6900 - Special Topics, Cr. 3.  
 BMGT 6400 - Employee Relations, Cr. 3.  
 BMGT 6510 - International Business, Cr. 3.  
 BMGT 6710 - Concepts in Management of Technology, Cr. 3.  
 BMGT 6900 - Special Topics, Cr. 3.  
 DS 6120 - Operations and Supply Chain Management, Cr. 3.  
 DS 6430 - Managing Quality, Cr. 3.  
 DS 6530 - Decision Support Systems, Cr. 3.  
 DS 6540 - Business Telecommunications Systems, Cr. 3.  
 DS 6550 - Data Resources Management, Cr. 3.  
 DS 6560 - Information Systems Development, Cr. 3.  
 DS 6900 - Special Topics, Cr. 3.  
 ECON 6900 - Special Topics, Cr. 3.  
 ECON 6920 - International Economics, Cr. 3.  
 FIN 6350 - Small and Micro-Cap Portfolio Management, Cr. 3.  
 FIN 6900 - Special Topics, Cr. 3.  
 FIN 6910 - Multinational Finance, Cr. 3.  
 LAW 6450 - Organizational Ethics, Cr. 3.  
 MBA 6830 - Business Consulting and Research, Cr. 3.  
 MBA 6840 - Field Research Project, Cr. 1-3.  
 MKT 6500 - Advanced Marketing Analysis, Cr. 3.  
 MKT 6630 - Entrepreneurship and Small Business Management, Cr. 3.  
 MKT 6900 - Special Topics, Cr. 3.  
 MKT 6930 - International Marketing, Cr. 3.

**Total Electives & Required Common Courses: 30**

### **Accounting Concentration MBA Required Accounting Courses**

ACCT 6110 - Financial Accounting Reporting Standards, Cr. 3.  
 ACCT 6250 - Governmental Not-for-Profit, and Healthcare Accounting, Cr. 3.  
 ACCT 6310 - Tax Research and Strategy, Cr. 3.  
 ACCT 6620 - Auditing and Attestation, Cr. 3.

**Total Required Accounting Courses & Required Common Courses: 30**

**Finance Concentration MBA Required Courses**

Must complete nine (9) hours from the following:

- FIN 6470 - Investment Challenge, I Cr. 3.
- FIN 6480 - Investment Challenge, II Cr. 3.
- FIN 6710 - Perspectives of Risk and Insurance, Cr. 3.
- FIN 6720 - Corporate Risk Management, Cr. 3.
- FIN 6740 - Current Issues in Risk Management and Insurance, Cr. 3.
- FIN 6910 - Multinational Finance, Cr. 3.

**Total Required Courses & Required Common Courses: 30**

**Human Resource Management Concentration MBA Required Courses**

Must complete nine (9) hours from the following:

- BMGT 6400 - Employee Relations, Cr. 3.
- BMGT 6800 - Strategic Human Resource Staffing, Cr. 3.
- BMGT 6810 - Strategic Human Resource Performance Management, Cr. 3.
- BMGT 6820 - Professional issues in Human Resource Management, Cr. 3.

**Total Required Courses & Required Common Courses: 30**

**International Business Concentration MBA Required Courses**

Must complete nine (9) hours from the following:

- FIN 6910 - Multinational Finance, Cr. 3.
- ECON 6920 - International Economics, Cr. 3.
- MKT 6930 - International Marketing, Cr. 3.
- BMGT 6940 - International Management, Cr. 3.
- MBA 6980 - International Experience, Cr. 3.

**Total Required Courses & Required Common Courses: 30**

**Management Information Systems Concentration MBA Required MIS Courses**

- DS 6530 - Decision Support Systems, Cr. 3.
- DS 6540 - Business Telecommunications Systems, Cr. 3.
- DS 6550 - Data Resources Management, Cr. 3.
- DS 6560 - Information Systems Development, Cr. 3.

**Total Electives & Required Common Courses: 30**

## College of Education

The College of Education offers a variety of graduate programs at the Master of Arts (M. A.), Specialist in Education (Ed. S.), and Doctorate (Ph.D.) degree levels. The Regents Online Degree Program also offers a Master of Education (M.Ed.). All professional education programs offered in the College are accredited by the National Council for the Accreditation of Teacher Education (NCATE) and are designed to prepare teachers, school support personnel, and administrators for the elementary and secondary schools and other service provider agencies in the Upper Cumberland of Tennessee as well as other locations in the nation. The overall model for the College is that the graduate of a teacher education program will be a competent, caring professional for a diverse, technological society.

### Exceptional Learning, Ph.D.

#### Lisa Zagumny, Director

The Ph.D. at TTU focuses on the characteristics, strengths, and educational needs of individuals and groups whose learning potential and opportunities for success are frequently unrealized. Exceptional and at-risk populations include people for whom social, economic, and physical characteristics may serve as a barrier to development and learning. The Ph.D. will prepare leaders to work in schools, agencies, and universities to effect positive change in populations of diverse and at-risk learners, addressing social, economic, and physical characteristics that may serve as barriers to learning, primarily through research and service activities. The program core develops an understanding of the characteristics of these populations. The research core provides a strong emphasis on research techniques and applications. Four (4) concentrations allow you to focus on specific interests:

**Applied Behavior Analysis** prepares professionals who can develop and deliver behavioral interventions and supports for individuals within educational and habilitative settings. There are two strands with ABA:

**Young Children and Families** prepares professionals to provide support and interventions to young, at-risk children and families with emphasis on building relationships and advocating for children and families. (Concentration leader - Dr. Jane Baker)

**Applied Behavior Analysis School-Aged Children and Adult Populations** is not currently offered.

**Literacy** empowers educational innovators to develop cutting-edge, socially conscious approaches to multiliteracies and challenge narrow conceptions of learners, families, and worldviews. (Concentration leader – Dr. Deborah Setliff)

**Program Planning and Evaluation** prepares professionals for leadership roles in program evaluation and planning with an emphasis on statistical methods. (Concentration leader – Dr. Barry Stein)

**STEM Education** builds the capacity of innovative educational leaders to advance new ideas and to design/implement strategic innovations in science, technology, engineering and mathematics (STEM) education. (Concentration leader – Dr. Holly Anthony)

### Doctor of Philosophy Degree Admission Requirements

Applications will be accepted for the Fall semester only and must be received by March 1.

**Jennifer Shank, Interim Dean**

**Lisa Zagumny, Associate Dean**

**Julie C. Baker, Assistant Dean**

### Departments in the College of Education

Department of Art

Department of Counseling and Psychology

Department of Curriculum and Instruction

Department of Exercise Science, Physical Education, and Wellness

Department of Music and Art

## Degrees available in the College of Education

### Master of Arts in

Curriculum and Instruction  
 Educational Psychology and Counselor Education  
 Exercise Science, Physical Education, and Wellness  
 Instructional Leadership

### Specialist in Education in

Curriculum and Instruction  
 Educational Psychology and Counselor Education  
 Exercise Science, Physical Education, and Wellness  
 Instructional Leadership

### Doctor of Philosophy in

Exceptional Learning

1. **QPA**--Consideration for admission to the program is based on the applicant's grade point average (GPA) in the last graduate degree or the last 60 hours of undergraduate work if no graduate degree has been completed. An average of 3.0 (on a 4.0 scale) or above from a recognized baccalaureate, graduate, or professional degree from an accredited college or university, or an international equivalent based on a four-year curriculum is required for admission.
2. **GRE\***--Exceed 153 on Verbal Reasoning and score 140 or above on Quantitative Reasoning AND a score of 4.0 or above is required on Analytical Writing. -OR- Exceed 144 on Quantitative Reasoning and score 146 or above on Verbal Reasoning AND a score of 4.0 or above is required on Analytical Writing.
3. **Scholarly Writing**--Students must demonstrate the ability to do scholarly writing by submitting a reference-based paper, thesis, or other written document in which information from various sources has been synthesized. The applicant must be the sole author.
4. **Statement of Intent**--One (1) to two (2) pages should be sufficient to include intended enrollment (fall admission only), intended concentration, autobiographical statement, education and professional goals, area of interest for future research, and how your interest fits with faculty in your chosen area of study.
5. **Three Letters of Recommendation**--At least one (1) letter should be from a professor who is able to comment on your qualifications for graduate study. Consideration will be made based upon the content of the letters.
6. **Professional Vitae**
7. **Interviews with Ph.D. doctoral program faculty.**

## Doctor of Philosophy Degree Requirements

The student must maintain a cumulative point average of 3.25 and, in addition to adhering to the general regulations of the Graduate School, adhere to the specific regulations for the Ph.D. in Exceptional Learning program. These regulations, standards, and expectations include:

1. A minimum of 78/79 semester hours of course work, including 36 semester hours in the research component and dissertation requirements and built upon the student's course of study.
  - A minimum of 51 semester hours of course work beyond the baccalaureate must be completed after matriculation into the doctoral program, including a minimum of 12 semester hours at the 7000 level (excluding dissertation credit).
  - No more than 27 semester hours of credit at the Master's and Educational Specialist levels, excluding theses and problems courses, will be accepted for transfer credit toward the doctorate. All graduate course credit transferred from other degree programs must be approved by the student's Advisory Committee prior to an assignment of credit in the student's formal program of study.
2. A residency requirement of three (3) full-time semesters (at least nine (9) hours each) must be met following matriculation.
3. All requirements, including the dissertation, must be completed within a period of no more than eight (8) consecutive years.
4. Following completion of all course work, excluding EDU 7920 and EDU 7990, or during the last semester during which such course work is to be completed, students should complete their Comprehensive Examinations.
5. Satisfactory completion of the dissertation requires an oral defense.
6. The 15 hours required for the dissertation may be completed in no fewer than two (2) semester.
7. A's and B's are required in coursework. A grade of "C" is considered a failing grade in doctoral programs. The student is allowed to maintain a grade of "C" in only one (1) course completed toward the Ph.D. degree. If a student receives two (2) "C's" they will be dismissed from the program.
8. "F's" are not acceptable in the Ph.D. in Exceptional Learning program. If a student receives a grade of "F" in a course, they will be dismissed from the program.
9. If an Incomplete is granted, the student has one (1) academic year to complete the requirements. If the requirements have not been met in the allotted time period, the grade is converted to an "F," and the student will be dismissed from the program.
10. Approval of the dissertation topic and a successful proposal to the entire Committee must precede any significant work on the dissertation. Approval from the Institutional Review Committee for the Protection of Human Subjects must be obtained for any research project initiated by a student (or faculty member).
11. A maximum of 12 credit hours may be taken in one (1) semester. Written approval from the Ph.D. Coordinator, the student's concentration leader, and advisor is required to register and take more than 12 credit hours in one (1) semester.

## Summary of Course Requirements

Curricular Component	Hours Required
General Education	N/A
Major Field/General Core	13

Guided Electives	6/7
Concentrations	23/24
Research Component	21
Dissertation	15
TOTAL HOURS: 78/79	

## Curriculum

### Major Field/General Core

EDU 7000 - Trans-Concentration Seminar, Cr. 1. \*  
 EDU 7010 - Educational Policy and Cultural Diversity, Cr. 3. \*  
 EDU 7020 - At-Risk Populations: Research, Service, and Delivery, Cr. 3. \*  
 EDU 7040 - Program Planning and Proposal Development, Cr. 3. \*  
 CUED 7430 - Specialized Applications of Technology to Education, Cr. 3.  
 EDU 7440 - Technology Applications for Institutional Dissemination of Info., Cr. 3.

### Guided Electives

CUED 7030 - Rural Schools and Communities, Cr. 3. \*  
 EDU 7050 - Advanced Learning and Cognition, Cr. 3. \*  
 EDU 7060 - Issues in Education, Cr. 3. \*  
 EDU 7950 - Doctoral Seminar: Special Topics in Education, Cr. 1-6. \*  
 SPED 6120 - Early Childhood Special Education Assessment, Cr. 3.  
 SPED 7110 - Family Collaboration in Special Education, Cr. 3.  
 READ 6350 - Secondary School Reading Program, Cr. 3.

### Research Component

EDU 7300 - Research Design, Cr. 3. \*  
 EDU 7310 - Research in Literacy, Cr. 3. \*  
 EDU 7320 - Single Subject Design, Cr. 3. \*  
 EDU 7330 - Qualitative Inquiry in Research, Cr. 3. \*  
 EDU 7340 - Ethnographic Inquiry in Education, Cr. 3. \*  
 EDU 7420 - Quantitative Inquiry in Education I, Cr. 3. \*  
 EDU 7430 - Quantitative Inquiry in Education II, Cr. 3. \*  
 EDU 7920 - Research Seminar in Education, Cr. 3. \*

### Dissertation

EDU 7990 - Research and Dissertation, Cr. 3, 6, 9. \*

### Concentration in Applied Behavior Analysis

EDUB 7030 - Functional Analysis of Behavior, Cr. 3. \*  
 EDUB 7810 - Practicum in Behavior Analysis, Cr. 3. \*  
 SPED 6000 - Behavioral Interventions and Supports, Cr. 3.

### (Area of emphasis under ABA concentration) Young Children and Families

ABAP 7120 - Positive Behavior Support & Families, Cr. 3. \*  
 ABAP 7920 - Topics, Issues & Research in Early Childhood Special Edu., Cr. 2. \*  
 HEC 6610 - Families: Normative/Catastrophic Issues. Cr. 3.  
 SPED 6120 - Early Childhood Special Education Assessment, Cr. 3.  
 EDUC 7400 - Programs and Service Delivery Models, Cr. 3. \*  
 EDUC 7450 - Doctoral Seminar: Young Children and Families, Cr. 3. \*  
 SPED 7110 - Family Collaboration in Special Education, Cr. 3.  
 ECED 7220 - Early Childhood Instruction and Materials, Cr. 3.

*\*Only students admitted to the Ph.D. program are permitted to enroll in these courses.*

**(Area of emphasis under ABA concentration) School Aged Children and Their Families**

EDUB 7010 - Advanced Systematic Instruction, Cr. 3. \*  
 EDUB 7040 - Assessment of Autism Spectrum Disorders, Cr. 3. \*  
 EDUB 7050 - Intervention and Treatment in Autism Spectrum Disorders, Cr. 3.  
 SPED 6050 - Introduction to Applied Behavior Analysis, Cr. 3.

**Concentration in Literacy**

EDUL 7000 - Seminar in Reading and Language Arts, Cr. 3.  
 EDUL 7800 - Professional Development in the Educational Setting, Cr. 3.  
 READ 6100 - Uses of Technology in Reading and Language Instruction, Cr. 3.

READ 6310 - Assessment and Intervention, Cr. 3.

**OR**

SPED 6320 - Assessment of Persons with Disabilities, Cr. 3.

READ 6600 - Literature Across the Curriculum, Cr. 3.  
 READ 7010 - Literacy Across the Curriculum, Cr. 3.  
 READ 7020 - Family Literacy, Cr. 3.  
 READ 7370 - Linguistics: Theory and Application for Educations, Cr. 3.

**Concentration in Program Planning and Evaluation**

EDUP 7410 - Advanced Program Planning and Evaluation Methods I, Cr. 3.  
 EDUP 7420 - Advanced Program Planning and Evaluation Methods II, Cr. 3.  
 EDUP 7810 - Supervised Practicum in Program Planning and Evaluation, Cr. 3-9.  
 EDUP 7810 - Supervised Practicum in Program Planning and Evaluation, Cr. 3-9.  
 EDUP 7810 - Supervised Practicum in Program Planning and Evaluation, Cr. 3-9.

**Concentration in STEM Education**

EDUS 7500 - STEM Education Foundations, Cr. 3. \*  
 EDUS 7510 - STEM Curriculum & Assessment, Cr. 3. \*  
 EDUS 7515 - STEM Education Seminar, Cr. 1. \*  
 EDUS 7520 - STEM Technology Seminar, Cr. 1. \*  
 EDUS 7530 - STEM Education Research, Cr. 3. \*  
 EDUS 7540 - STEM Education Pedagogy, Cr. 3. \*  
 EDUS 7550 - STEM Education Trends and Issues, Cr. 3. \*  
 EDUS 7560 - STEM Learners and Learning, Cr. 3. \*  
 EDUS 7570 - STEM Education Policy & Leadership, Cr. 3. \*  
 EDUS 7580 - STEM Education Field Study, Cr. 2. \*

*\*Only students admitted to the Ph.D. program are permitted to enroll in these courses.*

## Department of Counseling and Psychology

**Barry S. Stein, Chairperson**

Graduate Faculty:

Jann D. Cupp

Tammy Dukewich

Sherrie M. Foster

Kevin Harris

Marissa Hartwig

Mark Anthony Loftis

Chad Luke

Laura Yvonne Malone

Barry S. Stein

Sandra Terneus

Zachary Wilcox

Matthew J. Zagumny

## Department of Counseling and Psychology

A primary purpose of the department is to offer strong academic programs in the preparation of counselor education and educational psychology. Graduate programs are offered at both the Master of Arts and Specialist in Education levels in Educational Psychology and Counselor Education, with a number of concentrations available in each of these programs. The degree programs in Educational Psychology and Counselor Education each consist of a counseling concentration, appropriate cognate area, and a research component. Concentrations are available in:

Agency Counseling

Case Management and Supervision (Master's level only)

Educational Psychology

Mental Health Counseling (Master's level only)

School Counseling

School Psychology

### Master of Arts Degree Admission Requirements

Students pursuing graduate study in the Department of Counseling and Psychology can select from among several concentrations that are designed to lead to licensure in the State of Tennessee or that lead to non-licensure degrees.

#### Admission Criteria

The Department offers admission to applicants who appear to have the highest potential for graduate study and who have the disposition to be successful in their concentration. The minimum admission requirements are:

1. A bachelor's degree from an accredited institution.
2. Satisfactory undergraduate grade point average, usually a minimum of 2.75 on a 4.0 scale.
3. Enough undergraduate training in psychology to do graduate work in the chosen concentration.
4. Three acceptable letters of recommendation for graduate study from faculty members or other persons who have adequate knowledge of the applicant's professional qualities or potential for success as a graduate student.
5. A score of 400 (old format) or 146 (new format) on the verbal portion, and 400 (old format) or 140 (new format) quantitative portions of the General Record Examination (GRE) along with a 4.0 score on the analytical writing portion.

Satisfying minimal standards, however, does not guarantee your admission. Admission decisions are based on departmental review, using a combination of factors, including an interview to evaluate dispositions for professionals in the chosen concentration.

Students may be admitted with provisional status if they do not meet all of the criteria above but do meet the minimum requirements of the graduate school and are approved for provisional status by the departmental admissions committee. Provisional status will limit students to a maximum of nine (9) hours before the departmental admissions committee makes a recommendation for full admission. To advance from provisional to full admission a student must earn a 3.0 GPA on the nine (9) semester hours of graduate study in the concentration and be approved by the departmental admissions committee.

#### Evidence of English Language Proficiency

All applicants from countries in which the official language is not English are required to submit evidence of proficiency in English equivalent to level 9 in FLS.

## Master of Arts Degree Requirements

For all M. A. degree programs there is a core research requirement, including educational statistics, educational research, and either a problems course or a thesis, the hours ranging from 6 to 12 hours for this research component. At least 70% of the courses taken toward the degree must be at the 6000 level or above.

### Research Requirements for Master's Degree in the Department of Counseling and Psychology

<u>Non-thesis Option Required Courses</u>		<u>Thesis Option Required Courses</u>	
EDPY 6310 or EDPY 7310	3	EDPY 6310 or EDPY 7310	3
EDPY 6930	3	FOED 6920 or EDPY 7900	3
Guided Elective	3	EDPY 6990	6

## Specialist in Education Degree Admission Requirements

An earned master's degree from an accredited institution is required for admission to the Ed.S. program. The student seeking admission should have had previous experience appropriate to the proposed areas of specialization.

Requirements:

1. An overall quality point average of 3.5 earned in a master's degree program from an accredited institution.
2. A score range of 388-395 on the Miller Analogies Test (MAT) (raw score of 37 on tests taken prior to October 2004) or satisfactory scores on the GRE (a score of 900 on the verbal and quantitative portions and a 4.0 score on the analytical writing portion).
3. Three (3) letters of recommendation for graduate study from faculty members or other persons who have adequate knowledge of the applicant's professional qualities.

A student may be admitted to provisional standing with an earned master's degree from an accredited institution with a 3.00 quality point average and a score range of 380-387 on the Miller Analogies Test (MAT) (raw score of 31 on tests taken prior to October 2004) on the GRE (a score of 900 on the verbal and quantitative portions and a 4.0 score on the analytical writing portion). To advance from provisional to full admission, a student must earn a minimum 3.5 QPA on the first nine (9) hours of graduate study including six (6) hours in the major area and achieve a score range of 380-387 on the Miller Analogies Test (MAT) (raw score of 31 on tests taken prior to October 2004) or meet satisfactory scores on the GRE (a score of 900 on the verbal and quantitative portions and a 4.0 score on the analytical writing portion). More information on the Miller Analogies Test may be found at [www.milleranalogies.com](http://www.milleranalogies.com).

## Specialist in Education Degree Requirements

A minimum of 30 semester hours beyond the master's degree is required. At least 15 semester hours must be taken in courses numbered at the 7000 level; no courses below the 6000 level shall be counted for credit unless written approval is obtained from the student's advisory committee, the chairperson of the department in which the student is majoring, and the Associate Vice President for Research and Graduate Studies.

In the Department of Counseling and Psychology, a maximum of three (3)

semester hours of departmentally approved 5000-level credit may be included in a Specialist in Education Degree program of study.

### Research Component

Laboratory and/or Field Experience--3 semester hrs

Independent Study Project--3 semester hrs

## Department of Curriculum and Instruction

### Department of Curriculum and Instruction

**Jeremy Wendt, Interim Chairperson**

Graduate Faculty:

James E. Akenson

Holly G. Anthony

Jane Baker

Julie C. Baker

Jason Beach

Kathy Brashears

Amy B. Brown

Amy Callender

George Chitiyo

Helen Dainty

Laura Graves

Martha Howard

Janet K. Isbell

Nancy Kolodziej

David L. Larimore

Oneida L. Martin

Carl W. Owens

Kelly Ramey

Amy Rogers

Deborah Setliff

Sandi J. W. Smith

Julie Stepp

Leslie Suters

F. Leann Taylor

Kristen Trent

Jeremy Wendt

Stephanie Wendt

Dana Winningham

Lisa Zagumny

The department houses graduate programs at the Master of Arts and Specialist in Education levels in Curriculum and Instruction, with concentrations in

Curriculum

Early Childhood Education

Educational Technology (Master's level only)

Elementary Education

Library Science (Master's level only)

Music (Master's level only)

Reading

Secondary Education

Special Education

The program of Instructional Leadership is also housed within the department.

### Curriculum and Instruction Master of Arts Degree Admission Requirements

Students pursuing graduate study in the Department of Curriculum and Instruction have the option of three (3) types of programs leading to the Master of Arts degree. Licensure programs are those that require a teaching license for full admission and may lead to additional licensing. The non-licensure degree-granting programs do not necessarily require a teaching license for full admission nor do they lead to licensing. The postbaccalaureate program is for those whose undergraduate area is outside education or for those that do not have a teaching license but wish to become licensed.

#### Requirements for Admission in Full Standing (Licensure, Non-licensure, and Post-baccalaureate programs):

1. Overall undergraduate QPA of 2.5 or above upon completion of a baccalaureate degree program.
2. Three (3) current letters of recommendation from those who have adequate knowledge of the applicant's professional qualities or potential for success as a graduate student.
3. A minimum score of 380 on the Miller Analogies Test (MAT) (raw score of 31 on tests taken prior to October 2004) or a GRE Score of:
  - Exceed 150 on Verbal Reasoning and score 138 or above on Quantitative Reasoning AND a score of 4.0 and above is required on Analytical Writing;
  - OR
  - Exceed 141 on Quantitative Reasoning and score 143 or above on Verbal Reasoning AND a score of 4.0 or above is required on Analytical Writing.

#### Requirements for Admission in Provisional Standing (Licensure, Non-licensure, and Post-baccalaureate programs):

1. Overall undergraduate minimum QPA of 2.25 upon completion of a baccalaureate degree program.
2. Three (3) current letters of recommendation from those who have adequate knowledge of the applicant's professional qualities or potential for success as

a graduate student.

3. A score range of 372-379 on the Miller Analogies Test (MAT) (raw score of 27 on tests taken prior to October 2004) or a combined score of 900 on the verbal and quantitative portions of the General Record Examination (GRE) along with a minimum of 4.0 score on the analytical writing portion.

Students who do not meet the minimum required test scores will not be permitted to enroll for more than nine (9) hours in their first semester in their degree program.

**To advance from Provisional Standing to Full Standing a student must earn:**

1. (Licensure and Non-licensure) A minimum 3.0 QPA on the first nine (9) hours of graduate credit including six (6) hours in the major.
2. (Post-baccalaureate) A minimum 3.0 QPA on the first nine (9) hours of graduate study or on 12 hours of combination undergraduate/graduate study including six (6) hours in the major.
3. A score range of 372-379 on the Miller Analogies Test (MAT) (raw score of 27 on tests taken prior to October 2004) or a combined score of 900 or above on the verbal and quantitative portions of the General Record Examination (GRE) along with a minimum of 4.0 score on the analytical writing portion.

Students who do not meet the minimum required test scores will not be permitted to enroll beyond their first semester of enrollment in their degree program.

**Additional Admission Requirements for International Students (Licensure, Non-licensure, and Post-baccalaureate programs):**

International applicants must also meet the English Language Requirement by providing FLS Level 9 and test results on one (1) of the following:

TOEFL - minimum IBT of 71 (FLS not required with TOEFL)

IELTS - minimum score of 5.5

PTE Academic - minimum score of 48

**Curriculum and Instruction Master of Arts Degree Requirements**

For all M. A. degree programs there is a core research requirement, including educational statistics, educational research, and either a problems course or a thesis, the hours ranging from 6 to 12 hours for this research component. At least 70% of the courses taken toward the degree must be at the 6000 level or above.

**Research Requirements:**

Research requirements vary based on concentration.

**For concentrations in Curriculum, Early Childhood Education and Reading:**

<u>Problem Option Required Courses</u>		<u>Thesis Option Required Courses</u>	
FOED 6920 or FOED 6980	3	EDPY 6310 or EDPY 6350 or FOED 6920 or FOED 6980	3
CUED or ECED or ELED or READ or INSL 6900	3	CUED or ECED or READ or INSL 6990	3

**For concentrations in Elementary Education and Library Science:**

<u>Problem Option Required Courses</u>		<u>Thesis Option Required Courses</u>	
FOED 6920 or FOED 6980	3	EDPY 6310 or EDPY 6350 or FOED 6920 or FOED 6980	3
CUED or ECED or ELED or READ or INSL 6900	3	CUED or ECED or READ or INSL 6990	3

**For concentrations in Secondary Education:**

<u>Problem Option Required Courses</u>		<u>Thesis Option Required Courses</u>	
EDPY 6350 or FOED 6920 or FOED 6980	3	EDPY 6310 or EDPY 6350 or FOED 6920 or FOED 6980	3
CUED or ECED or ELED or READ or INSL 6900	3	CUED or ECED or READ or INSL 6990	3

**For concentrations in Special Education:**

<u>Problem Option Required Courses</u>		<u>Thesis Option Required Courses</u>	
EDPY 6310 or EDPY 6350 or EDPY 7310 or FOED 6980 or FOED 6980	3	EDPY 6310 or EDPY 6350 or EDPY 7310 or FOED 6920 or FOED 6980	3
SPED 6900	3	SPED 6990	3

**Curriculum****M.A. in Curriculum & Instruction, Educational Technology Concentration****Core Courses (All Required)**

CUED 6050 - Readings in Curriculum, Cr. 3.  
 CUED 6430 - Production of Instructional Materials, Cr. 3.  
 CUED 6440 - Emerging Technologies in Education, Cr. 3.  
 CUED 6450 - Internet Integration for Teaching and Learning, Cr. 3.  
 CUED 6460 - Constructivist Strategies for Classroom Instruction, Cr. 3.  
 FOED 6320 - Educational Applications of Technology, Cr. 3.  
 INSL 6560 - Technology for Administrators, Cr. 3.  
 Guided Elective, Cr. 3.

**Technology Focused Research Component (courses to be taken in order)**

FOED 6820 - Applied Educational Assessment, Cr. 3.  
 FOED 6920 - Educational Research, Cr. 3.  
 CUED 6900 - Problems in Curriculum, Cr. 3.

**M.A. in Curriculum & Instruction, Music Concentration****Core Courses (choose 2)**

CUED 6010 - Curriculum Development and Evaluation, Cr. 3.  
 CUED 6050 - Readings in Curriculum, Cr. 3.

CUED 7010 - Learning Theories, Cr. 3.  
 FOED 6020 - Perspectives in American Education, Cr. 3.  
 INSL 7010 - Instructional Leadership, Cr. 3.

**Total Hours for Core Courses: 6**

### **Research Component**

MUS 6010 - Research Techniques in Music, Cr. 3.  
 MUED 6920 - Topics, Cr. 3.

**Total Hours for Research Courses: 6**

### **Guided Electives\* (Music)**

MUS 4110 (5110) - History and Literature of Jazz, Cr. 2.  
 MUS 4120 (5120) - Contemporary Music, Cr. 2.  
 MUS 4150 (5150) - Computer Applications in Music, Cr. 3.  
 MUS 4250 (5250) - Recording Techniques, Cr. 2.  
 MUS 4400 (5400) - Composition, Cr. 1-3.  
 MUS 4500 (5500) - Conducting, Cr. 1-3.  
 MUS 4710 (5710) - Supervised Teaching Experience I, Cr. 1-3.  
 MUS 4720 (5720) - Supervised Teaching Experience II, Cr. 2.  
 MUS 6000 - Ensemble Performance, Cr. 1.  
 MUS 6010 - Research Techniques in Music, Cr. 3.  
 MUS 6100 - Proseminar in Style and Analysis, Cr. 3.  
 MUS 6110 - Score Study and Realization, Cr. 3.  
 MUS 6120 - Seminar in Music Education, Cr. 3.  
 MUS 6200 - Seminar in Music History, Cr. 3.  
 MUS 6220 - Survey of Literature for Homogeneous Ensembles, Cr. 3.  
 MUS 6330 - Advanced Choral/Instrumental Techniques, Cr. 3.  
 MUS 6400 - Applied Study, Cr. 1-2.  
 MUS 6800 - Graduate Recital Performance, Cr. 1.  
 MUS 6900 - Graduate Performance Document, Cr. 2.  
 MUED 4850 (5850) - Workshop in Music Education, Cr. 1-2.  
 MUED 6600 - Foundations of Music Education, Cr. 3.  
 MUED 6920 - Topics, Cr. 1-6.

**Total Hours for Elective Courses: 21**

*\*Only nine (9) hours of 5000 level courses may be counted toward the master's degree.*

## **Curriculum and Instruction Specialist in Education Degree Admission Requirements**

An earned master's degree from an accredited institution is required for admission to the Ed.S. program. The student seeking admission should have had previous experience appropriate to the proposed areas of specialization.

Requirements:

1. An overall quality point average of 3.5 earned in a master's degree program from an accredited institution.
2. A score range of 388-395 on the Miller Analogies Test (MAT) (raw score of 37 on tests taken prior to October 2004) or satisfactory scores on the GRE (a score of 900 on the verbal and quantitative portions and a 4.0 score on the analytical writing portion).
3. Three (3) letters of recommendation for graduate study from faculty members or other persons who have adequate knowledge of the applicant's professional qualities.
4. International applicants must also meet the English Language Requirement by providing FLS Level 9 and test results on one (1) of the following:
  - TOEFL - minimum IBT of 71 (FLS not required with TOEFL)
  - IELTS - minimum score of 5.5
  - PTE Academic - minimum score of 48

A student may be admitted to provisional standing with an earned master's degree from an accredited institution with a 3.00 quality point average and a score range of 380-387 on the Miller Analogies Test (MAT) (raw score of 31 on tests taken prior to October 2004) on the GRE (a score of 900 on the verbal and quantitative portions and a 4.0 score on the analytical writing portion). To advance from provisional to full admission, a student must earn a minimum 3.5 QPA on the first nine (9) hours of graduate study including six (6) hours in the major area and achieve a score range of 380-387 on the Miller Analogies Test (MAT) (raw score of 31 on tests taken prior to October 2004) or meet satisfactory scores on the GRE (a score of 900 on the verbal and quantitative portions and a 4.0 score on the analytical writing portion). More information on the Miller Analogies Test may be found at [www.milleranalogies.com](http://www.milleranalogies.com).

## Curriculum and Instruction Specialist in Education Degree Requirements

A minimum of 30 semester hours beyond the master's degree is required. At least 15 semester hours must be taken in courses numbered at the 7000 level; no courses below the 6000 level shall be counted for credit unless written approval is obtained from the student's advisory committee, the chairperson of the department in which the student is majoring, Dean of College of Education, and the Associate Vice President for Research and Graduate Studies.

### Specialist in Education Core Curriculum

CUED 6010-Curriculum Development and Evaluation, Cr. 3\*

EDPY 7200-Advanced Educational Psychology, Cr. 3\*\*

FOED 7020-Philosophy and Public Policy, Cr. 3\*\*\*

*\*CUED 6010 is not required of Ed.S. program in Reading Specialist and concentration in Reading.*

*\*\*EDPY 7200 is not required of Ed.S. program in Reading Specialist and concentration in Reading, Curriculum, and Early Childhood Education*

*\*\*\*FOED 7020 is not required of Ed.S. program in Reading Specialist and concentration in Reading*

### Specialist in Education Research Component

Laboratory and/or Field Experience, Cr. 3

Advanced Research Project, Cr. 3

## Instructional Leadership

### Instructional Leadership Program

**Dana Winningham, Chairperson**  
Graduate Faculty:  
Gwen Hobbs  
Oneida Martin  
Dana Winningham

### Admission Process for TTU's Initial License INSL Program

1. A valid TN teaching license and three (3) years teaching experience required
2. Successfully complete admission process for TTU Graduate School
3. Receive notification from TTU Graduate School indicating full admission status and assignment of a T#
4. Complete online Declaration of Intent for INSL Program
5. Complete online Request for Disposition Assessments for INSL Program (INSL candidates do not need to submit three (3) letters of recommendation to the Graduate School)

6. Receive notification from TTU INSL Program unit indicating status of Intent
7. Schedule INSL Program Interview and prepare INSL Program Portfolio to bring to Interview

### Portfolio Contents

- Copy of TN State Department of Education Educators License Information page located at the following address: <https://www.k-12.state.tn.us/tcertinf/EducatorSearch.asp>
- Copy of most recent LEA Performance Appraisal Record
- Copy of current Professional Development Plan (PD Plan/Future Growth Plan)
- Copy of Experience Verification Form (signed by the appropriate LEA personnel) located at the following address: <http://www.state.tn.us/education/lic/doc/ed2034a.pdf>
- Evidence of your ability to improve student achievement
- Evidence of leadership demonstrated in coaching other teachers to raise student achievement (assessment scores, performance appraisals, etc.)

### Master of Arts Admission Requirements for the TTU Graduate School

- Satisfactory test scores on either the Miller Analogies Test (MAT) (372 minimum for provisional standing and 380 minimum for full standing) or the General Record Exam (GRE) (900 total on the verbal/quantitative portions and 4.0 on the analytical writing portion)
- Official transcripts from your bachelor's institution and any other institutions attended
- Grade Point Average on Bachelor's degree of at least 2.50
- Successful screening from four (4) Disposition Assessments - submitted electronically to INSL database

Degree Program Completion: Requires submission of passing score on State Licensing Exam for TN Learning Centered Leadership System.

### Curriculum

INSL 6560 - Technology for Administrators, Cr. 3.

#### Core Courses

INSL 6510 - School Leadership, Law, Ethics, and Diversity, Cr. 6.

INSL 6520 - School-Based Management and Community Relations, Cr. 6.

INSL 6530 - Data Driven Curriculum: Development, Assessment and Eval., Cr. 6.

#### Candidacy Required for the Following Courses

INSL 6540 - Seminar in INSL: Effective Teaching and Supervision, Cr. 6.

INSL 6550 - Internship and Culminating Experience in INSL, Cr. 6.

### Specialist in Education Admission Requirements for the TTU Graduate School

- Satisfactory test scores on either the Miller Analogies Test (MAT) (380 minimum for provisional standing and 388 minimum for full standing) or the General Record Exam (GRE) (900 total on the verbal/quantitative portions

and 4.0 on the analytical writing portion)

- Official transcripts from your bachelor's and master's institutions and any other institutions attended
- Grade Point Average on Master's degree of at least 3.0
- Four (4) satisfactory disposition assessments submitted to the INSL database

Degree Program Completion: Requires submission of passing score on State Licensing Exam for TN Learning Centered Leadership System.

## Curriculum

### Core Courses

INSL 7510 - School Leadership Law and Ethics, Cr. 6.

INSL 7520 - Human Resources Management and Public Relations, Cr. 6.

INSL 7530 - Assessment and Evaluation: Improvement in Teaching, Cr. 6.

### Candidacy Required for the Following Courses

INSL 7540 - INSL Seminar: School-Based Leadership and Supervision, Cr. 6.

INSL 7550 - INSL Apprenticeship and Portfolio Development, Cr. 6.

## Department of Exercise Science, Physical Education, and Wellness

### Department of Exercise Science, Physical Education, and Wellness Christy Killman Chairperson

Graduate Faculty:

LeBron Bell

R. Michael Cathey

Christy Killman

Mike Phillips

LaNise Rosemond

The department houses a Master of Arts program in Exercise Science, Physical Education, and Wellness, with areas of emphasis in elementary and middle school physical education, physical education licensure, fitness and lifetime wellness, and adapted physical education. The elementary and middle school program and the licensure program are accredited by the National Council for the Accreditation of Teacher Education (NCATE). This program is 100% online. The graduate program is designed to offer professional training for teachers, coaches, and fitness specialist wellness professionals.

Graduate students in EXPW can choose one (1) of four (4) concentrations.

**Sport Management.** This program is designed for students who desire to work as an administrator in the sports industry, professional and college sports teams. Elementary and Secondary Physical Education. This program is designed for students with a current license in physical education who want to pursue additional study in the field.

**Licensure.** This program is designed for students who are pursuing either initial licensure or an add-on endorsement in physical education. Students pursuing this program must also consult with the Office of Teacher Education to prepare a program contract.

**Fitness and Wellness.** This program is designed for students interested in health, wellness or performance aspects of physical activity and training. This program focuses on practical application rather than clinical rehabilitation.

**Adapted Physical Education.** This program is designed for students interested in leading adapted physical activity programs for individuals with disabilities.

## Master of Arts Admission Requirements

### Admission Requirements for Provisional Standing:

- Undergraduate GPA of 2.25
- Three (3) current letters of recommendation from those who have supervised a previous education or work experience
- A letter describing interest in program and future professional goals
- Official test scores on the MAT (372 minimum) or GRE (900 total on the verbal/quantitative portions and 3.5 on the analytical writing portion)

**Admission Requirements for Full Standing:**

- Undergraduate GPA of 2.50
- Three (3) current letters of recommendation from those who have supervised a previous education or work experience
- A letter describing interest in program and future professional goals
- Official test scores on the MAT (380 minimum) or GRE (900 total on the verbal/quantitative portions and 4.0 on the analytical writing portion)

Graduate students in EXPW are required to participate in an initial on-campus orientation before starting classes. Orientations are offered on specific Saturdays in August, January, and May prior to the start of the academic term. The orientation addresses the online course management system, outlines course sequences for each program of study, and provides an overview of appropriate online academic practices. Students are also required to take comprehensive exams on campus.

## Master of Arts Degree Requirements

For all M. A. degree programs there is a core research requirement, including educational statistics, educational research, and either a problems course or a thesis, the hours ranging from 6 to 12 hours for this research component. At least 70% of the courses taken toward the degree must be at the 6000 level or above.

### Curriculum

#### Core Courses

EXPW 6220 - Technology in Physical Education, Cr. 3.  
 EXPW 6240 - Assessment in Physical Education, Cr. 3.  
 EXPW 6250 - Applied Motor Development and Motor Learning, Cr. 3.

#### Research Requirements for Master's Degrees in the Department of Exercise Science, Physical Education, and Wellness

<u>Problem Option Required Courses</u>		<u>Thesis Option Required</u>	
EXPW 6510	3	EXPW 6510	3
EXPW 6520	3	EXPW 6990	3

#### Electives

EXPW 5500 - Perspectives on Physical Education, Fitness and Sport Prog., Cr. 3.  
 (Required for those students who do not hold an undergraduate major in Physical Education.)  
 EXPW 5940 - Fitness and Wellness, Cr. 3.  
 EXPW 6140 - Assessment and Strategies for Adapted Physical Education, Cr. 3.  
 EXPW 6590 - Field Experience, Cr. 1-3.  
 EXPW 6600 - Special Topics, Cr. 1-3.

**Concentrations*****Sport Management***

EXPW 5940 - Fitness and Wellness, Cr. 3  
 EXPW 6240 - Assessment in Physical Education, Cr. 3  
 EXPW 6590 - Field Experience, Cr. 3  
 EXPW 6710 - Leadership and Management in Sport, Cr. 3  
 EXPW 6720 - Legal, Ethical & Risk Management Issues in Sport Mgmt., Cr. 3  
 EXPW 6730 - Administration and Supervision of Sport, Cr. 3  
 EXPW 6740 - Sport Marketing and Promotions, Cr. 3  
 EXPW 6750 - Design & Management of Leisure & Sport Facilities, Cr. 3  
 EXPW 6760 - Internship in Sport Management, Cr. 3

***Elementary & Middle School Physical Education***

EXPW 6140 - Assessment and Strategies for Adapted Physical Education, Cr. 3.  
 EXPW 6210 - Curriculum Design in Physical Education, Cr. 3.  
 EXPW 6350 - Instructional Strategies for Physical Education, Cr. 3.  
 EXPW 6450 - Teaching Middle School Physical Education, Cr. 3.

***Fitness and Lifetime Wellness***

EXPW 5940 - Fitness and Wellness, Cr. 3.  
 EXPW 6042 - Wellness Promotion, Cr. 3.  
 EXPW 6440 - Physiology of Exercise, Cr. 3.  
 EXPW 6590 - Field Experience Cr. 1-3.  
 Elective 3 hours

***Adapted Physical Education***

SPED 6060 - Education of Orthopedic and Motor Impaired Cr. 3.  
 EXPW 6140 - Assessment and Strategies for Adapted Physical Education Cr. 3.  
 EXPW 6590 - Field Experience Cr. 1-3.  
 Electives 6 hours

***Licensure***

EXPW 6140 - Assessment and Strategies for Adapted Physical Education, Cr. 3.  
 EXPW 6210 - Curriculum Design in Physical Education, Cr. 3.  
 EXPW 6350 - Instructional Strategies for Physical Education, Cr. 3.  
 EXPW 6440 - Physiology of Exercise, Cr. 3.  
 EXPW 6450 - Teaching Middle School Physical Education, Cr. 3.  
 Elective 3 hours

## Department of Music and Art

**Department of Music and Art****Jennifer S. Shank, Chairperson**

Graduate Faculty:

Gregory Danner  
 Charles Decker  
 Eric Harris  
 Joshua Hauser  
 Joseph W. Hermann  
 Frederick Kennedy  
 Chris McCormick  
 R. Winston Morris  
 Joseph Rasmussen  
 Judith Sullivan  
 Craig Zamer

No degree is offered in Music but courses may be used (with advisory committee approval) as electives in other fields of study.

## College of Engineering

The College of Engineering offers programs leading to the degrees of Master of Science and Doctor of Philosophy in Engineering. The Master of Science is offered with majors in computer science, chemical engineering, civil engineering, electrical engineering, and mechanical engineering. The Doctor of Philosophy in Engineering is an interdisciplinary degree program under the direction of advisory committees that are interdepartmental in nature. The Doctor of Philosophy in Engineering offers specialization in computer science, chemical engineering, civil engineering, electrical and computer engineering, and mechanical engineering.

Each M.S. and Ph.D. student has an advisory committee of faculty members which helps to guide the student's studies and progress toward completion of degree requirements. The chairperson of the committee, who must be a faculty member from the department in which the student is majoring, has special responsibility to assist the student with development of an individualized program of study and appropriate research goals.

The College of Engineering operates two (2) state supported Centers of Excellence: Manufacturing Research and Energy Systems Research. State-of-the-art facilities are available through these centers for graduate student research projects. In the Center for Energy Systems Research, computer and laboratory facilities exist to perform engineering and economic modeling for the design of power plants and electrical distribution and transmission systems. The Manufacturing Center maintains extensive computer-aided design (CAD) and computer-aided manufacturing (CAM) capabilities. In addition to computer modeling capabilities, the Water Resources Center (state supported and operating under the Office of Research & Economic Development) has an EPA-certified water analysis laboratory.

The Chemical Engineering Department maintains research facilities in energy conservation, mass transfer, computer-aided process design, distillation, polymers, and physical properties. Within the Civil and Environmental Engineering Department and the Water Resources Center are excellent facilities for water and industrial-waste treatment research, chemical analyses, soils and structural engineering, stress analysis, and transportation materials. Among the excellent facilities in the Electrical and Computer Engineering Department and the Electric Power Center are laboratories for antennas, digital systems, plasmas, lasers, power-system simulation and training, robotics, telecommunication and signal processing, gaseous electronics, and nuclear engineering. Mechanical Engineering Department, the Electric Power Center, and the Manufacturing Research Center have extensive facilities for noise control, combustion engines, computer-aided design, fluid dynamics, heat transfer, machine design, material sciences and solar engineering.

Financial aid is available through individual departments and centers in the form of teaching or research assistantships. Full assistantships pay tuition and fees plus a monthly stipend. Partial assistantships, which pay a prorated share of tuition, fees, and a monthly stipend, are sometimes awarded. (See College's Peterson's guide for current range of pay rates.) A limited amount of support is available during the summer months. Approximately 85% of engineering graduate students received assistantships during part or all of the duration of their studies.

### Master of Science Admission Requirements

An applicant for admission to any of the MS programs offered by the departments of the College of Engineering is expected to have earned a BS degree from an approved program, or its equivalent. The basic admission standards for each department are the same:

- undergraduate GPA of at least 3.0 on a 4.0 scale,

**Joseph J. Rencis, Dean**

**Roy Loutzenheiser, Associate  
Dean for Academic Affairs**

**Vahid Motevalli, Associate  
Dean for Research and  
Innovation**

### Departments in the College of Engineering

Department of Chemical Engineering  
Department of Civil and Environmental  
Engineering  
Department of Computer Science  
Department of Electrical and Computer  
Engineering  
Department of Manufacturing and  
Engineering Technology  
Department of Mechanical Engineering

### Degrees available in the College of Engineering

Doctor of Philosophy, Engineering

Master of Science  
Chemical Engineering  
Civil Engineering  
Computer Science  
Electrical and Computer Engineering  
Mechanical Engineering

Professional Science Masters  
Manufacturing Sustainability

- GRE® General Test (GRE) scores with Quantitative greater than or equal to 50%; Verbal greater than or equal to 33%; Analytical Writing greater than or equal to 33%. Students with BS degrees in related fields from TTU are not required to take the GRE.
- Three (3) letters of recommendation that demonstrate strong evidence for success in the graduate program.
- Availability of appropriate faculty to serve as research advisor(s).
- Participation in undergraduate research.
- Post-BS degree professional experience relevant to planned degree of study.
- Publications in peer reviewed journals and/or award-winning presentations in technical conferences.
- International students must score at least 550 (213 computer-based or 79 internet-based) on the TOEFL or a minimum base score of 5.5 on the IELTS.

Based on the level of satisfaction of the above criterion, the department will either recommend admission to Full Standing, Provisional Standing, or Special Standing, or deny admission. Standing status may be changed to Full Standing after the student satisfies the requirements specified by the department at the time of admission.

### **Master of Science Degree Requirements**

A master's degree is a certification that the recipient is able to read with understanding and apply with profit the literature of his/her field. The general requirements for an MS degree are the same for all departments: development and completion of a program of study which includes a minimum of 24 semester hours of course credits and at least six (6) semester hours of thesis. All pertinent regulations of the Graduate School apply.

Listed below are College of Engineering regulations that are clarifications of, or additions to, those promulgated by the Graduate School. Additional information can be found in the listings of the individual departments.

#### **Advisory Committee**

Every master's student is required to have an advisory committee having a minimum of three (3) members. The student is responsible for identifying, in consultation with the departmental chairperson, a faculty member who is willing to chair his/her advisory committee. In consultation with the chairperson of the committee, the student is responsible for identifying at least two (2) other faculty members who are willing to serve on his/her committee. Advisory committees may include more than three (3) members. If desired or required, two (2) members of the committee may serve as co-chairs of the committee rather than the committee having one (1) chair. If a student is not able to identify a sufficient number of faculty who are suitable and willing to serve on his/her advisory committee, the student will be advised by the departmental chairperson that he/she should either change his/her area of research interests to more closely match those of the available faculty or consider selecting another major. Failure to be able to form a committee is cause for transfer to nondegree status. Further regulations concerning the membership, appointment and responsibilities of a student's advisory committee are given in other sections of the catalog, including the sections on "Organization of the Graduate School" and "Degree Requirements."

#### **Thesis/Comprehensive Examination**

A thesis is required in all majors with the Department of Electrical and Computer Engineering also offering a non-thesis option. A candidate for a master's degree must submit a thesis in writing and orally present and defend the thesis to his/her advisory committee. The meeting at which the thesis presentation and

defense occurs also serves as the time for the student's final oral comprehensive examination over any or all aspects of the student's master's program. On the form on which the chairperson of the student's advisory committee reports the results of the thesis defense, the chairperson also reports the results of the comprehensive examination, including a brief synopsis of the examination.

#### **Limitations on Financial Aid**

A master's student may receive support during the first two (2) calendar years after initial enrollment. This time limitation does not imply a student will receive support during his/her first two (2) years. Whether or not a student receives support depends on the availability of funds and the suitability of the student to carry out the responsibilities associated with the support. Support beyond the stated limits requires justification, which must be reviewed and approved by the Associate Dean of Engineering for Graduate Studies and Research prior to the implementation.

## Engineering, Ph.D.

### **Doctor of Philosophy Admission Requirements**

A graduate program leading to a Doctor of Philosophy (Ph.D.) degree in Engineering is offered by the College of Engineering. When applying for admission, a student must state on the application the specialization area of study for which admission is requested.

The basic admission standards for the Ph.D. program are the same as for the MS programs, except that, additionally, an applicant is expected to have completed an MS degree in an academic area appropriate to the proposed area of study and to have earned an MS GPA of at least 3.5 on a 4.0 scale.

Though the general requirement for admission to the Ph.D. program is a master's degree in an appropriate discipline, students with a bachelor's degree may be admitted to the Ph.D. program directly on exceptional basis, provided the applicant has a record of excellent academic performance in an appropriate engineering program undergraduate program. The applicant's test scores, personal recommendations, and relevant work experience must indicate a high potential for success in doctoral studies and research. In addition, factors such as appropriateness of the applicant's research objectives to the research interests of the program faculty, availability of faculty to supervise the applicant's research, and prior research accomplishments of the applicant will also influence the admission decision.

Fulfilling the minimum requirement does not guarantee admission; an applicant who does not meet the above minimum, but appears to have reasonable potential for success as a Ph.D. student, may be admitted to provisional standing. His/her status may be changed to full standing after satisfying requirements specified by the Associate Dean of Engineering for Graduate Studies and Research, in consultation with the appropriate departmental chairperson, at the time of admission.

If admitted in provisional standing at either the MS or Ph.D. level, the student must remove all deficiencies and apply for reclassification to full standing prior to the completion of 15 graduate hours.

Sometimes a master's-level student takes more graduate-level courses than are required for the degree because the student is expecting to continue on to the Ph.D. program and hopes to use the extra courses to satisfy the Ph.D. coursework requirement. When this is the case, the student can request when registering for the course(s) that the course(s) be "banked" for the Ph.D. program. If the student lacks no more than 12 semester hours on the master's degree,

he/she may accumulate a maximum of nine (9) semester hours which may be applied toward the Ph.D. When this is the case, the student's advisory committee must initiate approval via memo with consensus of the departmental chairperson, dean of the college, and the Associate Vice President of Research and Graduate Studies. Banked courses then show up on the student's transcript as courses taken for the Ph.D. rather than being shown as a part of his/her M.S. program. Banking course does not guarantee admission to the Ph.D. program, or, if admitted, that the student's Ph.D. advisory committee will approve the course as part of the student's Ph.D. program of study.

## Doctor of Philosophy Degree Requirements

### Students Admitted with a Master's Degree

The Ph.D. is a research degree. The general requirements for a Ph.D. degree in Engineering are the same for all departments:

1. A minimum of 48 credits of course work and doctoral research and dissertation as follows:
  - a. A minimum of 18 semester credits of course work beyond the master's degree, including six (6) semester credits of 7000-level course work acceptable to the student's advisory committee. Additional six (6) semester credits of either graduate level course work or research experience as per the policy of the student's major department. No 5000-level courses are to be used to meet the minimum requirements of course work, and no directed study courses (xxx7980) are to be used to meet the 7000-level course requirement.
  - b. The equivalent of 24 semester credits of doctoral research and dissertation built upon the student's course of study and making a significant contribution to the state of knowledge or to the art of the engineering profession, is required; not more than nine (9) credits may be earned in a particular semester.
2. Residence of four (4) semesters beyond the master's degree, with at least two (2) semesters in continuous residence, is required. All requirements, including the dissertation, must be completed within a period of eight (8) consecutive years.
3. Maintenance of a minimum quality point average of 3.0 and adherence to the general regulations of the Graduate School are expected.

All students in the program must follow a plan of study and research developed in conjunction with an advisory committee, satisfactorily complete a comprehensive examination, achieve candidacy, and satisfactorily defend the dissertation.

### Students Admitted Directly from the Bachelor's Degree

A student admitted with a bachelor's degree on exceptional basis, must successfully complete a qualifying examination based mostly on undergraduate materials before the end of the second semester of enrollment. This examination will be aimed at determining the student's mastery of the basic concepts in the discipline and the potential for successfully conducting research at the doctoral level. Based on the student's performance on the qualifying examination, the student may be (i) permitted to continue in the Doctoral Program, or (ii) advised to transfer to a MS degree program in an appropriate discipline in the College, or (iii) recommended for termination from the graduate program of the College.

If permitted to continue in the doctoral program, the student, as described elsewhere in the catalog, will select a research advisor, form an advisory committee, and submit a program of study satisfying the following requirements.

The program of study should have a minimum total of 72 semester credit hours of academic work, consisting of course work and dissertation work, beyond baccalaureate work, subject to the following:

- The program of study should include a minimum of 42 semester credits of appropriate graduate level course work consisting of a minimum of six (6) semester credits at the 7000-level and a maximum of nine (9) semester credits at the 5000-level, acceptable to the student's advisory committee.
- It should also include an additional six (6) semester credits of either graduate level course work or research experience as per the policy of the student's major department.
- No directed study courses at 7000-level (xxx7980) are to be used to meet the six (6) credits of 7000-level course requirement.
- A minimum of 24 semester credit hours of doctoral research and dissertation, built upon the student's course of study and making significant contribution to the state of knowledge and the art of the engineering profession, is required; no more than nine (9) credit hours may be earned in a particular semester.

### **Advisory Committee**

Each Ph.D. student's advisory committee will have a minimum of five (5) voting members with at least three (3) members from the student's major department and at least one (1) member from outside the department. The College of Engineering's Associate Dean for Graduate Studies and Research will serve as an ex officio, nonvoting member. The student is responsible for identifying, in consultation with the departmental chairperson and Associate Dean, a faculty member who is willing to chair his/her advisory committee. In consultation with the chairperson of the committee, the student is responsible for identifying the other faculty members required/desired and determining if they are willing to serve. Advisory committee is permitted to have more than the minimum number required. Normally one (1) faculty member will serve as the chair. If the proposed research work is interdisciplinary, or if the initial chair retires, experiences health problems, or for some other cannot continue to perform all of the duties of the chair, the student may request that a cochair be appointed. The request should be made in writing to the Associate Vice President for Research and Graduate Studies, via the Departmental Chair and the Associate Dean of Engineering for Graduate Studies and Research. If a student is not able to identify a sufficient number and type of faculty who are suitable and willing to serve on his/her advisory committee, the student will be advised by the Associate Dean that he/she should either change his/her area of research interest to more closely match those of the available faculty or consider selecting another major. Failure to be able to form a committee is a cause for transfer to nondegree status. Further regulations concerning the membership, appointment, and responsibilities of the advisory committee are given in other sections of the catalog, including the sections on "Organization of the Graduate School" and "Degree Requirements."

### **Program of Study**

All students will undergo a preliminary assessment during their semester of enrollment. The purpose of the preliminary assessment is to determine the strengths and weaknesses of the newly admitted student so that a program of study could be tailored to prepare the student for advanced course work and independent research. Each department will make an objective assessment of the student's strengths and weaknesses, and the program of study should reflect such assessment. The department may employ a written examination or other objective instruments to make this assessment. Each department is required to develop its own policy in this regard and submit it to the Engineering Graduate Committee. The preliminary assessment must be done before the end of the second semester of enrollment for the degree. A memo from the chairperson of the department should accompany the student's program of study to the Associate Dean of Engineering for Graduate Studies stating the results of the preliminary assessment of the student.

The plan of study is specified in the student's Program of Study. The Program of Study shall include a minimum of 24 semester credits of coursework beyond the master's. The Program of Study will also include a list of background,

graduate-level courses taken prior to enrollment in the Ph.D. program. If the student has not taken at least 24 semester credits of appropriate (timely and relevant) background courses (as determined by the advisory committee), the student will be required to take additional courses either as background courses or in addition to his/her required minimum of 24 semester credits of coursework beyond the masters. These additional courses will be shown appropriately on the Program of Study. All courses shown on the Program of Study, including background courses, are indicators of the student's depth and breadth of knowledge in the discipline and shall be considered by the committee when designing the written part of the student's comprehensive examination. In determining the time limits for taking the comprehensive examination, for earning the degree, and for determining eligibility for financial aid, the time that the background courses were completed shall not be considered.

Each proposed Program of Study must be approved by the student's advisory committee, the departmental chairperson, the Associate Dean of Engineering for Graduate Studies and Research, and the Associate Vice President for Research and Graduate Studies. There will be a hold placed on a student's registration if his/her Program of Study has not been filed in the Graduate School office by the time 15 semester hours have been earned.

### **Comprehensive Examination and Admission to Candidacy**

The comprehensive examination will consist of a written part and the presentation and oral defense of the research proposal. The written examination will consist of several parts as appropriate to the engineering major discipline and the research area. This examination will be to test the student's breadth of knowledge in the discipline, depth of knowledge in selected areas, and the ability to integrate the knowledge acquired from several courses. This examination must be given after the student has completed at least 80% of the coursework beyond the master's degree, as prescribed in the program of study. However, the written comprehensive examination should be completed before the end of the semester following completion of the coursework prescribed in the program of study. The extension of this deadline is possible with the appropriate justification. A student desiring an extension shall make a request in writing to the Associate Dean of Engineering for Graduate Studies and Research. The request must include justification and a schedule for completion. If the student is not satisfied with the decision of the Associate Dean, the decision may be appealed to the Engineering Graduate Committee, with the Dean of Engineering substituting for the Associate Dean as chair of the committee.

All parts of the written examination should be completed within a period of two (2) weeks. Other details of this examination, including format, content, method of evaluation and timing, will be left to the discretion of the committee. All voting members of the committee should participate in evaluating the student's performance in the written parts of the examination.

The written research proposal should, as a minimum, consist of the development of the research problem from the extant knowledge in the area, the approach and methodology to be followed, the expected original contribution to the extant knowledge and the expected timeline for the completion of the research. The student should submit copies of written proposal to the committee within 30 days from the date of taking the final part of the written examination, and the proposal defense will be scheduled shortly thereafter. The student will be informed of the results of the entire comprehensive examination (written part and proposal presentation) at the end of the defense of the research proposal.

On passing the entire comprehensive examination, the student will become an official candidate for the doctoral degree. Normally, a student not passing any part of the comprehensive examination will not be permitted to continue in the doctoral program. However, at the request of the student, the committee may agree to give a second chance to the student to pass that part of the written examination that he/she did not pass. The committee may prescribe additional

academic work to be undertaken by the student prior to making the second attempt. No student will be permitted to continue in the program if he/she does not successfully complete all parts of the comprehensive examination after the second attempt.

#### **Limitation on Financial Aid**

It is expected that a Ph.D. student should be able to achieve candidacy within the first three (3) calendar years after enrollment. After year three (3), a student will not be eligible for an assistantship if he/she has not attained candidacy. Under unusual circumstances, an exception may be granted by the Associate Dean of Engineering for Graduate Studies and Research.

#### **Other Information**

The Associate Dean of Engineering for Graduate Studies and Research is the head of the Ph.D. program in engineering. A new student in the program is expected to report to the Associate Dean prior to initial registration. Students or faculty having questions about the program should direct them to either the appropriate departmental chairperson or the Associate Dean, or both.

Two (2) levels of graduate courses may be taken to meet the minimum requirement of 24 semester hours of course work: 6000-level and 7000-level. The College of Engineering defines these two (2) levels as follows:

- **6000-level Courses**—Courses at the 6000-level may present either fundamental knowledge of a subject with some mathematical rigor or a broad range of topics in a subject leading to state of the art material. The courses should promote self study, literature search, and critical analysis, syntheses and evaluation of ideas, concepts and techniques. Students who take a 6000-level course should be required to possess some basic understanding of the subject at the level of at least junior undergraduate courses.
- **7000-level Courses**—Courses at the 7000-level are built on the fundamental knowledge acquired through 6000-level courses. At least one (1) 6000-level course shall be a prerequisite. Courses at the 7000-level shall present state of the art advanced material in a focused area of a subject. The student should be expected to acquire the latest knowledge and techniques of the subject. These courses should be conducted such that critical analysis, synthesis and evaluation skills are developed.

## Department of Chemical Engineering

The Master of Science degree program in the Department of Chemical Engineering is available to individuals who have completed a BS degree in Chemical Engineering or a closely allied field. The MS program's technical content and research component prepares the individual to enter the profession with advanced engineering skills.

Graduate students pursuing the MS degree develop a program of study tailored to their objectives and complete a master's thesis. Research topics in the areas of electric field-based processes and systems, biological engineering processes and systems, molecularly-based engineered materials and interfacial systems, and computational mathematics are among those available.

The faculty of the Department of Chemical Engineering actively participates in the Doctor of Philosophy program in Engineering. Admission to the doctoral program is open to individuals with outstanding academic records and potential for original research. The departmental faculty and graduate students work cooperatively with the three (3) State funded Centers of Excellence: two within the College of Engineering and one under the Office of Research & Economic Development.

**Department of  
Chemical Engineering**  
**Pedro E. Arce, Chairperson**  
Graduate Faculty:  
Pedro E. Arce  
Joseph J. Biernacki  
J. Robby Sanders  
Holly A. Stretz

## Departmental Degree Requirements

To receive an MS degree in CHE the student should complete all the MS requirements specified by the University and the College of Engineering.

## Department of Civil and Environmental Engineering

### **Department of Civil and Environmental Engineering**

**Benjamin J. Mohr, Interim  
Chairperson**

Graduate Faculty:

Daniel A. Badoe

Steven M. Click

L. K. Crouch

R. Craig Henderson

Faisal Hossain

David H. Huddleston

X. Sharon Huo

Y. Jane Liu

Roy C. Loutzenheiser

Jessica O. Matson

Benjamin J. Mohr

Francis O. Otuonye

Guillermo Ramirez

Edmond P. Ryan

James R. Smith

Lenly J. Weathers

The Department of Civil and Environmental Engineering offers advanced studies leading to the Master of Science degree in Civil Engineering and the Doctor of Philosophy degree in Engineering with specialization in Civil Engineering. The goals of the Ph.D. program are listed under the College of Engineering and administered by the Associate Dean of Engineering for Graduate Studies and Research. The goal of the MS program is to provide the strong academic programs necessary to prepare students to become educated members of society who can join and make significant contributions to the civil engineering profession.

This is accomplished by allowing MS graduate students to specialize in specific engineering topics through advanced and in-depth studies in these topics; by providing guidance to students in fundamental and applied research; by helping them to develop powers of analysis, synthesis and critical thinking; and by preparing outstanding graduate students to continue academic and research careers through doctoral-level studies.

The department offers the Master of Science Degree in Civil Engineering with concentrations in environmental engineering, structural engineering, and transportation engineering. The departmental faculty have expertise and conduct research in the following areas: environmental and water resources engineering; structural engineering, transportation and paving materials; engineering mechanics; and computational mechanics. Faculty advisors assist graduate students in developing individual programs of study depending on their career goals and thesis research interests. The student's advisory committee assists the student in the development and execution of the program of study and monitors and evaluates the student's work towards the degree.

Many departmental faculty actively participate in research related to the three (3) Centers of Excellence operated within the University: two within the College of Engineering and one under the Office of Research & Economic Development. The resources and facilities of the Centers greatly enhance the graduate program of the Department.

### **Fast Track M.S. Program**

The Fast Track M.S. Program in Civil Engineering will provide an opportunity for promising CEE undergraduate students to accelerate the completion of the M.S. by allowing undergraduates to accumulate up to six (6) credit hours of graduate coursework while still pursuing their undergraduate degree and to transition to the graduate program smoothly. Up to six (6) hours of graduate coursework, exclusive of directed study, taken during the student's senior year can be used to satisfy both undergraduate and graduate degree requirements. These courses must be taken at Tennessee Tech University and must be approved as appropriate substitutions in the undergraduate curriculum for senior CEE electives.

Students must apply to the CEE Fast Track M.S. program by the end of their second junior Term. Students must apply and take the GRE during their second senior term (one [1] semester prior to their anticipated graduation). The CEE Fast Track students should be aware that they need to consult with their future M.S. advisor for the 5000-level courses taken during their senior terms, especially for the courses not in their area of concentration.

The minimum requirements for acceptance into the Fast Track program are:

- Enrolled in TTU Civil Engineering student with Junior or Senior standing
- Overall GPA of 3.25 and a GPA for CEE courses of at least 3.5
- Recommendation of a CEE faculty mentor
- All requirements for admission to Graduate School must be met upon graduation

### **Departmental Admission Requirements**

The minimum requirements for admission to the MS program are the same as those for any MS program in the College of Engineering and are stated under the College of Engineering listing. The program is designed for graduates of approved undergraduate programs. Thus a baccalaureate degree in civil engineering is required for full standing. Applicants that have an undergraduate degree in a closely related field will be evaluated on a case-by-case basis and may be admitted to full standing upon completion of identified background courses.

For the admission requirements to the Ph.D. program, please refer to the College of Engineering program listing elsewhere in this catalog.

### **Departmental Degree Requirements**

To receive an MS degree in CEE, the student should complete all the MS requirements specified by the University and the College of Engineering. Additionally, certain departmental requirements listed below shall also be satisfied:

#### **MSCE with Thesis Option**

An MSCE program of study with thesis option requires a minimum of 25 semester hours of graduate-level coursework which are on the program of study approved by the student's graduate advisory committee, one semester hour of CEE 6910 CEE graduate seminars, and a minimum of six (6) hours of thesis completed under the supervision of the graduate advisor. At least 15 credit hours of graduate coursework must be CEE courses. The required thesis should document the student's research to the satisfaction of both the student's graduate advisory committee and the Graduate School. The student must also successfully defend his/her thesis before the graduate advisory committee. A minimum GPA of 3.0 is also required. Other departmental requirements may apply.

#### **MSCE with Non-thesis Option**

An MSCE program of study with non-thesis option requires a minimum of 34 credit hours of graduate course work, as specified in the student's approved Program of Study. The program of study shall include 30 semester hours of graduate-level coursework, one semester hour of CEE 6910 - CEE Graduate Seminar, and three (3) semester hours for CEE 6980 Special Topics (Project Work) course. At least 15 credit hours of graduate coursework exclusive of CEE 6980 must be CEE courses. The Special Topics course will demonstrate the student's capability to engage in independent learning. Non-thesis MSCE students will have to submit a project report on CEE 6980, present the project results, and pass an oral comprehensive exam. Other departmental requirements may apply.

## Departmental Degree Requirements for Specialization in Doctor of Philosophy

Requirements for the Ph.D. degree in Engineering may be satisfied with a primary emphasis in civil engineering. The degree requirements for the Ph.D. degree are given in the College of Engineering listing. In addition, all candidates must take at least two (2) hours of CEE 6910 - CEE Graduate Seminar.

### Department of Computer Science

**Doug A. Talbert, Chairperson**

Graduate Faculty:

Mark Boshart  
William Eberle  
David Elizandro  
Sheikh Ghafoor  
David Hume  
Martha J. Kosa  
Michael Rogers  
Stephen Scott  
Ambareen Siraj  
Doug A. Talbert

## Department of Computer Science

The Department of Computer Science offers advanced studies leading to the Master of Science degree in Computer Science with a concentration in Internet-Based Computing. Our M.S. degree program in computer science is driven by two (2) distinct needs, fueled by the growth in technological companies and jobs in the middle Tennessee and Upper Cumberland regions. These include:

- The need for a strong professional graduate program in computer science in this region that provides opportunities for personnel from surrounding industries to upgrade their professional skills, especially in response to the rapid technological advances with emphasis in Internet-based computing.
- The need for a strong academic program in computer science that prepares capable graduates from TTU and this region to pursue a terminal (Ph.D.) degree with emphasis in computer science. The program focuses on Internet-Based Computing and its applications in different disciplines, thereby providing a distinctive learning experience for our graduates and preparing them for computer and Internet-based jobs in various industries. Graduate students may carry out their research for their thesis in any Computer Science related area, under the supervision of a faculty member having expertise in that area. Faculty advisors assist graduate students in developing individual programs of study depending on their career goals and research interests. The student's advisory committee assists the student in the development and execution of the program of study and monitors and evaluates the student's work towards the degree.

Many departmental faculty members actively participate in basic and applied Computer Science related research. Current faculty research interests include: Intelligent Systems Development, Distributed Computing, Digital Libraries, Clinical Information Management, Algorithmic Visualization, Modeling and Simulation, Graphics and Virtual Reality. The department is equipped with three (3) laboratories--a PC-based teaching laboratory, a high-performance computing laboratory with a Gigabit networking backbone and a research laboratory--Software Automation and Intelligence Laboratory (SAIL). SAIL provides the opportunity for undergraduate Computer Science students to participate in various faculty research activities while collaborating with graduate students from Computer Science and other Engineering majors. The College of Engineering also has three (3) Centers of Excellence, through which our faculty may pursue collaborative research. The resources and facilities of these Centers add valuable learning experiences for students of the Department.

The faculty of the Department of Computer Science actively participates in the Doctor of Philosophy program in Engineering. Admission to the doctoral program is open to individuals with outstanding academic records and potential for original research. The departmental faculty and graduate students work cooperatively with the three (3) State funded Centers of Excellence within the University: two within the College of Engineering and one under the Office of Research & Economic Development.

### Fast Track M.S. Program in Computer Science

The Fast Track program is designed to enable TTU CSC undergraduates in the CSSC concentration to accumulate up to six (6) credit hours of graduate coursework while still pursuing their undergraduate degree and to transition to

the graduate program smoothly, with accelerated completion. Up to six (6) hours of graduate coursework, exclusive of directed study, taken during the student's senior year can be used to satisfy both undergraduate and graduate degree requirements. These courses must be taken at Tennessee Tech University and must be approved as appropriate substitutions in the undergraduate curriculum for senior CSC electives.

The minimum requirements for applying to the Fast Track program are:

- Enrolled as TTU Undergraduate Computer Science student in the CSSC concentration with at least 60 hours of completed courses within the CSSC curriculum.
- Completed a minimum of 90 hours of overall coursework.
- Overall GPA of at least 3.25 and a GPA for CSC courses of at least 3.5.
- Letter from a CSC graduate faculty member agreeing to serve as applicant's graduate advisor.

Program participants should consult with their future M.S. advisor regarding appropriate graduate courses to take during their senior year and must earn a minimum grade of "B" in the graduate courses in order to apply them to their M.S. program of study. Additionally, all requirements for full admission to Graduate School must be met upon graduation.

## Departmental Admission Requirements

An applicant for admission to the Master of Science program in Computer Science is expected to have earned a B.S. degree from an approved program, or its equivalent. Students admitted to the master's program in Computer Science will be placed in one (1) of the following categories:

**Full Standing:** This category indicates that in the opinion of the Department of Computer Science and the Associate Vice President for Research and Graduate Studies the student has an adequate background for pursuing graduate work, and that all minimum requirements for admission to graduate standing have been met. The minimum requirements for Full Standing are:

- An undergraduate GPA of at least 3.0 upon completion of an approved baccalaureate degree program OR graduate Computer Science GPA of at least 3.0. The degree grade point average used for admission purposes will be the one presented on the transcript by the degree-granting institution.
- A minimum score of 3.5 on the Analytical Writing test of the Graduate Record Examination (GRE), AND the sum of the verbal and quantitative scores on the General Test of the GRE must be at least 1000 with at least 350 on Verbal and at least 600 on Quantitative (Students with BS degrees in related fields from TTU are not required to take the GRE).
- Three (3) letters of recommendation for graduate study from faculty members or other persons who have adequate knowledge of the applicant's professional qualities or potential for success as a graduate student (recommendation forms are furnished with other application materials).
- International students must have either a TOEFL (Test of English as a Foreign Language) score or IELTS (International English Language Testing Systems) score. A minimum TOEFL score of 550 PBT (Paper-based Test) or 213 CBT (Computer-based Test) or 79 iBT (Internet-based Test) is required. The required IELTS score is 6.5.
- Completion of core CS courses with a grade "C" or better in all core courses. Core Computer Science areas include: (i) Discrete Structures, (ii) Data Structures and Algorithms, and (iii) Design of Algorithms.

**Provisional Standing:** This category indicates that in the opinion of the Department of Computer Science and the Associate Vice President for Research

and Graduate Studies the student does NOT qualify for Full Standing and that before Full Standing can be granted all deficiencies must be removed during the completion of the first semester with the exception of the CS core course requirement which must be rectified in the first nine (9) graduate hours. The minimum requirements for Provisional Standing are:

- One of the following:
  - o An undergraduate QPA\* of at least 2.75 upon completion of an approved baccalaureate degree program, OR
  - o An undergraduate Computer Science GPA\* of at least 3.0 with at least nine (9) computer science hours, OR
  - o Five plus (5+) years of relevant work experience, OR
  - o Evidence of substantive undergraduate computer science research.

*\*The degree GPA used for admission purposes will be the one presented on the transcript by the degree-granting institution.*

- A minimum score of 3.0 on the Analytical Writing test of the Graduate Record Examination (GRE), AND the sum of the verbal and quantitative scores on the General Test of the GRE must be at least 950. (Students with BS degrees in related fields from TTU are not required to take the GRE). Exception of incomplete GRE score can be considered for applicants with undergraduate degree earned from U.S. institutions. Provisionally admitted students must address this deficiency by completing the GRE during their first semester with the scores needed for full standing.
- Three (3) letters of recommendation for graduate study from faculty members or other persons who have adequate knowledge of the applicant's professional qualities or potential for success as a graduate student (recommendation forms are furnished with other application materials).
- International students must have either a TOEFL (Test of English as a Foreign Language) score or IELTS (International English Language Testing Systems) score. A minimum TOEFL score of 550 PBT (Paper-based Test) or 213 CBT (Computer-based Test) or 79 iBT (Internet-based Test) is required. The required IELTS score is 6.5.
- Provisionally admitted students who have not successfully completed the core CS courses with a grade "C" or better in all core courses must satisfactorily complete them within their first nine (9) graduate hours. Core Computer Science areas include: (i) Discrete Structures, (ii) Data Structures and Algorithms, and (iii) Design of Algorithms.

The student must apply for reclassification after having satisfactorily removed all deficiencies and met any special conditions or requirements. The student will be reclassified to full standing once satisfaction of the requirements detailed above is met.

Fulfilling the above minimum requirements does not guarantee admission. Students who do not meet the minimum admission requirements or whose potential for success is not evident from their application may be considered for provisional admission. These students will be reclassified to full standing once they satisfy the conditions specified in the Certificate of Admission. Students with good academic backgrounds, but having B.S. degrees in fields other than Computer Science, will be admitted on a provisional basis. They will be required to satisfactorily complete all undergraduate core computer science courses before they apply for reclassification to full standing.

### **Departmental Degree Requirements**

The graduate program in Computer Science offers a Masters in Computing Science (MSCS) with a concentration in Internet-Based Computing. A student may choose a thesis or non-thesis project option, and must complete

a final presentation in the thesis/project related area. All students must take a comprehensive exam that covers their core coursework and area of specialization.

#### **MS-CSC with Thesis Option**

A thesis option requires 31 semester credit hours of graduate work, including 24 hours of coursework, one (1) hour of graduate seminar, and six (6) hours of graduate thesis approved by the advisory committee.

#### **MS-CSC with Non-thesis Project Option**

A non-thesis project option requires 34 semester credit hours of graduate work, including 30 hours of course work, one (1) hour of graduate seminar, and three (3) hours of project work approved by the advisory committee.

Students must complete the following:

- Graduate Seminar (1 hour)
- Core Theory (6 hours)
- Internet-Based Computing Core (6 hours)
- Specialization in an approved area (6 hours)
- Approved Electives (6 hours for thesis option; 12 hours for non-thesis option)
- Research and Thesis (6 hours) OR Project (3 hours)

## Department of Electrical and Computer Engineering

The Department of Electrical and Computer Engineering offers advanced studies leading to the Master of Science degree in Electrical and Computer Engineering and the Doctor of Philosophy degree in Engineering with specialization in Electrical and Computer Engineering. The Ph.D. program is administered by the Associate Dean of Engineering for Graduate Studies and Research. The goals and the admission and degree requirements for the Ph.D. program are listed under the College of Engineering. The goals of the MS program are to prepare graduates with advanced engineering and research skills and state-of-the-art knowledge in selected areas for positions in industry and for advanced studies towards the Ph.D. The MS-ECE degree program can be pursued with either a thesis option or a non-thesis option.

The departmental faculty have expertise in the following areas of electrical engineering: circuits and signal processing; control, robotics and instrumentation, digital systems, computers, and VLSI circuit design; nuclear engineering; physical phenomenon and lasers; electric power; and telecommunications, wireless communications and networking. Graduate students may carry out their research for their thesis/dissertation in any one (1) of the above areas under the supervision of a faculty member having expertise in that area. Faculty advisors assist graduate students in developing individual programs of study depending on their career goals and thesis/dissertation research interests. The student's advisory committee assists the student in the development and execution of the program of study and monitors and evaluates the student's work towards the degree.

Many departmental faculty members actively participate in research related to the three (3) Centers of Excellence operated within the University: two within the College of Engineering and one under the Office of Research & Economic Development. The resources and facilities of the Centers greatly enhance the graduate program of the Department.

### **Department of Electrical and Computer Engineering**

**R. Wayne Johnson, Chairperson**

Graduate Faculty:  
 Ali T. Alouani  
 Adam L. Anderson  
 Jeffrey R. Austen  
 Rabie Belkacemi  
 Charles L. Carnal  
 Omar Elkeelany  
 Syed Rafay Hasan  
 Satish M. Mahajan  
 Joseph O. Ojo  
 Robert Qiu  
 Ghadir Radman  
 P. K. Rajan  
 Stephen L. Scott

## Fast Track MS Program

The Fast Track program is designed to enable TTU ECE undergraduates to accumulate up to six (6) credit hours of graduate coursework while still pursuing their undergraduate degree and to transition to the graduate program smoothly, with accelerated completion. Up to six (6) hours of graduate coursework, exclusive of directed study, taken during the student's senior year can be used to satisfy both undergraduate and graduate degree requirements. These courses must be taken at Tennessee Tech University and must be approved as appropriate substitutions in the undergraduate curriculum for senior ECE electives. In order to remain in the Fast Track program, the student must demonstrate ongoing scholarship by continuing to meet the GPA admission requirements during the semester that the student enrolls in the first of their graduate courses. The student must earn a minimum grade of "B" in the graduate courses in order to apply them to their M.S. program of study and to continue in the Fast Track program. Additionally, Fast Track students will be integrated into ECE research projects and/or capstone design projects while enrolled as seniors with the expectation that this research will directly coordinate with their M.S. thesis research. Either a thesis or non-thesis M.S. option may be pursued. ECE Fast Track students that graduate with their B.S. in the spring semester can be expected to complete their M.S. requirements in either the spring or summer term of the following calendar year.

Fast Track students are only eligible for graduate teaching or research assistantship during the fifth (graduate) year of their studies. Students who do not succeed in their first graduate course during their senior year (B grade or better) will be advised to withdraw from the Fast Track program and complete their B.S. degree in a normal manner.

## Departmental Admission Requirements

The minimum requirements for full standing admission into the MS program are the same as those for any MS program in the College of Engineering and these are stated under the College of Engineering listing. Similarly, the minimum requirements for full standing admission into the Ph.D. program with a major in ECE are the same as those for the Ph.D. program listed in the College of Engineering section. Applicants with impressive academic performance or publication record may be admitted on full standing status even if their GRE and/or TOEFL scores do not meet the minimum requirements. The Departmental Admissions Committee evaluates each application individually for potential to succeed in the graduate program and makes an admission recommendation. Students who do not meet the minimum admission requirements or whose potential for success is not evident from the application may be considered for provisional admission. These students will be reclassified to full standing admission once they satisfy the conditions specified in the admission letter. Students with good academic background but having BS degrees in fields other than electrical engineering will be admitted on a provisional basis. They will be required to complete satisfactorily a specified set of undergraduate electrical and computer engineering courses before they are reclassified to full standing.

## Master of Science Departmental Degree Requirements

To receive an MS degree in ECE the student should complete all the MS requirements specified by the University and the College of Engineering. Additionally, certain departmental requirements listed below shall also be satisfied:

### MS-ECE with Thesis Option

An MS-ECE program of study with thesis option requires a minimum of 24 credit hours of course work and a minimum of six (6) credit hours of thesis completed under the supervision of the graduate thesis advisor. The coursework shall include: ECE 6910 - Introduction to Graduate Research, during the first semester

of study; at least 15 hours of graduate ECE courses; no more than six (6) hours of 5000-level courses such that the 5000-level ECE courses, if any, in the program of study are outside the student's area of primary research; and no more than six (6) hours of directed/independent study courses to satisfy the required minimum of 24 hours of coursework. The thesis requirement includes research, the findings of which must be submitted in writing subject to the policies and satisfaction of the Graduate School and the advisory committee. In addition, each student must pass a comprehensive exam which includes a defense of his/her research work before the advisory committee. The advisory committee shall be chaired or cochaired by an ECE faculty member and include an additional member from the ECE Department.

### **MS-ECE with Non-thesis Option**

An MS-ECE program of study with non-thesis option requires a minimum of 34 credit hours of course work and shall include: ECE 6910 - Introduction to Graduate Research, during the first semester of study; 12 credit hours of ECE graduate level core courses from a list maintained by the department; a minimum of nine (9) credit hours of graduate level ECE elective courses; a three (3) credit hours directed study ECE 6980 or special problems ECE 6900 course that will enhance independent learning skills and a maximum of nine (9) hours of graduate level elective courses from outside the department. Additionally, each student should also pass a written comprehensive exam administered by the department.

### **Departmental Degree Requirements for Doctor of Philosophy**

To receive a Ph.D. degree with specialization in ECE, the student shall complete all the requirements for the Ph.D. specified under the College of Engineering section of the catalog.

Additionally, the program of study for Ph.D. students majoring in ECE shall include ECE 6910 - Introduction to Graduate Research during the first semester of study except when the student has already taken ECE 6910 as a part of the MS program or when the student has prior research experience as demonstrated by the successful completion of a master's thesis; and no more than nine (9) hours of independent/directed study courses such as ECE 6980/ECE 7980. The ECE departmental chairperson will assist the Associate Dean in deciding the appropriateness of each program of study.

The student's advisory committee must be chaired or cochaired by an ECE faculty member, and additionally, the committee must include at least two (2) members of the ECE faculty, a member from the engineering faculty outside the ECE Department and one (1) member from the Mathematics Department. The Associate Dean of Engineering for Graduate Studies and Research is an ex officio nonvoting member of every Ph.D. student's advisory committee.

## **Department of Manufacturing and Engineering Technology**

Manufacturing and Engineering Technology gives you STEM knowledge to work with engineers, scientists and managers on a plan while taking part in a project with the skills of a technologist or applied engineer.

### **Departmental Mission:**

To graduate innovative Engineering Technologists and Applied Engineers who solve technological challenges to meet societal needs.

The department is accredited by the Association of Technology, Management, and Applied Engineering (ATMAE), which sets standards for academic program accreditation, personal certification, and professional development for educators and industry professionals involved in integrating technology, leadership and design.

**Department of  
Manufacturing and  
Engineering Technology**  
Ahmed ElSawy, Chairperson  
Graduate Faculty:  
Ismail Fidan  
Awni M. Qasaimeh

### **Professional Science Masters, P.S.M.**

The Professional Science Master's (PSM) degree is a unique professional degree grounded in natural science, technology, engineering, mathematics and/or computational sciences and is designed to prepare students for direct entry into a variety of career options in industry, business, government, or non-profit organizations. It is a distinctive advanced degree for those intending to pursue a career in the practice of science. PSM programs prepare graduates for high-level careers in science that have a strong emphasis on such skill areas as management, policy, and entrepreneurship. PSM recognition provides assurance that the program conforms to nationally accepted criteria.

#### **Concentration in Manufacturing Sustainability**

Sustainable manufacturing, pollution reduction, and efficient use of limited natural resources and the minimization of use of toxic chemicals are increasingly issues for the consideration of manufacturers and managers. The Professional Science Master's with a concentration in Manufacturing Sustainability degree program effectively prepares you for a career dedicated to developing technologies to transform resources into goods and services that respond to basic needs and improve human quality of life.

Manufacturing Sustainability combines existing courses in the Colleges of Business, Arts and Sciences, Agricultural and Human Sciences with newly developed courses in the Department of Manufacturing and Engineering Technology to effectively produce a new and essential degree.

Manufacturing Sustainability will also use an interdisciplinary approach of course delivery by incorporating faculty from the Colleges of Business, Arts and Sciences, and Engineering. Business core courses are from the MBA program and are taught online. The program is designed for graduates of approved STEM (Science, Technology, Engineering and Mathematics) related undergraduate programs.

As manufacturing sustainability takes hold across the country, the demand for workforces who are trained to identify opportunities for improving processes and preventing environmental waste will increase. An initiative, jointly created by the Department of Energy, Environmental Protection Agency, Department of Labor, Small Business Administration and the Manufacturing Extension Partnership (MEP) of the National Institute of Standards and Technology, has been started to help manufacturers implement Manufacturing Sustainability practices. Already, manufacturers are required to meet demands placed on companies as worldwide awareness of environmentalism increases. Tennessee's auto manufacturers are already embracing E3 (the three pillars of sustainability; Economy, Energy and the Environment). As a result, there are a number of career opportunities for professionals with these skills and Tennessee Tech is addressing this need by creating the Manufacturing Sustainability concentration under its Professional Science Master's degree program.

#### **Admission Requirements**

- Undergraduate GPA of at least 3.0 on a 4.0 scale from a STEM (Science, Technology, Engineering and Mathematics) related discipline. Candidates not holding an appropriate baccalaureate degree may be required to complete necessary prerequisite courses prior to admission to the program. Thus, a baccalaureate degree is required for full standing. Applicants that have baccalaureate degrees in a closely related field will be evaluated on a case-by-case basis and may be admitted to full standing upon completion of identified background courses. Academic exceptions may be granted in exceptional circumstances for individuals with extensive professional experience or other background that, in the opinion of the admission committee, qualifies the candidate for admission.
- Total of at least 1000 on the verbal and quantitative portions of the GRE® General Test (GRE) (306 New revised score) along with a 3.5 score on the analytical writing portion of the test.

- Official transcripts from all previously-attended colleges or universities
- Three (3) letters of recommendation from faculty familiar with the academic ability of the applicant.
- International applicants must also meet the English Language Requirement by providing test results on one (1) of the following:
  - TOEFL -- 550 minimum (213 computer-based or 79 internet-based)
  - IELTS -- minimum base score of 5.5

### Degree Requirements

Graduation requirements are the successful completion of all coursework and the capstone internship, with an overall GPA of 3.0.

### Curriculum

Curriculum Component	Hours Required
General Education	0
Major Field Core (courses required of all students in program)	12
Concentration (courses specific to the concentration)	15
Elective(s)	3
Capstone Project (may be guided or general electives)	3
Total Hours	33

### Required Business Courses

These courses, taught online and on campus via TTU's MBA program, are available to any PSM student. The prerequisites will be met through College of Business course modules that can be taken at the student's own pace and be completed within a month, a week, or a weekend.

- ACCT 6010 - Accounting Information for Management Decisions Cr. 3.
- BMGT 6200 - Organizational Leadership Cr. 3.
- MATH 6070 - Applied Linear Statistical Methods I Cr. 3.
- MKT 6100 - Strategic Marketing Cr. 3.

### Concentration

- EVSS 6010 - Environmental Social Policy Cr. 3.
- Econ 4200 (5200) - Environmental Economics Cr. 3
- MET 4650 (5650) - Lean Six Sigma Manufacturing Cr. 3.
- MET 6100 - Manufacturing Strategy for Sustainability Cr. 3.
- MET 6200 - Energy Management Principles Cr. 3.
- MET 6990 - Internship Cr. 3.

### Electives

- CEE 4430 (5430) - Water and Wastewater Engineering Cr. 3.
- EVSC 6010 - Environmental Chemistry Cr. 3.
- ESS 4300 (5300) - Environmental Management System Cr. 3.
- MATH 6170 - Experimental Design I Cr. 3.
- MATH 6180 - Experimental Design II Cr. 3.
- MET 4060 (5060) - CNC Concepts, Advanced Techniques and Applications Cr. 3.
- MET 4200 (5200) - Industrial Electronics Cr. 3.

*\*Applicants that have baccalaureate degrees in a closely related field will be evaluated on a case-by-case basis and may be admitted to full standing upon completion of identified background courses.*

- MET 4210 (5210) - Programmable Logic Controllers and Process Control Cr. 3.
- MET 4220 (5220) - Industrial Automation and Robotics Cr. 3.
- MET 4300 (5300) - Advanced CAD Techniques Cr. 3.
- MET 4310 (5310) - Plant Layout and Materials Handling Cr. 3.
- MET 4400 (5400) - Geometric Dimensioning and Tolerancing Cr. 3.
- MET 4430 (5430) - Industrial Supervision Cr. 3.
- MET 4450 (5450) - Rapid Prototyping Cr. 3.
- MET 4500 (5500) - Tool Design Cr. 3.
- MET 4550 (5550) - Maintenance, Replacement and Reliability Engineering Cr. 3.
- MET 4600 (5600) - Product Design and Development Cr. 3.
- MET 6300 - Alternative Energy Production Cr. 3.

Total Credit Hours: 33

## Department of Mechanical Engineering

### **Department of Mechanical Engineering**

**Mohan Rao, Chairperson**

Graduate Faculty:

Stephen Anton

Stephen L. Canfield

Jie Cui

Glenn T. Cunningham

Corinne M. Darvennes

Samuel S. M. Han

Darrell E. P. Hoy

Stephen A. Idem

Glen E. Johnson

Jeffrey A. Marquis

Vahid Motevalli

Sally J. Pardue

John Peddieson, Jr.

Meenakshi Sundaram

Kwun-Ion Ting

Christopher D. Wilson

Dale A. Wilson

Ying Zhang

Jiahong (John) Zhu

The Mechanical Engineering Department offers courses and research projects leading to the Master of Science Degree in Mechanical Engineering and enthusiastically participates in the Doctor of Philosophy Degree offered in the College for those doctoral students focusing their work in the mechanical engineering area. The MS program is administered by the Department and the Ph.D. program is administered by the Associate Dean of Engineering for Graduate Studies and Research. Both degrees are research-oriented.

Participation in graduate education is consistent with the Department's goals and objectives of:

- to provide quality instructional programs and research experiences in mechanical engineering subjects that are at a level of sophistication compatible with professional norms;
- to maintain a competent, dynamic faculty, expert in the various facets of mechanical engineering that strive to motivate the student and that practices effective educational techniques;
- and to provide instructional and research facilities, equipped with up-to-date apparatus, which are conducive to the education of mechanical engineering graduate students.

A graduate student may customize his graduate courses in one (1) of several areas subject to the approval of his/her graduate advisory committee. Areas of specialty include acoustics, controls, dynamics and vibrations, energy systems encompassing the thermal sciences, machine design, materials and manufacturing, measurements and experimental system design, and mechanics. Graduate course offerings are arranged, year by year, to meet the needs of the graduate students. Graduate students may carry out their research for their thesis/dissertation in any one of the aforementioned areas under the supervision of a faculty member, who is also a member of the graduate faculty, having expertise in that area. Individual programs of study are developed for each student depending on his/her career goals and thesis research interest. Faculty advisors assist graduate students in the development of their individual programs of study depending on their career goals and thesis/dissertation interests. The advisor chairs the student's advisory committee. The student's advisory committee is the advising body and monitor of the student's work.

The research and graduate education within the College are enhanced by three Centers of Excellence: the Center for Electric Power; the Center for

Manufacturing Research and technology Utilization; and the Center for the Management, Utilization, and Protection of Water Resources. The Mechanical Engineering Department is much more involved with the first two (2). Faculty actively interact with the Power and Manufacturing Centers in seeking external funding for research. The Centers complement the faculty efforts by supporting graduate students and via administrative support. The interaction involves a strengthening through sharing of resources and personnel.

### **Departmental Admission Requirements**

Minimum requirements for admission are consistent with those applicable to the University and stated in the College of Engineering listing. A graduate with a BS degree in Mechanical Engineering from an approved undergraduate program meeting the minimum criteria would readily be admitted. The minimum requirements for full standing admission into the MS program in ME are the same as those for any MS program in the College of Engineering and are stated under the College of Engineering listing. Similarly, the minimum requirements for full standing admission into the Ph.D. program with a specialization in ME are the same as those for the Ph.D. program listed in the College of Engineering section. The Department has a Departmental Admissions Committee who reviews and evaluates each application individually for unique merits and for the applicant's potential success in the graduate program and makes admission recommendation to the appropriate administrator. Students who do not meet the minimum admission requirements or whose potential for success is not evident from the application may be considered for provisional standing. These students will be reclassified to full standing once they satisfy the conditions specified in the provisional admission statement. Occasionally, highly qualified students not having their BS degree in mechanical engineering may be admitted on a provisional basis with the stipulation of satisfactorily completing a specified set of undergraduate courses before achieving full standing.

### **Master of Science Departmental Degree Requirements**

#### **MS-ME with Thesis Option**

An MS program of study with thesis option requires a minimum of 24 credit hours of graduate course work, as specified in the student's approved Program of Study, and a minimum of six (6) hours of thesis credit, completed under the supervision of the graduate thesis advisor. No more than nine (9) credit hours of the 24 credit hour total may be at the 5000-level. A minimum GPA of 3.0 is required both to graduate and to remain in good standing in the program. The thesis requirement includes research, the findings of which must be submitted in writing and are subject to the policies and satisfaction of the Graduate School Office and the advisory committee. In addition, each student must pass a comprehensive exam which includes a defense of his/her research work before the advisory committee.

#### **MS-ME with Non-thesis Option**

An MS program of study with non-thesis option requires a minimum of 33 credit hours of graduate course work, as specified in the student's approved program of study. The program of study shall include 30 semester hours of formal, graded coursework, and three (3) semester hours of special topics. At least 70% of the credit to be counted toward the MS degree (23 hours) must be at the 6000 level or above. The special topics course will demonstrate the student's capability to engage in independent learning. The content and format of the special topics course, including the comprehensive examination, will be entirely at the discretion of the student's advisory committee. Typically the special topics course will be taken in the final semester listed on the program of study. A student who wishes to enroll in the non-thesis option must submit an approved program of study to the Graduate School after nine (9) semester hours of graduate coursework have been completed. Thereafter any changes to the program of study must be approved by all members of the committee, and the Department Chair.

# College of Interdisciplinary Studies

Melissa Geist, Interim Dean

## School of Environmental Studies

Hayden Mattingly, Interim Director

### Schools in the College of Interdisciplinary Studies

School of Environmental Studies

School of Interdisciplinary Studies

School of Professional Studies

### Degrees available in the College of Interdisciplinary Studies

Doctor of Philosophy, Environmental Studies

Master of Education, Advanced Studies in Teaching and Learning

Master of Professional Studies

Professional Science Masters

### Environmental Sciences, Ph.D.

The Doctor of Philosophy degree program in Environmental Sciences offers a concentration in either biology or chemistry but emphasizes the solution of complex environmental problems using an interdisciplinary approach. Course work is required in biology, chemistry, geology, agriculture, and sociology. This interdisciplinary approach insures that students become aware of a wide range of environmental concerns and that their research includes a breadth of environmental understanding beyond the boundaries of a particular discipline. The goal of the program is to prepare students for careers in research, management, government service, teaching, and other areas where they can make productive contributions to the solution of environmental problems.

The program of study for a doctoral degree requires a minimum of 61 semester credits beyond the bachelor's level, including 13 credits in "core courses," 12 credits at the 7000 level, and at least 18 credits in doctoral research and dissertation. Graduate assistantships are available.

### Admission Requirements

Applicants for admission to the doctoral program in Environmental Sciences must have:

- a bachelor's or master's degree in science, mathematics, engineering, or environmental science;
- a grade point average of 3.0 or above on a 4.0 scale;
- international students must have a score of 525 or above on the TOEFL;
- and a combined score of at least 1000 on the verbal and quantitative portions of the exam.

Applicants seeking admission with Full Standing in the program must satisfy the following concentration's departmental requirements:

### Additional Departmental Admission Requirements for Admission in Full Standing

#### Concentration in Biology

- applicants must have a bachelor's or master's degree in a biological science
- a grade point average of 3.5 or above for the highest degree earned
- a minimum combined score of 1500 on the verbal, quantitative, and analytical writing (converted score\*) portions of the GRE.

*\*Converted score=(analytical writing score/6) X 800*

In addition, a graduate faculty member must have agreed to direct the student's doctoral program and financial support must have been identified for a stipend and for research needs.

#### Concentration in Chemistry

- applicants must have a bachelor's degree in chemistry that has been certified by the American Chemical Society or course work equivalent to

this degree;

- applicants must have one (1) year each of general, organic, and physical chemistry;
- applicants must have one (1) semester of analytical and inorganic chemistry, one semester of instrumental analysis.

Applicants who do not fully meet the above requirements for Full Standing may be admitted in Provisional Standing on the basis of a favorable recommendation to the Associate Vice President for Research and Graduate Studies by the appropriate departmental chairperson and the Director of the Environmental Sciences doctoral program. If admitted in Provisional Standing, the student must remove all deficiencies and apply for reclassification to Full Standing prior to the completion of 15 hours of graduate work.

Application materials may be obtained from the Graduate School Office.

### **Degree Requirements**

The general requirements for the Ph.D. degree in Environmental Sciences are:

- A minimum of 61 semester credits of course work and doctoral research and dissertation as follows:
  - o A minimum of 43 semester credits of course work beyond the bachelor's degree. This must include 13 semester credits chosen from EVSA 6010, EVSG 6010, EVSS 6010, EVS 7910, and either EVSB 6010 or EVSC 6010 and must include at least 12 semester credits at the 7000 level.
  - o A minimum of 18 semester credits of research and dissertation, resulting in the satisfactory completion of a doctoral dissertation.
- Residence of four (4) semesters beyond the bachelor's level, with at least two (2) semesters in continuous residence.
- Completion of all requirements for the degree, including the dissertation within a period of eight (8) consecutive years.
- Maintenance of a general grade point average of 3.0.
- Satisfactory completion of a comprehensive examination.
- Satisfactory presentation and defense of a doctoral dissertation.

In addition, a student must adhere to all policies and procedures governing graduate study at the University, as contained in the Graduate Catalog and administered by the Associate Vice President of Research and Graduate Studies.

### **Guidelines for Graduate Committee Composition**

The organization and appointment of advisory committees to supervise graduate study for the degree of Doctor of Philosophy in Environmental Sciences shall be the same, generally, as in the master's program, except that the advisory committee shall consist of at least five (5) members of the Graduate Faculty, plus the Director of Environmental Sciences Ph.D. program who serves as an ex officio, nonvoting member. Three (3) members shall be from the student's area of concentration, either Biology or Chemistry. Two (2) members shall be from separate departments of the environmental science core outside the student's area of concentration. Changes in a Ph.D. advisory committee must adhere to all policies and procedures governing graduate study at the University, as contained in the Graduate Catalog and administered by the Associate Vice President of Research and Graduate Studies.

### **Guidelines for the Comprehensive Examination**

Prerequisites. Before requesting that his or her major professor schedule a Comprehensive Examination, a student must:

- have achieved Full Standing in the program

- completed approximately 80% of the course work in his/her Program of Study

### ***Descriptions***

The test will consist of written and/or oral portions. The student's advisory portion will consist of four (4) sections. Total time for each section should not exceed eight (8) hours. Three (3) sections will contain material from the student's area of concentration and one (1) section will integrate material from the Environmental Sciences Core Curriculum.

If an oral exam is to be included as part of the comprehensive exam it will be administered by the student's advisory committee within three (3) weeks of the successful completion of the written portion of the exam. A question will be included in the oral exam that tests the student's understanding of the interdisciplinary nature of Environmental Sciences.

If an oral exam is included as part of the comprehensive exam, both portions of the Comprehensive Examination will be completed during one (1) academic semester.

### ***Results***

Four-fifths of the voting members of the committee must agree that the student has successfully completed the comprehensive exam.

The student will be given one (1) additional opportunity to pass each portion of the Comprehensive Examination. Failure to pass either portion on the second try will result in the student's dismissal from the Ph.D. program.

A written evaluation of the student's performance on the Comprehensive Examination will be prepared by the student's advisory committee and kept on file in the office of the Director of the Environmental Sciences Ph.D. program.

### ***Time Constraints***

Successful completion of the Comprehensive Examination must be achieved in a timely fashion. The complete Comprehensive Examination must be scheduled and taken within a year following the completion of 80% of the course work in the student's Program of Study, including successful completion of all core courses. It shall be the student's responsibility, in consultation with his/her advisor, to schedule this examination at a date agreeable to the whole examining committee. The committee shall be given at least two (2) months advance notice of the Examination date in order to make preparations. Any second attempts to pass portions of the Comprehensive Examination must be scheduled in the subsequent (Fall/Spring) semester. Failure to follow these procedures shall result in the student's dismissal from the program. Any appeal by the student for exceptions to this policy shall be made in writing and submitted to the Executive Committee of the Ph.D. program.

## **Professional Science Masters, P.S.M.**

The Professional Science Master's (PSM) degree is a unique professional degree grounded in natural science, technology, engineering, mathematics and/or computational sciences and is designed to prepare students for direct entry into a variety of career options in industry, business, government, or non-profit organizations. It is a distinctive advanced degree for those intending to pursue a career in the practice of science. PSM programs prepare graduates for high-level careers in science that have a strong emphasis on such skill areas as management, policy, and entrepreneurship. PSM recognition provides assurance that the program conforms to nationally accepted criteria.

### **Concentration in Environmental Informatics**

Population growth, pollution, and limited natural resources, result in increasingly topical environmental issues. The Professional Science Master's with a concentration in Environmental Informatics degree program effectively prepares you for a career dedicated to sustaining Earth's resources for future generations.

Environmental Informatics combines existing courses in the Colleges of Business, Arts and Sciences, Agricultural and Human Sciences, and Engineering

to effectively produce a new and essential degree. Currently, the business core courses are offered online and on campus through TTU's MBA program.

Environmental Informatics will also use an interdisciplinary approach of course delivery by incorporating faculty from the Colleges of Business, Arts and Sciences, and Engineering.

There are increasing numbers of career opportunities for professionals with this degree. Environmental scientists and technicians are required to meet increasing demands placed on companies as worldwide awareness of environmentalism increases. Statistics show many professionals in this field will soon be retiring, leaving space for the next generation of environmentalists.

The program is designed for graduates of approved natural resources undergraduate programs (e.g., environmental biology, environmental chemistry, environmental engineering, water resources engineering, geology, environmental agriculture, environmental management, etc.).

### **Admission Requirements**

Applicants that have baccalaureate degrees in a closely related field will be evaluated on a case-by-case basis and may be admitted to full standing upon completion of identified background courses.

- Undergraduate GPA of at least 3.0 on a 4.0 scale in environmental sciences, natural resource management, environmental engineering, or equivalent field of study.\*
- Total of at least 1000 on the verbal and quantitative portions of the General Test of the Graduate Record Examination (GRE) (306 New revised score) along with a 3.5 score on the analytical writing portion of the test.
- Official transcripts from all previously-attended colleges or universities
- Three (3) letters of recommendation from faculty familiar with the academic ability of the applicant.
- International applicants must also meet the English Language Requirement by providing test results on one of the following:
  - TOEFL -- 550 minimum (213 computer-based or 79 internet-based)
  - IELTS -- minimum base score of 5.5

### **Degree Requirements**

In addition to the Graduate School requirements, the student must successfully complete the 33 hours required by the program and the Capstone internship experience. The internship course is a capstone project supervised by faculty and employers, evaluated or graded by faculty, and typically developed with an employer, which integrates the practical application of scientific and professional knowledge, behavior and skills.

### **Curriculum**

#### ***Background Courses***

A student may take a pre-test to test out of these courses or may gain approval through the program's GIS faculty in the Department of Earth Sciences.

GEOG 4510 (5510) - Theory of GIS I, Cr. 3.

GEOG 4511 (5511) - Theory of GIS II, Cr. 3.

#### ***Required Business Courses***

These courses, taught online and on campus via TTU's MBA program, are available to any PSM student. The prerequisites will be met through College of Business course modules that can be taken at the student's own pace and be completed within a month, a week, or a weekend.

ACCT 6010 - Accounting Information for Management Decisions, Cr. 3.

*\*Applicants that have baccalaureate degrees in a closely related field will be evaluated on a case-by-case basis and may be admitted to full standing upon completion of identified background courses.*

BMGT 6200 - Organizational Leadership, Cr. 3.  
 MATH 6070 - Applied Linear Statistical Methods I, Cr. 3.  
 MKT 6100 - Strategic Marketing, Cr. 3.

**Concentration**

ESS 6510 - Programming GIS, Cr. 3.  
 ESS 6910 - Internship, Cr. 3.  
 EVSS 6010 - Environmental Social Policy, Cr. 3.  
 GEOG 4410 (5410) - Remote Sensing, Cr. 3.  
 GEOG 4650 (5650) - Environmental Applications of GIS, Cr. 3.  
 MATH 6470 - Environmental Statistics, Cr. 3.

**Electives**

AGBE 4210 (5210) - Agricultural and Biological Statistics, Cr. 3.  
 CSC 6220 - Data Mining, Cr. 3.  
 CSC 6300 - Web-Based Database Systems, Cr. 3.  
 DS 6550 - Data Resources Management, Cr. 3.  
 ECON 5200 - Environmental Economics, Cr. 3.  
 ESS 4300 (5300) - Environmental Management System, Cr. 3.  
 ESS 6520 - GIS Project Development and Management, Cr. 3.  
 MATH 6080 - Applied Linear Statistical Methods II, Cr. 3.  
 MATH 6170 - Experimental Design I, Cr. 3.  
 MATH 6180 - Experimental Design II, Cr. 3.  
 SOC 4920 (5920) - Data Analysis and Management, Cr. 3.

**Total Credit Hours: 33**

## School of Interdisciplinary Studies

**Steven Frye, Interim Director**

### Advanced Studies in Teaching and Learning, M.Ed. (RODP)

The RODP Master of Education (M.Ed) degree provides advanced professional preparation in the area of reading and language arts for practicing teachers. All participants must be fully licensed teachers who are currently teaching in classrooms. The program bases course content and learning experiences on the student's work as a classroom teacher and will include assignments that teachers will carry out in their own classrooms.

#### Admission Requirements

1. An overall undergraduate quality point average of 2.5 upon completion of a baccalaureate degree program.
2. Three (3) letters of recommendation for graduate study from faculty members or other persons who have adequate knowledge of the applicant's professional qualities or potential for success as a graduate student.
3. A score range of 380-387 on the Miller Analogies Test (MAT) (raw score of 31 on tests taken prior to October 2004) or a score of 900 on the verbal and quantitative portions of the General Record Examination (GRE) along with a 4.0 score on the analytical writing portion.

Students with a 2.25 quality point average or with a raw score of 27 on the MAT or with a score range of 372-379 on the MAT (raw score of 27 on tests taken prior to October 2004) or with successful completion of the GRE (900 total on verbal/quantitative and 4.0 on analytical writing) may be admitted with provisional standing. To advance from provision to full admission, a student must earn a minimum 3.0 QPA on the first nine (9) hours of graduate credit including six (6)

hours in the major and achieve a score range of 372-379 on the MAT (raw score of 27 on tests taken prior to October 2004) or a score of 900 on the verbal and quantitative portions and a score of 4.0 on the analytical writing portion of the GRE.

### Curriculum

Research Requirements for the Master of Education Degree in Advanced Studies in Teaching and Learning

#### Research Requirements

ASTL 6729/7729 - Remediation of Literacy Problems K-8 (Literacy V), Cr. 3.

ASTL 6709/7709 - Action Research, Cr. 3.

#### Program of Study

ASTL 6700/7700 - Portfolio Development, Cr. 3.

ASTL 6701/7701 - Teacher as Learner, Cr. 3.

ASTL 6703/7703 - Knowledge of the Learner, Cr. 3.

ASTL 6705/7705 - Assessment of Learning, Cr. 3.

ASTL 6706/7706 - Learning Strategies/Instructional Strategies, Cr. 3.

ASTL 6721/7721 - Theory and Foundation of Developmental Lit.(Literacy I), Cr. 3.

ASTL 6723/7723 - Understanding and Implementing Best Practices in Teaching Beginning Literacy (Literacy II), Cr. 3.

ASTL 6725/7725 - Understanding and Implementing Best Practices for Continued Literacy Growth in the Middle Grades (Literacy III), Cr. 3.

ASTL 6726/7726 - Diagnosing Literacy Problems K-8 (Literacy IV), Cr. 3.

ASTL 6729/7729 - Remediation of Literacy Problems K-8 (Literacy V), Cr. 3.

ASTL 6709/7709 - Action Research, Cr. 3.

**Total: 33 (a minimum of 23 must be at 6000 level or above)**

## School of Professional Studies

**Joseph Roberts, Interim Director**

### Professional Studies, M.P.S. (RODP)

The Master of Professional Studies-Regents Online Degree Program (MPS-RODP) – This graduate professional studies degree consists of 33 hours of interdisciplinary coursework. This degree is available in three concentrations:

- **Healthcare Administration**—provides the healthcare professional with leadership and strategic management tools to lead and serve one of the nation's largest service industries. The focus of the program is to provide the healthcare professional with the opportunity to develop important skills in healthcare, leadership, finance, informatics, research and administration in the various components of healthcare delivery systems that include hospitals, nursing homes, group medical practices, personal care homes, retirement centers, health maintenance organizations, medical sales, insurance companies, etc.
- **Human Resources Leadership**—prepares you for a leadership role in the area of human resources. The interdisciplinary approach is appropriate because of the many skills and knowledge areas that are needed for success in this field.
- **Strategic Leadership**—prepares you to lead in today's rapidly changing professional environment. The interdisciplinary approach focuses on the areas of leadership, communication, strategic planning and assessment,

organizational structure and research/data analysis.

- **Training and Development**

The MPS-RODP is designed to affordably and flexibly meet the needs of working adults who are not generally served by traditional methods. This unique program is taught by professors who are best suited to help you develop the skills necessary to excel in your career field and this program is offered completely online and available 24/7.

### **Admission Requirements**

#### ***For Full Standing:***

- An undergraduate grade point average of at least 2.75 on a 4.0 scale from an accredited college or university.
- An acceptable score on the GRE, generally at least 400 verbal, 500 quantitative and a 4.0 on analytical writing. Applicants with five (5) or more years of professional work experience may submit a portfolio in lieu of the GRE. The portfolio is to include: a resume; a 500- to 600-word essay detailing the reasons for wanting to enter the MPS program and discussing how the program will help the applicant achieve personal and professional goals; and two (2) sealed letters of professional reference. Other items that an applicant may include in the portfolio include a description of professional responsibilities, professional achievements and professional awards/recognitions. The portfolio material must be submitted as a packet, not mailed separately. Applicant should submit the application and the GRE scores or portfolio to the Graduate School. The admission decision will be based on the entire academic and professional record. Applicants will be granted unconditional admission if the overall record (based on the above variables) indicates a high potential for success in the program.

#### ***For Provisional (Conditional) Admission:***

- Applicants who do not meet the requirements for full standing might be admitted provisionally (conditionally) if their entire academic and professional records indicate potential for success in the program. Conditions may include, but are not limited to, taking prerequisite undergraduate courses, enrolling in specified graduate-level courses, and achieving a specified grade point average.

**Note: During your first semester you must complete all entrance requirements including formal transcripts and any required tests for full admission to the program.**

For more information, visit the RODP site.

### **Degree Requirements**

Follow the Graduate School General Degree Requirements as stated in the Graduate Catalog.

### **Concentration in Healthcare Administration**

#### **Required Major Field Core (9 hours)**

PRST 6100 - Professional Environment: Issues and Ethics Cr. 3.

PRST 6200 - Globalization and the Professions Cr. 3.

PRST 6300 - Research Methods Cr. 3.

#### **Healthcare Administration Concentration (21 hours)**

EDPY 6310 - Educational Statistics Cr. 3.

PRST 6550 - Computer Based Decision Modeling for Healthcare Administrators Cr. 3.

PRST 6540 - Health Informatics Cr. 3.

PRST 6570 - Public Health Cr. 3.

PRST 6560 - Biological Sciences for Healthcare Administrators Cr. 3.

PRST 6530 - Healthcare Systems Economics Cr. 3.

PRST 6810 - Masters of Professional Studies Internship Cr. 3.

**Required Culminating Professional Project (3 hours)**

PRST 6998 - Professional Project Cr. 3.

**Concentration in Strategic Leadership**

***Required Major Field Core (9 hours)***

PRST 6100 - Professional Environment: Issues and Ethics, Cr. 3.

PRST 6200 - Globalization and the Professions, Cr. 3.

PRST 6300 - Research Methods, Cr. 3.

***Strategic Leadership Concentration (21 hours)***

Students will complete seven (7) of the following courses including at least one (1) course from each of the five (5) subject areas:

**Leadership Theory**

PRST 6500 - Foundations of Leadership, Cr. 3.

LDSP 6000 - Current Issues and Cases in Leadership, Cr. 3.

ELPA 6560 - Small Group Leadership, Cr. 3.

**Research/Data Analysis**

PRST 6770 - Computer-Based Decision Modeling, Cr. 3.

PRST 6600 - Statistical Analysis, Cr. 3.

**Organizational Structure and Change**

PRST 6310 - Leadership in Organization, Cr. 3.

PRST 6800 - Organizational Skills and Development, Cr. 3.

**Communication**

COMM 6110 - Leadership and Communication, Cr. 3.

JOUR 6450 - Public Relations Management, Cr. 3.

PRST 6700 - Conflict Management and Negotiation, Cr. 3.

**Strategic Planning and Assessment:**

PRST 6040 - Human Resources Management, Cr. 3.

**Required Culminating Professional Project (3 hours)**

PRST 6998 - Professional Project, Cr. 3.

**Concentration in Human Resources Leadership**

PRST 6040 - Human Resources Management, Cr. 3.

***Required Major Field Core (9 hours)***

PRST 6100 - Professional Environment: Issues and Ethics, Cr. 3.

PRST 6200 - Globalization and the Professions, Cr. 3.

PRST 6300 - Research Methods, Cr. 3.

*Required (Must complete all four [4] of the above classes)*

**Human Resources Leadership Concentration (21 hours)**

Students will complete seven (7) of the following courses as detailed below:

PRST 6600 - Statistical Analysis, Cr. 3.

PRST 6910 - Employment and Human Resources Law, Cr. 3.  
PRST 6920 - Diversity in the Workplace, Cr. 3.

**Select one (1)**

PRST 6500 - Foundations of Leadership, Cr. 3.  
PRST 6310 - Leadership in Organization, Cr. 3.

**Select two (2)**

PRST 6700 - Conflict Management and Negotiation, Cr. 3.  
PRST 6930 - Compensation and Benefits, Cr. 3.  
PRST 6940 - Recruitment, Selection, and Retention, Cr. 3.  
PRST 6460 - Instructional Design for Training and Development, Cr. 3.

**Required Culminating Professional Project (3 hours)**

PRST 6998 - Professional Project, Cr. 3.

**Concentration in Training and Development**

**Required Major Field Core (9 hours)**

PRST 6100 - Professional Environment: Issues and Ethics, Cr. 3.  
PRST 6200 - Globalization and the Professions, Cr. 3.  
PRST 6300 - Research Methods, Cr. 3.

**Concentration classes (Must complete 15 hours)**

PRST 6410 - Evaluation of learning, Cr. 3.  
PRST 6420 - Organizational Needs Analysis, Cr. 3.  
PRST 6770 - Computer-Based Decision Modeling, Cr. 3.  
PRST 6600 - Statistical Analysis, Cr. 3.  
PRST 6400 - Instructional Design for Training and Development, Cr. 3.  
PRST 6470 - Facilitation of Learning, Cr. 3.  
PRST 6430 - Instructional Design for Electronic Training, Cr. 3.  
PRST 6440 - Teaching Online, Cr. 3.  
PRST 6450 - Computer-based Instruction, Cr. 3.  
Two elective from any course in the MPS Program, Cr. 6

**Required Culminating Professional Project (3 hours)**

PRST 6998 - Professional Project, Cr. 3.

# Whitson-Hester School of Nursing

## School of Nursing

The Master of Science in Nursing Degree (MSN) is offered through the Regent's Online Degree Program (RODP), and is delivered following the standard protocol established for the delivery of RODP courses and programs. This program will prepare nurses to:

- Teach in a variety of academic and practice settings;
- Provide advanced nursing care to rural, urban, and underserved populations;
- Practice in collaborative and interdisciplinary relationships;
- Assume positions of leadership in the health care delivery system;
- Contribute to the current and evolving body of nursing science; and
- Continue study at the doctoral level.

The purposes of the MSN-RODP are:

- To increase access to graduate nursing education, especially for those nurses aspiring to teach in entry level nursing programs, manage professional practice work settings, and practice as advanced clinicians in a changing health care delivery system.
- To maximize the effective use of technology for delivery of graduate-level instruction. Distance delivery through the use of technology will increase access to graduate education, especially in remote areas of the state and for practicing nurses for whom time flexibility is a critical resource.
- To provide student access to web-based courses and degree programs. Web-based courses will reach populations not currently enrolled in graduate education, and will also permit students who are currently enrolled in on-campus courses to take additional courses, thus completing their programs sooner.

### Admission Requirements

- Eligibility to practice as a Registered Nurse in the state in which clinical assignments are completed.
- Official transcripts from previously attended colleges and/or universities.
- Cumulative undergraduate GPA of 3.0 on a 4.0 scale for full admission.
  - o For provisional standing admission:
    - 1) an overall undergraduate quality point average of 2.75 - 2.99 on a 4.0 scale, upon completion of a baccalaureate degree program.
    - 2) meet all other requirements for admission to MSN-RODP.
- Cumulative GPA of 3.0 on a 4.0 scale for all previous graduate studies.
- A Bachelor's degree:
  - o Requirements for the RN with a BSN degree: Completion of the BSN
  - o Requirements for the RN with a BA/BS non-nursing degree: Completion of a 12 unit RN/MSN nursing bridge sequence
    - NURS 4210 - Health Care Research,
    - NURS 4211 - Nursing Leadership and Management,
    - NURS 4212 - Trends and Issues in Nursing and Healthcare,
    - NURS 4213 - Community Health, and
 RN/MSN graduate will not be awarded the BSN degree.

**Huey-Ming Tzeng, Dean**

**Schools in the  
Whitson-Hester School of  
Nursing**

School of Nursing

**Degrees available in the  
Whitson-Hester School of  
Nursing**

Master of Science, Nursing

### School of Nursing

Graduate Faculty:

Judy Duvall  
Melissa Geist  
Sheila Green  
Kim Hanna  
Ann Hellman  
Barbara Jared  
Bedelia Russell

- TOEFL score of 600 (250 CBT) if native language is not English OR IELTS score of 5.5.
- A written document prepared by the applicant that includes a resume, a discussion of prior professional experience, future career goals, and reasons for pursuing graduate study.
- Letters of recommendations from at least three (3) persons (a minimum of one [1] academic) familiar with the applicant's academic and professional background and experience in nursing practice, specifying in detail the applicant's capabilities for graduate study and for future practice as an advanced practice nurse.
- For more information, visit the RODP site.

**Nursing, M.S.N. (RODP) Degree Requirements**

- Follow the Graduate School Grading System as published in the TTU Graduate School Catalog. (NOTE: only grades of A, B, and S are considered satisfactory at the graduate nursing level.)
- A minimum B grade is required in each nursing course.
- Required GPA. A graduate nursing student is required to maintain a cumulative grade average of at least B (3.0) on all courses taken for degree purposes. Credit toward a degree objective will be granted for any graduate course in which a grade of A, B, or S is assigned; however, not more than six (6) hours of credit below a B grade will be allowed. If a grade of C, D, U, F, WF, or NF is assigned in a nursing degree-related course, the course must be repeated; and both the original grade and the grade for the repetition will be counted in the cumulative average.
- A nursing course may be repeated ONE (1) time, and no more than TWO (2) nursing courses may be repeated.

**Curriculum**

**Core Courses for All Concentrations**

- NURS 6000 - Theoretical Foundations, Cr. 3.
- NURS 6001 - Health Care Policy, Cr. 3.
- NURS 6002 - Advanced Nursing Research, Cr. 3.
- NURS 6003 - Advanced Role Development, Cr. 3.

Concentration	Core	Conc. Req.	Spec. Elec.	Prac.	Total
Nursing Education	15	12	6	6	39
Nursing Administration	15	15		4	34
Nursing Informatics	15	19		4	38
<i>Advanced Practice:</i>					
Family Nurse Practitioner	15	10	17	4	46

NURS 6990 - Scholarly Synthesis/Research, Cr. 3.

**Concentration in Nursing Education\***

**Required Courses**

- NURS 6201 - Theories of Nursing Education, Cr. 3.
- NURS 6202 - Teaching Strategies and Evaluation, Cr. 3.
- NURS 6203 - Curriculum Design Advanced, Cr. 3.
- NURS 6103 - Advanced Pathophysiology, Cr. 3.

**Clinical Focus Courses**

Complete 6 hours from one of the following clinical areas.

***Adult Health***

NURS 6501 - Advanced Adult Health Nursing I, Cr. 3.  
NURS 6503 - Advanced Adult Health Nursing II, Cr. 3.

***Psychiatric Mental Health***

NURS 6511 - Psychiatric Nursing Care I, Cr. 3.  
NURS 6513 - Psychiatric Nursing Care II, Cr. 3.

***Critical Care***

NURS 6522 - Core Concepts in Critical Care I, Cr. 3.  
NURS 6523 - Core Concepts in Critical Care II, Cr. 3.

***Maternal Child***

NURS 6541 - Women's Health and Perinatal Nursing I, Cr. 3.  
NURS 6543 - Women's Health and Perinatal Nursing II, Cr. 3.

***Pediatrics***

NURS 6631 - Pediatric Nursing I, Cr. 3.  
NURS 6633 - Pediatric Nursing II, Cr. 3.

**Nursing Education Practicum Requirement**

NURS 6207 - Clinical Focus Practicum, Cr. 2. (8 contact hours)  
NURS 6209 - Nursing Education Practicum, Cr. 4.

**Total practice contact hours = 360**  
**Clinical Focus Practicum = 120**  
**Nursing Education Practicum = 240**

**Concentration in Nursing Administration****Required Courses**

NURS 6301 - Nursing Administration I, Cr. 3.  
NURS 6302 - Nursing Administration II, Cr. 3.  
NURS 6303 - Health Care Economics, Cr. 3.  
NURS 6304 - Human Resources Management Quality, Cr. 3.  
NURS 6305 - Management in Nursing and Health Care, Cr. 3.

**Practicum Requirement**

NURS 6309 - Nursing Administration Practicum, Cr. 4.

**Total practice contact hours = 240**

**Concentration in Nursing Informatics****Required Courses**

NURS 6401 - Introduction to Healthcare Informatics, Cr. 3.  
NURS 6402 - Health Care Information Sys. and Technology Integration, Cr. 3.  
NURS 6403 - Project Management in Systems Analysis and Design, Cr. 3.  
NURS 6404 - Project Management in System Implementation and Eval., Cr. 3.  
NURS 6406 - Health Care Data Analysis and Evidence-Based Practice, Cr. 2.

**Practicum Requirement**

NURS 6407 - Informatics Applications I, Cr. 2.  
NURS 6409 - Informatics Applications II, Cr. 2.

**Total practice contact hours = 240**

**Concentration in Family Nurse Practitioner**

*\*Students choosing the nursing education concentration who desire to take national certification exams for the Clinical Nurse Specialist (CNS) will also need to meet requirements in the CNS option.*

**Advanced Practice Concentration Required Courses**

NURS 6101 - Advanced Health Assessment, Cr. 3.  
 NURS 6102 - Advanced Health Assessment - Clinical, Cr. 1.  
 NURS 6103 - Advanced Pathophysiology, Cr. 3.  
 NURS 6104 - Advanced Pharmacology, Cr. 3.

**Family Nurse Practitioner Courses**

NURS 6601 - Family Nurse Practitioner I, Cr. 3.  
 NURS 6602 - Family Nurse Practitioner I - Clinical, Cr. 2.  
 NURS 6603 - Family Nurse Practitioner II, Cr. 3.  
 NURS 6604 - Family Nurse Practitioner II - Clinical, Cr. 4.  
 NURS 6605 - Family Nurse Practitioner III, Cr. 3.  
 NURS 6606 - Family Nurse Practitioner III - Clinical, Cr. 2.

**Family Nurse Practitioner Practicum Requirement**

NURS 6609 - Advanced Family Nurse Practitioner Practicum, Cr. 4.

**Total practice contact hours = 780**

**Nursing Certificate Programs (RODP)**

The School of Nursing offers four (4) post-master's certificate programs:

- Family Nurse Practitioner (FNP)
- Nursing Administration
- Nursing Education
- Nursing Informatics

**Family Nurse Practitioner (FNP) Certificate (RODP)**

The Family Nurse Practitioner (FNP) Option in the Advanced Practice Concentration of the Master's of Science in Nursing program is designed to prepare nurses to deliver primary health care to families in a variety of settings. Students follow patients through the life cycle utilizing obstetric, pediatric, gynecologic, as well as adult and geriatric primary care diagnostic and management skills.

The scope of practice of the Family Nurse Practitioner is based on a team approach. An interdependent member of the health team, the FNP provides primary care through the following means:

- Documentation of individual and family health history
- Physical assessment
- Diagnostic, therapeutic, and educational care plans
- Collaboration with physicians and other health care professionals
- Referral to appropriate health care providers
- Coordination of health care

Graduates are eligible to take the certifying examination offered by the American Nurses Association and the American Academy of Nurse Practitioners. Graduates find positions in a variety of settings such as outpatient clinics, community health centers, private practice offices, health departments, homeless shelters, chronic care facilities, schools, day care programs, hospices, homes, and acute care settings.

Since opening the MSN-RODP, a number of master's prepared nurses have indicated an interest in completing the Family Nurse Practitioner Concentration courses in order to sit for the national certification exam to practice as a Family Nurse Practitioner. In order to be eligible to take the certification exam, students must "successfully complete graduate didactic and clinical requirements of a master's nurse practitioner program through a formal graduate-level certificate or master's level NP program in the desired area of practice." Establishment of the FNP Certificate program offers a formal program of study to meet this need for students without requiring them to complete a second master's degree.

Constant change in the health system challenges the notion that one nurse can be all things to all people. Nurses with varied education and practice competencies bring different skills to patient care, and they must be able to practice to the fullest potential of these capabilities. To compete as attractive professional destinations, practice environments must recognize and reward these differences by defining nurses' roles, and by utilizing and compensating nurses according to their different educational preparation and competencies. Nurses prepared at the master's level in a variety of advanced practice roles are needed to meet patient needs in a changing health care environment.

### **Additional Admission Requirements**

Additional admission requirements for the Family Nurse Practitioner Certificate Program include:

- A master's degree in nursing from an accredited program (NLNAC or CCNE).
- Satisfactory completion of the following courses at the master's level:
  - o Advanced Health Assessment – Clinical or lab (1 sem hr)
  - o Advanced Health Assessment (3 sem hrs)
  - o Advanced Pathophysiology (3 sem hrs)
  - o Advanced Pharmacology (3 sem hrs)
- Eligibility to practice as a Registered Nurse in Tennessee or the state in which clinical assignments are completed. Appropriate licensure/ authorization must be obtained during the first semester following admission to the program.
- Overall GPA of 3.0 on a 4.0 scale
- TOEFL score of 600 (100 internet-based or 250 computer-based) OR, minimum base score of 5.5 on the IELTS, if native language is not English
- A written document prepared by the applicant that includes a resume, a discussion of prior professional experience, future career goals, and reasons for pursuing graduate study.
- Letters of recommendation from at least three (3) persons (a minimum of one [1] academic) familiar with the applicant's academic and professional background and experience in nursing practice, specifying in detail the applicant's capabilities for graduate study and for future practice as an advanced practice nurse.

### **Required Courses**

NURS 6601 - Family Nurse Practitioner I, Cr. 3.

NURS 6602 - Family Nurse Practitioner I - Clinical, Cr. 2.

NURS 6603 - Family Nurse Practitioner II, Cr. 3.

NURS 6604 - Family Nurse Practitioner II - Clinical, Cr. 4.

NURS 6605 - Family Nurse Practitioner III, Cr. 3.

NURS 6606 - Family Nurse Practitioner III - Clinical, Cr. 2.

### **Advanced Practice Practicum Requirement (4 hours)**

NURS 6609 - Advanced Family Nurse Practitioner Practicum, Cr. 4.

### **Concentration(s) Total credits = 21**

#### **Total contact hours – Advanced Family NP Clinical/Practicum = 720**

Students in the FNP Certificate program will complete all courses in the FNP option of the Advanced Practice Concentration in the MSN-RODP. All courses are already approved through all review/approval processes.

Clinical experiences and required practicum are included. Clinical and practicum courses require four (4) clock hours per credit hour. (For every credit hour awarded, the student is required to complete four [4] clock hours in clinical/ practicum contact.)

### **Nursing Administration, M.S.N. Post-Master's Certificate (RODP)**

The Nursing Administration Certificate program provides a formal program of study for masters prepared nurses interested in obtaining a credential allowing them to assume a management position in a healthcare setting. The program provides the content necessary in nursing administration including health care finance, human resource management, and quality management in healthcare. Once students complete the certificate, they will be eligible to sit for the national certification exam in this area. This certificate is the optimal way for those already holding a masters degree and desiring this specialization to gain marketability without having to complete a second master's degree.

#### **Additional Admission Requirements**

Additional admission requirements for the M.S.N. Post-Master's Nursing Administration Certificate program include:

- A master's degree in nursing from an accredited program (NLNAC or CCNE).
- Eligibility to practice as a Registered Nurse in Tennessee or the state in which clinical assignments are completed.
- Overall GPA of 3.0 on a 4.0 scale.
- TOEFL score of 600 if native language is not English.
- A written document prepared by the applicant that includes a resume, a discussion of prior professional experience, future career goals, and reasons for pursuing graduate study.
- Letters of recommendation from at least three persons (a minimum of one academic) familiar with the applicant's academic and professional background and experience in nursing practice, specifying in detail the applicant's capabilities for graduate study and for future practice as an advanced practice nurse.

#### **Curriculum**

NURS 6301 - Nursing Administration I, Cr. 3.  
 NURS 6302 - Nursing Administration II, Cr. 3.  
 NURS 6303 - Health Care Economics, Cr. 3.  
 NURS 6304 - Human Resources Management Quality, Cr. 3.  
 NURS 6305 - Management in Nursing and Health Care, Cr. 3.  
 NURS 6309 - Nursing Administration Practicum, Cr. 4.

**Total Credit Hours = 19**

### **Nursing Education, M.S.N. Post-Master's Certificate (RODP)**

The Nursing Education Certificate program provides a formal program of study for masters prepared nurses interested in obtaining a credential allowing them to teach. The program provides the content necessary to teach nursing students in a specific area of nursing. Once students complete the certificate, they will be eligible to sit for the national certification exam in this area. This certificate is the optimal way for those already holding a masters degree and desiring this specialization to gain marketability without having to complete a second master's degree.

#### **Additional Admission Requirements**

Additional admission requirements for the M.S.N. Post-Master's Nursing Education Certificate program include:

- A master's degree in nursing from an accredited program (NLNAC or CCNE).

- Satisfactory completion of the following course at the master's level:  
Advanced pathophysiology.
- Eligibility to practice as a Registered Nurse in Tennessee or the state in which clinical assignments are completed.
- Overall GPA of 3.0 on a 4.0 scale.
- TOEFL score of 600 if native language is not English.
- A written document prepared by the applicant that includes a resume, a discussion of prior professional experience, future career goals, and reasons for pursuing graduate study.
- Letters of recommendation from at least three (3) persons (a minimum of one [1] academic) familiar with the applicant's academic and professional background and experience in nursing practice, specifying in detail the applicant's capabilities for graduate study and for future practice as an advanced practice nurse.

### **Curriculum**

NURS 6201 - Theories of Nursing Education, Cr. 3.  
 NURS 6202 - Teaching Strategies and Evaluation, Cr. 3.  
 NURS 6203 - Curriculum Design Advanced, Cr. 3.  
 NURS 6207 - Clinical Focus Practicum, Cr. 2. (8 contact hours)  
 NURS 6209 - Nursing Education Practicum, Cr. 4.

### **Clinical Focus Courses**

Two 3-hour courses in the same area.

#### ***Adult Health***

NURS 6501 - Advanced Adult Health Nursing I, Cr. 3.  
 NURS 6503 - Advanced Adult Health Nursing II, Cr. 3.

#### ***Critical Care***

NURS 6522 - Core Concepts in Critical Care I, Cr. 3.  
 NURS 6523 - Core Concepts in Critical Care II, Cr. 3.

#### ***Pediatrics***

NURS 6631 - Pediatric Nursing I, Cr. 3.  
 NURS 6633 - Pediatric Nursing II, Cr. 3.

**Total Credit Hours = 21**

### **Nursing Informatics, M.S.N. Post-Master's Certificate (RODP)**

The Nursing Informatics Certificate program provides a formal program of study for masters prepared nurses interested in obtainin a credential allowing them to assume a position in healthcare informatics. The program provides the content necessary in information management within various healthcare settings. Once students complete the certificate, they will be eligible to sit for the national certification exam in this area. This certificate is the optimal way for those already holding a masters degree and desiring this specialization to gain marketability without having to complete a second master's degree.

#### **Additional Admission Requirements**

Additional admission requirements for the M.S.N. Post-Master's Nursing Informatics Certificate program include:

- A master's degree in nursing from an accredited program (NLNAC or CCNE).
- Eligibility to practice as a Registered Nurse in Tennessee or the state in

which clinical assignments are completed.

- Overall GPA of 3.0 on a 4.0 scale.
- TOEFL score of 600 if native language is not English.
- A written document prepared by the applicant that includes a resume, a discussion of prior professional experience, future career goals, and reasons for pursuing graduate study.
- Letters of recommendation from at least three (3) persons (a minimum of one [1] academic) familiar with the applicant's academic and professional background and experience in nursing practice, specifying in detail the applicant's capabilities for graduate study and for future practice as an advanced practice nurse.

#### **Curriculum**

NURS 6401 - Introduction to Healthcare Informatics, Cr. 3.

NURS 6402 - Health Care Information Sys. and Technology Integration, Cr. 3.

NURS 6403 - Project Management in Systems Analysis and Design, Cr. 3.

NURS 6404 - Project Management in Sys. Implementation and Evaluation, Cr. 3.

NURS 6406 - Health Care Data Analysis and Evidence-Based Practice, Cr. 2.

NURS 6407 - Informatics Applications I, Cr. 2.

NURS 6409 - Informatics Applications II, Cr. 2.

NURS 6410 - Informatics Practicum, Cr. 4.

**Total Credit Hours = 23**

# Cooperative Education

## Office of Career Services

Cooperative Education is a voluntary, independent education program available for all undergraduate and graduate students in any academic area. Work experience is gained with an employer who offers learning opportunities related to a student's academic discipline. The program provides careful supervision with timely evaluation of performance, attitude, and ability of the student on the job. The goal is to help students grow and improve their capabilities.

The co-op program allows a student to obtain on-the-job learning experiences that can increase motivational and conceptual understanding in the classroom. It can provide a realistic evaluation of your career choice along with the opportunity to earn a supplemental income to aid with college expenses.

## Eligibility

Students must meet the following requirements:

- Register with the Career Services office by establishing your Experience account
- Minimum 2.5 GPA (GPA must be maintained while participating in the program)
- Full-time student status
- Must complete one (1) semester at TTU prior to completing a co-op application
- Transfer students from another college or university must complete two (2) full semesters at TTU prior to completing a co-op application
- Attend an orientation session

## CO-OP Plans

There are four (4) co-op scheduling plans available:

1. Plan A - Student works full-time for an employer for 12 months.
2. Plan B - Student works alternate semesters at the employer's site (work, return to school, work, etc.)
3. Plan C - Student will attend college and work approximately 20 hours per week for the employer.
4. Plan D - Summer only assignment (two [2] or more summers)

Employers may specify in advance that students have completed certain courses prior to the co-op assignment. The co-op hiring process is competitive. Students must go through an interview process with the employer. Students participating in the co-op program must register and enroll in one (1) credit hour for each semester of their assignment. This does not count toward graduation requirements.

# Graduate Courses - Course Descriptions

## Course Descriptions

### Accounting

#### ACCT 6010 - Accounting Information for Management Decisions

Lec. 3. Cr. 3. Analysis, interpretation, and use of accounting information by managers in directing the operations of organizations. This course may not be used to satisfy prerequisite requirements for taking upper division undergraduate accounting courses.

#### ACCT 6110 - Financial Accounting Reporting Standards

Lec. 3. Cr. 3. Prerequisite: Undergraduate accounting core including ACCT 3170, ACCT 3180, ACCT 3210, ACCT 3330, and ACCT 3620 (or their equivalents). A case study course covering compliance with relevant authoritative pronouncements used in the preparation of general purpose financial statements.

#### ACCT 6250 - Governmental Not-for-Profit, and Healthcare Accounting

Lec. 3. Cr. 3. Prerequisite: Undergraduate accounting core including ACCT 3170, ACCT 3180, ACCT 3330, and ACCT 3620 (or their equivalents). This is a case study course in accounting and reporting for governmental and not-for-profit entities, including healthcare entities.

#### ACCT 6310 - Tax Research and Strategy

Lec. 3. Cr. 3. Prerequisite: Undergraduate accounting core including ACCT 3170, ACCT 3180, ACCT 3210, ACCT 3330, and ACCT 3620 (or their equivalents). A case study course emphasizing research, analysis, development, and communication of solutions to tax-related problems using modern information technology resources.

#### ACCT 6620 - Auditing and Attestation

Lec. 3. Cr. 3. Prerequisite: Undergraduate accounting core including ACCT 3170, ACCT 3180, ACCT 3210, ACCT 3330, and ACCT 3620 (or their equivalents). Emphasizes case studies, auditing simulations, modern authoritative pronouncements, and current events in the accounting profession.

#### ACCT 6900 - Special Topics

Lec. 3. Cr. 3. A case course dealing with current topics in business.

## Advanced Studies in Teaching and Learning

#### ASTL 6700/7700 - Portfolio Development

Cr. 3. Presents an overview of the portfolio as an authentic assessment tool utilized to document the scholarship of teaching. It introduces educators to the concept of using artifacts/products/teacher work samples as evidence of effective teaching and, then, expands this to include student work samples as supportive evidence of that effectiveness. The course emphasis is focused on collection and presentation of teacher developed instructional examples organized comprehensively to demonstrate the educator's abilities in six areas: planning and teaching, actual teaching, assessment and evaluation, learning environment, professional growth, and communication. Although the format of the professional portfolio will follow the National Board for Professional Teaching Standards requirements, the student may choose whether or not to submit the portfolio for National Board Certification.

#### ASTL 6701/7701 - Teacher as Learner

Cr. 3. Teachers seek to improve their knowledge and practice through a continuing process of professional reading, writing, dialogue, inquiry, and reflection. These processes can be supported by technology in a variety of ways. This course is designed to assist teachers to become comfortable with the hardware and software that can be used to create effective literacy learning experiences. In addition, teachers must also know how to find, access, and assess materials from a variety of sources as well as know how to design and develop multi- and hyper- media learning environments that promote active learning. The design and structure of the course will contribute to the professional development of educators to use effectively technology to promote and develop reflective learners-learners that are able to use technology to enhance and expand their learning environment.

#### ASTL 6703/7703 - Knowledge of the Learner

Cr. 3. This course addresses the areas of child and adolescent psychological development. The focus is on the science of individual human development. In addition, infant development is covered briefly to provide an understanding of the sequential and hierarchical nature of development. The majority of assignments will deal with children in the kindergarten to eighth grade. However, early childhood and teen assignments will be included to understand the precursors and aftereffects childhood and middle childhood. The course emphasizes an understanding of the important methods, terms, theories, and findings in the field of developmental psychology. The primary focus of the class is the cognitive, socioemotional and physical changes associated with child and adolescent development. The course is organized in a topical format, exploring the basic theories and tracing development across the preadult years for each psychological topic covered. The course requires both independent reading, interaction with online modules, field observations and Berk's text. It is strongly recommended that you have passed an introductory Developmental Psychology course before taking this class.

#### ASTL 6705/7705 - Assessment of Learning

Cr. 3. Assessment of learning for the classroom is an introduction to systematic assessment at the classroom level. The course provides an overview of models for planning and implementing classroom assessment projects. The emphasis in the course, however, is implementation, data collection, analysis, and reporting of results on classroom assessment projects. This course presents a rationale for learning-centered assessment and an overview of the tools, techniques, and issues that educators should consider as they design and use assessments focused on learner needs. Underlying assumptions in the course are: (1) assessment is viewed as deliberately designed to improve and educate student performance, not merely audit it; (2) assessment is a way to help students systematically self-correct their performance; and (3) assessment has two essential qualities (anchoring in authentic tasks and feedback to revise performance). The course examines what it would mean, in reality, if assessment were central to student and teacher work.

#### ASTL 6706/7706 - Learning Strategies/Instructional Strategies

Cr. 3. This course is designed to examine learning theories and to study their influence on current instructional practices. Students will be asked to reflect on the metacognitive processes involved in the decision making phase of classroom instruction. The alignment of National Board for Professional Teaching Standards with personal instructional practices is questioned and will be studied.

#### ASTL 6709/7709 - Action Research

Cr. 3. Must be taken during the final semester of the program. Will

empower classroom teachers to construct their own knowledge and to make it available to others for the benefit of all learners. This course is designed to help educators and other professionals understand the relationship between their own professional development and the process of improving the quality of pupils' and/or colleagues' learning.

**ASTL 6721/7721 - Theory and Foundation of Developmental Literacy (Literacy I)**

Cr. 3. Literacy I will engage candidates in professional reading about, and discussions of, the following: the nature of learning, the nature of language, how human beings learn language, the differences between receptive and productive language, the nature of the reading process, the nature of the writing process, how children develop their native language, what the relationships are among learning one's 'mother tongue' and learning to read and write that same language, what the typical stages are through which children pass as they develop literacy, and what some of the more obvious implications are for classroom instruction and assessment in reading and writing. This course lays the foundation for all further learning about the teaching of literacy. Among other assessment devices, candidates will take and pass a comprehensive examination to determine their grasp of the concepts for this course. Application of technology, diversity issues, and use of appropriate resources will be part of this literacy course.

**ASTL 6723/7723 - Understanding and Implementing Best Practices in Teaching Beginning Literacy (Literacy II)**

Cr. 3. Literacy II will engage candidates in reading and discussions to explore theory, understand best practices, and implement best practices in literacy instruction grades PreK-3. It will begin with an exploration of theory and best practices for family literacy from the birth of a child to school age. Theory and best practices will be examined from entrance into school, preschool to kindergarten, followed by explorations of best practices for teaching reading and writing in the primary grades. Candidates will be expected to work with primary grade children as they attempt to understand and implement best practices in emergent and early literacy development.

**ASTL 6725/7725 - Understanding and Implementing Best Practices for Continued Literacy Growth in the Middle Grades (Literacy III)**

Cr. 3. Literacy III will engage candidates in professional studies related to understanding and using best practice for continued literacy growth in the middle grades. This course reviews the characteristics of a comprehensive middle school reading program.

**ASTL 6726/7726 - Diagnosing Literacy Problems K-8 (Literacy IV)**

Cr. 3. Literacy IV will engage candidates in reading, discussions, and implementation of diagnostic tools and techniques in literacy for struggling students grades K-8. Students enrolled in the course are expected to give specified reading tests at least two students.

**ASTL 6729/7729 - Remediation of Literacy Problems K-8 (Literacy V)**

Cr. 3. Literacy V will engage candidates in reading, discussions, metacognition and implementation of instructional strategies based on the data derived from the diagnostic tools employed with students in Literacy IV. These students will be struggling readers in grades K-8. (Issues related to improving student writing will also be presented and explored.

## Agribusiness Economics

**AGBE 4120 (5120) - Environmental and Natural Resource Economics**

Fall. Lec. 3. Cr. 3. Prerequisite: AGBE 2100 and/or ECON 2110, or consent of instructor. Issues and policies involving pollution,

depletable and renewable resources, and sustainable development. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**AGBE 4210 (5210) - Agricultural and Biological Statistics**

Lec. 3. Cr. 3. Sampling, probability, distributions, statistical tests, analysis of variance, regression, interpretation of data. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**AGBE 4940 (5940) - Agribusiness Economics Topics**

Cr. 1-4. Prerequisite: Consent of instructor. Special study in an approved area of agribusiness economics under the supervision of a member of the School of Agriculture faculty. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**AGBE 4950 (5950) - Agribusiness Economics Topics**

Cr. 1-4. Prerequisite: Consent of instructor. Special study in an approved area of agribusiness economics under the supervision of a member of the School of Agriculture faculty. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

## Agricultural Engineering Technology

**AGET 4220 (5220) - Agricultural Machinery and Tractors**

Lec. 2. Lab. 2. Cr. 3. Principles of operation, selection, and economic utilization of agricultural power units and equipment. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**AGET 4610 (5610) - Greenhouse Structures and Landscaping Equipment**

Lec. 3. Cr. 3. Prerequisite: AGET 2110 or consent of instructor. Selection, design, construction, and operation of greenhouse structures and related nursery and landscaping equipment. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**AGET 4620 (5620) - Agricultural Structures**

Lec. 2. Lab. 2. Cr. 3. Prerequisite: AGET 2110 or consent of instructor. Planning; drawing; materials; principles of construction with respect to arrangement, location, and environmental control; plan reading. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**AGET 4720 (5720) - Agricultural Processing and Electric Power Technology**

Lec. 3. Cr. 3. Principles of fluid flow, heat transfer, drying, refrigeration, and electrical supply and control systems applied to agriculture. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**AGET 4940 (5940) - Agricultural Engineering Technology Topics**

Cr. 1-4. Prerequisite: Consent of instructor. Special study in an approved area of agricultural engineering technology under the supervision of a member of the School of Agriculture faculty. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**AGET 4950 (5950) - Agricultural Engineering Technology Topics**

Cr. 1-4. Prerequisite: Consent of instructor. Special study in an approved area of agricultural engineering technology under the supervision of a member of the School of Agriculture faculty. Students enrolled in the 5000-level course will be required to

complete additional work as stated in the syllabus.

## Agricultural Education

### **AGED 4150 (5150) - Communications and Public Relations in Agricultural and Extension Education**

Lec. 3. Cr. 3. Publics to be dealt with, public relations media, techniques of establishing and maintaining desirable communications and public relations in agriculture. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

### **AGED 4200 (5200) - Methods and Techniques of Teaching in Agricultural and Extension Education**

Lec. 2. Lab. 2. Cr. 3. Theory and practice in directing learning activities. Planning and delivering instruction to formal and informal groups in Agricultural and Extension Education. Preparing instructional materials. Using instructional technology. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

### **AGED 4250 (5250) - Use of Volunteers in Agricultural and Extension Education**

Lec. 3. Cr. 3. Developing skills in selecting, recruiting, training, coordinating, supervising, and evaluating volunteers in Agricultural and Extension Education. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

### **AGED 4300 (5300) - Development of Youth Programs in Agricultural and Extension Education**

Lec. 3. Cr. 3. Developing, Implementing, and evaluating the 4-H and FFA youth programs in Agricultural and Extension Education. Identifying needs and interests of youth. Identifying, securing, and developing supportive resources. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

### **AGED 4350 (5350) - Program Planning and Evaluation in Agricultural and Extension Education**

Lec. 3. Cr. 3. Advanced principles and procedures used in planning and evaluating Agricultural and Extension Education programs. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

### **AGED 4940 (5940) - Agricultural Education Topics**

Cr. 1-4. Prerequisite: Consent of instructor. Special study in an approved area of Agricultural Education under the supervision of a member of the School of Agriculture faculty. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

### **AGED 4950 (5950) - Agricultural Education Topics**

Cr. 1-4. Prerequisite: Consent of instructor. Special study in an approved area of Agricultural Education under the supervision of a member of the School of Agriculture faculty. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

## Agronomy

### **AGRN 4100 (5100) - Weed Science**

Lec. 2. Lab. 2. Cr. 3. Prerequisite: AGRN 1010 or consent of instructor. Plant and seed identification, growth habits, and dissemination of weeds. Biological, cultural, and chemical methods of control in the integrated pest management (IPM) concept. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

### **AGRN 4110 (5110) - Forage Crops Production and Management**

Lec. 3. Lab. 2. Cr. 4. Prerequisite: AGRN 1010 and 2210. Botany and classification, soil and climatic requirements, species adaptation, establishment, and management of grasses and legumes for silage, hay, and temporary, permanent, and rotational pastures for ruminants, swine, and horses. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

### **AGRN 4120 (5120) - Crop Improvement**

Lec. 2. Lab. 2. Cr. 3. Prerequisite: AGRN 1010 or consent of instructor. Objectives, genetic principles, and methods of crop improvement by conventional and genetic engineering methods. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

### **AGRN 4210 (5210) - Soil Fertility and Fertilizers**

Lec. 2. Lab. 2. Cr. 3. Prerequisite: AGRN 2210 or consent of instructor. Properties of soils in relation to plant nutrition; fertilizer materials and their relationship to soil fertility. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

### **AGRN 4220 (5220) - Environmental Soil Chemistry**

Lec. 3. Cr. 3. Prerequisite: AGRN 2210 or consent of instructor. Study of chemical composition of natural and anthropogenic material in soil and their reactions and movement in the soil environment. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

### **AGRN 4230 (5230) - Soil Classification**

Lec. 2. Lab. 2. Cr. 3. Prerequisite: AGRN 2210 or consent of instructor. Soil formation, morphology, and classification; methods of soil survey, and detailed mapping of an assigned area. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

### **AGRN 4940 (5940) - Agronomy Topics**

Cr. 1-4. Prerequisite: Consent of instructor. Special study in an approved area of agronomy under the supervision of a member of the School of Agriculture faculty. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

### **AGRN 4950 (5950) - Agronomy Topics**

Cr. 1-4. Prerequisite: Consent of instructor. Special study in an approved area of agronomy under the supervision of a member of the School of Agriculture faculty. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

### **AGRN 4960 (5960) - Soil Science Topics**

Cr. 1-4. Prerequisite: Consent of instructor. Special study in an approved area of soil science under the supervision of a member of the School of Agriculture faculty. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

## Animal Science

### **ANS 4940 (5940) - Animal Science Topics**

Cr. 1-4. Prerequisite: Consent of instructor. Special study in an approved area of animal science under the supervision of a member of the School of Agriculture faculty. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

### **ANS 4950 (5950) - Animal Science Topics**

Cr. 1-4. Prerequisite: Consent of instructor. Special study in an

approved area of animal science under the supervision of a member of the School of Agriculture faculty. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

## Applied Behavioral Analysis

### ABAP 7120 - Positive Behavior Support & Families

Lec. 3. Cr. 3. Prerequisite: Admission to Doctoral Program. Issues and practices associated with partnering with families in designing, implementing and evaluating positive behavior support for their children with challenging behavior.

### ABAP 7910 - Independent Study in Early Childhood Special Education

Lec. 2. Cr. 2. Prerequisite: Admission to Doctor Program and consent of instructor. Advanced study of an individual basis focusing on an area directly related to young children with special needs and their families.

### ABAP 7920 - Topics, Issues & Research in Early Childhood Special Education

Lec. 2. Cr. 2. Prerequisite: Admission to Doctoral Program and consent of instructor. Advanced study of a topic or topics relevant to research and/or practice in early childhood special education, early intervention or young children and positive behavior support.

## Applied Behavior and Learning

### EDUB 7010 - Advanced Systematic Instruction

Lec. 3. Cr. 3. An in-depth study of instructional methodologies for persons with moderate and severe disabilities.

### EDUB 7030 - Functional Analysis of Behavior

Lec. 3. Cr. 3. Prerequisite: Admission to Doctoral Program. Instruction in the functional analysis of severe and challenging behaviors.

### EDUB 7040 - Assessment of Autism Spectrum Disorders

Lec. 3. Cr. 3. Prerequisite: Admission to the Ph.D. program and SPED 6050. A comprehensive overview of assessment methods used in the evaluation of children with Autism Spectrum Disorders.

### EDUB 7050 - Intervention and Treatment in Autism Spectrum Disorders

Lec. 3. Cr. 3. Prerequisite: Admission to the Ph.D. Program, SPED 6050, and EDUB 7040. A comprehensive overview of research-based practices in the design and delivery of intervention and treatments to students with Autism Spectrum Disorders.

### EDUB 7810 - Practicum in Behavior Analysis

Cr. 3. Prerequisite: EDUB 7010, EDUB 7030; SPED 6050; Admission to Doctoral Program. Supervised practice in development and application of behavioral intervention.

## Art

### ART 4100 (5100) - Art Tour

Cr. 3. Prerequisite: ART 1030, 2110, 2120, 3130, 3150, or 3160, or consent of instructor. A 1-2 week trip to view internationally recognized art. A term paper is required. May be repeated for credit if trip is different. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

### ART 4140 (5140) - Art Theory

Lec. 3. Cr. 3. Prerequisite: ART 2110, 2120, and 3130, or consent of instructor. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

### ART 4170 (5170) - Ancient Mesoamerican Art

Lec. 3. Cr. 3. Prerequisite: None. Art and architecture of Pre-Columbian Mesoamerican cultures, including Olmec, Maya, Teotihuacan, Monte Alban, Veracruz, Mixtecs, and Aztecs. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

### ART 4540 (5540) - Special Problems in Clay

Cr. 3. Prerequisite: Permission of the instructor. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

### ART 4640 (5640) - Special Problems in Fibers

Cr. 3. Prerequisite: Permission of the instructor. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

### ART 4740 (5740) - Special Problems in Glass

Cr. 3. Prerequisite: Permission of the instructor. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

### ART 4840 (5840) - Special Problems in Metals

Cr. 3. Prerequisite: Permission of the instructor. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

### ART 4940 (5940) - Special Problems in Wood

Cr. 3. Prerequisite: Permission of the instructor. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

### ART 6030 - Graduate Seminar in Crafts

Cr. 3.

### ART 6070 - Independent Study-Art/Craft History

Cr. 1-3.

### ART 6120 - Practicum-Ceramics

Cr. 1-3.

### ART 6121 - Practicum-Ceramics

Cr. 1-3.

### ART 6180 - Independent Studies Crafts/Clay

Cr. 1-3.

### ART 6220 - Practicum-Fibers

Cr. 1-3.

### ART 6221 - Practicum-Fibers

Cr. 1-3.

### ART 6280 - Independent Studies Crafts/Fibers

Cr. 1-3.

### ART 6320 - Practicum-Glass

Cr. 1-3.

### ART 6321 - Practicum-Glass

Cr. 1-3.

### ART 6380 - Independent Studies Crafts/Glass

Cr. 1-3.

### ART 6420 - Practicum-Metals

Cr. 1-3.

### ART 6421 - Practicum-Metals

Cr. 1-3.

**ART 6480 - Independent Studies Crafts/Metals**

Cr. 1-3.

**ART 6520 - Practicum-Wood**

Cr. 1-3.

**ART 6521 - Practicum-Wood**

Cr. 1-3.

**ART 6580 - Independent Studies Crafts/Wood**

Cr. 1-3.

## Biology

**BIOL 4000 (5000) - General Parasitology**

Lec. 3. Lab. 2 Cr. 4. Prerequisite: BIOL 1110 and BIOL 3130 or WFS 3130. Biology of animal agents and vectors of diseases, with emphasis placed on medical parasitology and organisms that parasitize fish and wildlife species. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**BIOL 4040 (5040) - Immunology**

Lec. 3 Cr. 3. Prerequisite: Junior standing. Introduction to basic principles of cellular and molecular immunology. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**BIOL 4060 (5060) - Hormones and Chemical Communication**

Lec. 3. Cr. 3. Prerequisite: Prerequisite: BIOL 3140 and CHEM 1110 or CHEM 1210. A survey of hormones, their functions, and mechanisms of action in vertebrate animals including humans. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**BIOL 4100 (5100) - Evolutionary Biology**

Lec. 3. Cr. 3. Prerequisite: BIOL 3810 and BIOL 3130 or WFS 3130. Theories, evidences, principles, and examples of organic evolution. Emphasis on anatomical, chemical, ecological, geological, anthropological, and genetic factors. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**BIOL 4120 (5120) - Protozoology**

Lec. 3. Lab. 2. Cr. 4. Prerequisite: BIOL 3200 or BIOL 3230. Diversity, ecology, and taxonomy of protozoa, and the importance of protozoa as agents of human disease and as model organisms for studying eukaryotic cell biology. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**BIOL 4130 (5130) - Environmental Microbiology**

Lec. 2. Lab. 2. Cr. 3. Prerequisite: BIOL 3200 or 3230. The function of microorganisms in the environment. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**BIOL 4150 (5150) - Molecular Genetics**

Lec. 3. Cr. 3. Prerequisite: BIOL 3810, CHEM 3005 or 3020. Molecular basis of inheritance with special emphasis on microorganisms. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**BIOL 4160 (5160) - Genetic Engineering Laboratory**

Lab. 4. Cr. 2. BIOL 4150 (5150) Techniques of bacterial genetics and recombinant DNA methodology. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**BIOL 4220 (5220) - Biostatistics**

Lec. 3. Cr. 3. Probability and frequency distribution; statistical populations and samples; and tests of hypotheses used in biological research. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**BIOL 4230 (5230) - Animal Behavior**

Lec. 3. Cr. 3. Prerequisite: Junior standing. Introduction to basic principles underlying the behavior of animals. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**BIOL 4240 (5240) - Systematic Botany**

Lec. 2. Lab. 3. Cr. 3. Prerequisite: BIOL 1120 and 3240 or consent of instructor. Principles of evolutionary relationships among major plant groups, with an emphasis on the phylogeny of gymnosperms and flowering plant families. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**BIOL 4250 (5250) - Economic Botany**

Lec. 3. Cr. 3. Prerequisite: BIOL 1120 Interrelationships between plants and people. Topics include a survey of the past, present, and future uses of plants, and the role of conservation biology in the preservation of plant resources. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**BIOL 4300 (5300) - Plant Speciation and Evolution**

Lec. 3. Cr. 3. Prerequisite: BIOL 1120 Principles of the evolution of plants at the micro- and macroevolution levels, including a survey of relevant primary and secondary literature.

**BIOL 4310 (5310) - Plant Anatomy**

Lec. 2. Lab. 3. Cr. 3. Prerequisite: Junior standing. A comparative study of the structure of vascular plants in relation to function. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**BIOL 4320 (5320) - Plant Physiology**

Lec. 2. Lab. 3. Cr. 3. Physiological activities of seed plants, including photosynthesis, respiration, mineral nutrition, flowering, seed formation, and dormancy. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**BIOL 4330 (5330) - Plant Ecology**

Lec. 2. Lab. 3. Cr. 3. Prerequisite: BIOL 3130 or WFS 3130 Biotic and abiotic factors affecting the distribution and abundance of plant species, and the role of plants in ecosystem structure and function. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**BIOL 4430 (5430) - Vascular Plant Biology**

Lec. 2. Lab. 3. Cr. 3. Prerequisite: BIOL 1120. Morphological and phylogenetic survey of the vascular plants. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**BIOL 4610 (5610) - Invertebrate Zoology**

Lec. 2. Lab. 2. Cr. 3. Prerequisite: 8 hours of BIOL/WFS courses, plus BIOL/WFS 3130, or consent of the instructor. Biology of invertebrates with emphasis on morphology, systematics, and ecology. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**BIOL 4630 (5630) - Ornithology**

Lec. 2. Lab. 3. Cr. 3. Prerequisite: Junior standing. General survey of the class Aves with emphasis on morphology, identification, and ecology of local birds. Students enrolled in the 5000-level

course will be required to complete additional work as stated in the syllabus.

#### **BIOL 4650 (5650) - Marine Biology**

Lec. 3. Lab. 2. Cr. 4. Prerequisite: BIOL 3130 or WFS 3130. An introduction to the study of the marine environment and marine organisms. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

#### **BIOL 4750 (5750) - Medical Microbiology**

Lec. 2. Lab. 4. Cr. 4. Prerequisite: BIOL 3200 or 3230. A survey of microorganisms of medical importance, with emphasis on the bacteria and viruses. Principles of infectious diseases, including diagnostic methods and treatments. Laboratory exercises demonstrating methods of isolating and identifying pathogenic microorganisms. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

#### **BIOL 4780 (5780) - Phycology**

Lec. 2. Lab. 3. Cr. 3. Prerequisite: Junior standing. Introduction to freshwater algae. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

#### **BIOL 4810 (5810) - Ichthyology**

Lec. 2. Lab. 3. Cr. 3. Prerequisite: Junior standing. Identification, classification, anatomy, physiology, ecology, and adaptations of fishes; emphasis on North American freshwater species. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

#### **BIOL 4820 (5820) - Mammalogy**

Lec. 2. Lab. 3. Cr. 3. Prerequisite: Junior standing. Classification, structure and function, phylogeny, and geographical distribution of mammals; emphasis on Tennessee mammals. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

#### **BIOL 4830 (5830) - Herpetology**

Lec. 2. Lab. 3. Cr. 3. Prerequisite: Junior standing. Classification, adaptations, habits, life histories, and geographical distribution of amphibians and reptiles; emphasis on North American species. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

#### **BIOL 4840 (5840) - Limnology**

Lec. 2. Lab. 3. Cr. 3. Prerequisite: Junior standing or consent of instructor. Physiochemical and biological dynamics of inland waters. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

#### **BIOL 4850 (5840) - Applied Microbiology**

Lec. 2. Lab. 2. Cr. 3. Prerequisite: BIOL 3200 or 3230. Microbial production of foods and chemicals; microorganisms in food spoilage. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

#### **BIOL 4940 (5940) - Radiation Biology**

Lec. 3. Cr. 3. Prerequisite: Junior standing. Effects of ionizing radiation on biological systems. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

#### **BIOL 4950 (5950) - Radiation Biology Seminar**

Lec. 2. Cr. 2. Prerequisite: BIOL 4940 (5940). In-depth discussion of specific topics in radiation biology. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

#### **BIOL 4960 (5960) - Biotechnology Seminar**

Lec. 1. Cr. 1. Prerequisite: BIOL 4150 (5150) or consent of instructor. Discussion of current literature in biotechnology. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

#### **BIOL 4991 (5991) - Advanced Topics**

Cross-listing: WFS 4991 (5991)

Cr. 1. Prerequisite: Consent of instructor and departmental chairperson. Focused study equivalent to one (1) credit hour on an advanced topic in the life sciences or wildlife/fisheries sciences under faculty supervision and approval of the departmental chairperson. Course may be repeated until a maximum of 12 hours of combined credit in BIOL (WFS) 499- (599-), Advanced Topics courses, are earned.

#### **BIOL 4992 (5992) - Advanced Topics**

Cross-listing: WFS 4992 (5992)

Cr. 2. Prerequisite: Consent of instructor and departmental chairperson. Focused study equivalent to two (2) credit hours on an advanced topic in the life sciences or wildlife/fisheries sciences under faculty supervision and approval of the departmental chairperson. Course may be repeated until a maximum of 12 hours of combined credit in BIOL (WFS) 499- (599-), Advanced Topics courses, are earned.

#### **BIOL 4993 (5993) - Advanced Topics**

Cross-listing: WFS 4993 (5993)

Cr. 3. Prerequisite: Consent of instructor and departmental chairperson. Focused study equivalent to three (3) credit hours on an advanced topic in the life sciences or wildlife/fisheries sciences under faculty supervision and approval of the departmental chairperson. Course may be repeated until a maximum of 12 hours of combined credit in BIOL (WFS) 499- (599-), Advanced Topics courses, are earned.

#### **BIOL 4994 (5994) - Advanced Topics**

Cross-listing: WFS 4994 (5994)

Cr. 4. Prerequisite: Consent of instructor and departmental chairperson. Focused study equivalent to four (4) credit hours on an advanced topic in the life sciences or wildlife/fisheries sciences under faculty supervision and approval of the departmental chairperson. Course may be repeated until a maximum of 12 hours of combined credit in BIOL (WFS) 499- (599-), Advanced Topics courses, are earned.

#### **BIOL 6060 - Aquatic Toxicology**

Lec. 2. Lab. 4. Cr. 4. Prerequisite: BIOL 3530 and CHEM 3010 and 3020. A study of the mechanisms of toxicity in terrestrial and aquatic organisms, including the measurement of response, uptake, metabolism, and excretion of toxicants. Design and interpretation of toxicity tests, hazard evaluation, risk assessment, and toxics reduction plans. Fate and transport processes and advanced approaches in automated, computer assisted monitoring will be evaluated. Environmental policy and laws of national and international concern will be addressed.

#### **BIOL 6100 - Advanced Microscopy**

Lab. 6. Cr. 3. Prerequisite: Consent of instructor. An applied course in the use and maintenance of research-grade microscopes and various optical systems. Topics also include computer image analysis, confocal laser scanning microscopy, photography, calibration, and measurement.

#### **BIOL 6120 - Fishery Science**

Lec. 2. Lab. 3. Cr. 3. Prerequisite: WFS 4710 (5710). Current concepts and practices of fishery science, especially those environmentally related.

#### **BIOL 6130 - Advanced Fisheries Management**

Lec. 3. Lab. 3. Cr. 4. Prerequisite: WFS 4710 (5710). An in-

depth analysis of major historical developments in the theory and techniques of freshwater fisheries management.

#### **BIOL 6140 - Fish and Wildlife Biometrics**

Lec. 2. Lab. 2. Cr. 3. Prerequisite: WFS 4710 (5710) and BIOL 4220 (5220) or equivalents. Study and application of quantitative methods used to assess fish and wildlife populations. Estimation of parameters, hypothesis testing, and use of classical fisheries and wildlife statistical techniques.

#### **BIOL 6150 - Reservoir Fisheries Management**

Lec. 3. Cr. 3. A comprehensive introduction to basic and applied aspects of managing fisheries in man-made impoundments.

#### **BIOL 6160 - Cytogenetics**

Lec. 2. Lab. 2. Cr. 3. Prerequisite: BIOL 3810 and one (1) year of Chemistry. Normal and abnormal chromosome structure, crossing over, and control of gene action in eukaryotes.

#### **BIOL 6220 - Cytology**

Lec. 2. Lab. 2. Cr. 3. Prerequisite: BIOL 3140 and CHEM 3010 or 3020. Study of the cell and its components.

#### **BIOL 6310 - Biological Literature**

Lec. 1. Cr. 1. A survey of literature resources, experimental design, report writing, and rules adopted by the Council of Biological Editors.

#### **BIOL 6350 - Management of Wetland Wildlife**

Lec. 3. Lab. 3. Cr. 4. Prerequisite: WFS 4700 (5700). Ecology and management of wildlife species occurring in wetland habitats, emphasis on waterfowl and southeastern fauna.

#### **BIOL 6360 - Wetland Identification and Assessment**

Lec. 3. Lab.3. Cr. 4. Prerequisite: BIOL 6350. Advanced concepts of the physical, chemical, and biological properties of wetlands and how hydrology and geomorphology interact to create wetland ecosystems. field techniques for distinguishing wetlands from nonwetlands and for assessing functional capacity of wetland ecosystems will be covered.

#### **BIOL 6370 - Management of Upland Wildlife**

Lec. 3. Lab.3. Cr. 4. Ecology and management of wildlife species occurring in upland habitats, emphasis on southeastern fauna.

#### **BIOL 6420 - Water Resources Management Seminar**

Lec. 2. Cr. 2. Current problems and research in water resources management.

#### **BIOL 6500 - Biological Photography**

Lec. 2. Lab. 3. Cr. 3. Photographic principles applied to biological materials; photomicrography and photomacrography; preparation of black and white prints for publication and slides for presentation.

#### **BIOL 6600 - Microbial Ecology**

Lec. 2. Lab. 4. Cr. 4. Prerequisite: BIOL 3200 or 3230 or BIOL 4130 (5130). Topics will include role of microorganisms in nutrient cycling, techniques in sampling, enumeration, and activity measurements, distribution of microorganisms, diversity and adaptation, and microbial interactions including competition, symbioses, and predation.

#### **BIOL 6630 - Animal Ecology**

Lec. 2. Lab. 2. Cr. 3. The relationship between animals and their environment; the structure, processes, and distribution of animal communities.

#### **BIOL 6650 - Physiological Ecology**

Lec. 2. Lab. 4 Cr. 4. Prerequisite: BIOL 3530, and CHEM 3010 and 3020. Advanced concepts in ecological structure and

function and how they are governed by physiological processes. Resource utilization, mineral and nutrient cycling, and energy flux in maintenance, production, and reproduction of ecological population and communities will be addressed. Applications and tests of relevant approaches to data acquisition, processing, and interpretation are emphasized. Remote sensing technologies are included.

#### **BIOL 6660 - Fish Ecology**

Lec. 2. Lab. 3. Cr. 3. Prerequisite: WFS 4710 (5710). Principles of the evolutionary ecology of fishes, including reproductive guilds, morphological and behavioral polymorphism, foraging, habitat selection, intraspecific and interspecific interactions, and stability of fish assemblages.

#### **BIOL 6670 - Stream Ecology**

Lec. 2. Lab. 4. Cr. 4. Concepts in water chemistry and physics, hydrology, and sediments of lotic systems and their influences on ecological relationships. Stream production, metabolism, and energy flux relative to river continuum concepts will be emphasized through field studies and report preparation.

#### **BIOL 6680 - Malacology**

Lec. 1. Lab. 6. Cr. 3. Prerequisite: Consent of instructor. Identification, classification, and ecology of freshwater bivalves. Emphasis on ecology of Ohio River basin species.

#### **BIOL 6700 - Current Topics in Microbiology**

Lec. 2. Cr. 2. Discussion and literature search of current issues in medical and environmental microbiology, including scientific ethics, biotechnology issues, science, and politics.

#### **BIOL 6930 - Seminar**

Lab. 2. Cr. 1. Current literature in biology and presentation of current or completed graduate research.

#### **BIOL 6960 - Molecular Biology Seminar**

Lec. 1. Cr. 1. Critical review and presentation of current research from molecular biology literature.

#### **BIOL 6980 - Topics**

Lab. 2-8. Cr. 1-4. Prerequisite: Consent of instructor. Special study in an approved field under the supervision of a member of the graduate faculty as approved by the departmental chairperson.

#### **BIOL 6990 - Research & Thesis**

Cr. 1-9.

## **Business Administration**

#### **MBA 6830 - Business Consulting and Research**

Lec. 3. Cr. 3. Focus on business research methods, effective report construction with emphasis on expository strategy, case analysis, and oral presentation.

#### **MBA 6840 - Field Research Project**

Lec. 1-3. Cr. 1-3. Research and writing of a business case or research problem. Requires approval of MBA Studies Committee.

#### **MBA 6980 - International Experience**

Lec. 3. Cr. 3. MBA 6980 develops graduate students' understanding and knowledge of international business in a foreign nation. This course is based on the assumption that immersion in an alternative national setting is an extremely powerful method of learning. The aim of the course is to introduce a global business approach to students. Topics covered will include cultural differences, international strategy, regional politics, the internal economic situation, marketing, international finance, quality in services, organizational development and change, international negotiations, and international operations. Course may be taken for credit two (2)

times.

## Business Law

### LAW 5100 - Business Law and the Legal Environment

Lec. 3. Cr. 3. Basic legal instruments and legal principles comprising the legal environment of business, integrated with contemporary ethical, social, and political issues.

### LAW 6450 - Organizational Ethics

Lec. 3. Cr. 3. A case course examining ethical issues and systems for solving complex ethical problems in domestic and multinational organization.

## Business Management

### BMGT 4120 (5120) - Compensation Administration

Lec. 3. Cr. 3. Prerequisite: BMGT 3630. Theory and practice of determining wages, salaries, and employee benefits. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

### BMGT 4410 (5410) - Conflict Management and Negotiation

Lec. 3. Cr. 3. Prerequisite: BMGT 3630. Development of interpersonal skills for managing conflict and negotiations in business. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

### BMGT 4520 (5520) - Applied Management Skills

Lec. 3. Cr. 3. Prerequisite: BMGT 3510. Integration of behavioral theory and management practice with a focus on the application of theory as a means of developing the skill and competencies needed for managerial success.

### BMGT 4930 (5930) - Business Strategy

Lec. 3. Cr. 3. Prerequisite: FIN 3210, MKT 3400, senior standing. A capstone course stressing management problem analysis, problem solving, and decision making. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

### BMGT 6200 - Organizational Leadership

Lec. 3. Cr. 3. An examination of behavioral concepts required for effective leadership within business organizations.

### BMGT 6400 - Employee Relations

Lec. 3. Cr. 3. A case course focusing on employee-employer relations issues faced by line managers.

### BMGT 6510 - International Business

Lec. 3. Cr. 3. A case course designed to acquaint students with the economic, political, and cultural aspects of international business.

### BMGT 6800 - Strategic Human Resource Staffing

Cr. 3. This course will focus on the recruitment, selection, and retention of human resources within organizations. Specific topics will include workforce planning, recruiting, selection, and organizational entry. The strategic importance of these topics will be addressed by considering the legal, social, organizational, and technological environments in which staffing decisions are made.

### BMGT 6810 - Strategic Human Resource Performance Management

Cr. 3. This course will focus on the development, protection, and compensation of human resources within organizations. Specific topics will include performance appraisal and feedback, compensation, benefits, training, and health and safety. The strategic importance of these topics will be addressed by considering the legal, social, organization, and technological environments in which labor relations decisions are made.

### BMGT 6820 - Professional issues in Human Resource Management

Cr. 3. Prerequisite: BMGT 6800, BMGT 6810. This course will prepare students to function as competent human resource professionals and strategic business partners. Specific topics will include current issues in human resource management, interaction with organizational stakeholders, and human resource inventions.

### BMGT 6900 - Special Topics

Lec. 3. Cr. 3. A case course dealing with current topics in business.

### BMGT 6940 - International Management

Lec. 3. Cr. 3. Theory and practice of managing across borders. This course is about global management. It demonstrates how cultural factors influence behavior in the workplace and examines the skills needed to manage across national borders.

### BMGT 6950 - Business Strategy

Lec. 3. Cr. 3. Prerequisite: ACCT 6010, FIN 6020, ECON 6050, MKT 6100, BMGT 6200. An integrative capstone course dealing with the formulation and implementation of corporate strategy.

## Career Technical Education

### CTE 4030 (5030) - Curriculum and Program Development for Career Technical Education

Lec. 3. Cr. 3. A study of the fundamental steps involved in the development of curriculum in occupational education. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

### CTE 4040 (5040) - Advisory Committees in Industrial Education

Lec. 3. Cr. 3. A study on how to effectively establish and utilize advisory committees for student programs in industrial education. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

### CTE 4050 (5050) - Academic and Career Technical Interdependence

Lec. 3. Cr. 3. A study on how to infuse the academic and career technical programs into a unified educational delivery system. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

### CTE 4060 (5060) - Safety in Industrial Education

Lec. 3. Cr. 3. A study of the safety requirements associated with the provision of a safe learning environment in industrial education. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

### CTE 4070 (5070) - History and Philosophy of Industrial Education

Lec. 2. Cr. 2. History of industrial education in the United States and special focus on the development of a personal philosophy of industrial education. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

### CTE 4080 (5080) - Career Technical Student Organizations and Teaching Supervision

Lec. 3. Cr. 3. The methods of establishment, supervision, and evaluation of career technical youth organizations in industrial education. Students enrolled in the 5000 level course will be required to complete additional work as stated in the syllabus.

### CTE 4090 (5090) - Career Technical Education for Students with Special Needs

Lec. 3. Cr. 3. Overview of the nature of special needs students, technique of modification of career technical curriculum and development of appropriate teaching materials. Students enrolled in the 5000-level course will be required to complete additional work

as stated in the syllabus.

### **CTE 4850 (5850) - Use of Technology in Career Technical Education**

Cr. 1-3.

Laboratory approach providing opportunities for experienced educational personnel to concentrate their study in depth. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

### **CTE 6010 - The State Plan for Industrial Education**

Lec. 3. Cr. 3. A study of the current State Plan, its administration, provisions, and implications for Industrial Education in Tennessee.

### **CTE 6020 - Professional Development in Industrial Education**

Lec. 3. Cr. 3. The identification and development of strategies to meet personal professional needs in industrial education.

## **Chemical Engineering**

### **CHE 4110 (5110) - Introduction to Computational Heat, Mass, and Momentum Transfer**

Lec. 3. Cr. 3. General equations describing heat, mass, and momentum transport. Similarities and differences in transport properties are studied. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus. To obtain graduate credit, students enrolled in this course (CHE 5131) must conduct, in addition, a formal literature review as part of the writing of a full scientific paper.

### **CHE 4130 (5130) - Transfer Science III**

Lec. 3. Cr. 3. Prerequisite: CHE 2010. Principles, design, and operation of equipment for separation and purification of materials. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

### **CHE 4210 (5210) - Chemical Reaction Engineering**

Lec. 3. Cr. 3. Prerequisite: CHE 3020 or consent of instructor. Chemical reaction kinetics and chemical reactor design. Emphasis on homogeneous reactions. Ideal and nonideal reactors. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus. To earn graduate credit for this course (CHE 5210), the following additional requirements will be met: (1) students will be able to model scaleup of isothermal and nonisothermal pilot reactors and (2) students will perform simulations of the transient condition for idealized reactors.

### **CHE 4300 (5300) - Introduction to Air Pollution**

Lec. 3. Cr. 3. Prerequisite: CHE 3110. Problems of air pollution and their solutions. Analysis and design of devices for the control of air pollutants from chemical processes. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

### **CHE 4410 (5410) - Process Design I**

Lec. 3. Cr. 3. Prerequisite: Graduate standing in CHE and/or consent of instructor. Synthesis, design, economics, and optimization of chemical process systems. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

### **CHE 4420 (5420) - Process Design II**

Lec. 3. Cr. 3. Prerequisite: CHE 4410 (5410) and graduate standing in CHE and/or consent of instructor. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

### **CHE 4470 (5470) - Interdisciplinary Studies in Ceramic Materials Processing**

Cross-listing: ME 4470 (5470)

Lec. 3. Cr. 3. Prerequisite: Graduate standing in engineering or science. Materials processing; surface phenomena; particle size reduction; forming; consolidation by sintering and reaction processes; application of fracture mechanics; failure models; research on selected fabrication and synthesis routes for metals, ceramics and their composites; mechanical, chemical and morphological characterization theory and practice; materials design project using several onsite laboratories. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

### **CHE 4510 (5510) - Applied Mathematics in Chemical Engineering**

Lec. 3. Cr. 3. Prerequisite: CHE 3020, 3120, and MATH 2910. Applied numerical methods and the solution of differential equations, both analytically and numerically, in chemical engineering. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

### **CHE 4660 (5660) - Biochemical Engineering**

Lec. 3. Cr. 3. Prerequisite: CHE 4210 (5210) or consent of instructor. Applications of chemical engineering principles to the study of biochemical systems. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

### **CHE 4730 (5730) - Chemical Engineering Operations**

Lec. 3. Cr. 3. Prerequisite: Senior or graduate standing. Decision making techniques as applied to management of chemical processing plants. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

### **CHE 5330 - Polymer Engineering**

Lec. 3. Cr. 3. Prerequisite: CHEM 3020. Polymerization kinetics for key commercial polymers, structure/property relationships and characterization of key polymers, processing fundamentals, fundamentals of formulation of polymer composites and blends (nanocomposites, biopolymers).

### **CHE 6010 - Advanced Chemical Engineering Thermodynamics**

Lec. 3. Cr. 3. Prerequisite: Consent of instructor. Advanced thermodynamic concepts, especially phase and chemical equilibria, estimation and correlation of thermodynamic properties, and intermolecular forces.

### **CHE 6040 - Intermediate Fluid Mechanics**

Cross-listing: CEE 6040, ME 6040

Lec. 3. Cr. 3. Prerequisite: ME 3720. Formulation of mass and momentum transfer equations; exact solutions of laminar parallel flows; similarity and approximate solutions; potential flow; laminar momentum boundary layers.

### **CHE 6060 - Electrochemical Power Sources—Fuel Cells, Batteries, and Supercapacitors**

Lec. 2. Lab. 2. Cr. 3. Prerequisite: CHE 3010, ME 3210 or equivalent thermodynamics-related course. The lecture will start from the electrochemical thermodynamics and kinetics, with emphasis on electrochemical techniques, fundamental principles and technologies of batteries, fuel cells, and supercapacitors. A unique feature of the course is the fact that 20 percent of the time is spent in the laboratory using state of the art electrochemical instrumentation under the guidance of course instructor.

### **CHE 6110 - Computational Heat, Mass, and Momentum Transfer**

Lec. 3. Cr. 3. Prerequisite: Consent of instructor. An advanced study of fluid flow, heat transfer, and mass transfer.

### **CHE 6120 - Computational Heat, Mass, and Momentum Transfer**

Lec. 3. Cr. 3. Prerequisite: Consent of instructor. An advanced study of fluid flow, heat transfer, and mass transfer.

#### **CHE 6210 - Advanced Kinetics**

Lec. 3. Cr. 3. Prerequisite: Consent of instructor. Study of complex chemical reaction systems, catalytic and non-catalytic reactions, homogeneous and heterogeneous systems, and heat effects.

#### **CHE 6410 - Advanced Process Engineering Design**

Lec. 3. Cr. 3. Prerequisite: Consent of instructor. Applications of thermodynamics, kinetics, transfer operations, and economics to optimum design of processes, equipment, and plants.

#### **CHE 6530 - Process Optimization**

Lec. 3. Cr. 3. Prerequisite: Consent of instructor. Application of the principles of optimization and related techniques to the problems of chemical processes.

#### **CHE 6540 - Process Dynamics**

Lec. 3 Cr. 3. Prerequisite: CHE 4540 or equivalent. Continuation of Chemical Engineering 4540. Frequency response methods, nonlinear methods, process applications, and computer simulation.

#### **CHE 6810 - Special Topics in Chemical Engineering**

Lec. 3. Cr. 3. Prerequisite: Consent of instructor. Topics such as polymeric materials, biochemical engineering, pollution abatement, air and liquid filtration, energy conversion, processing in extreme conditions.

#### **CHE 6910 - Chemical Engineering Graduate Seminar**

Lec. 1. Cr. 1. Prerequisite: Graduate standing in Chemical Engineering. Current literature in Chemical Engineering and presentation of current or completed graduate research.

#### **CHE 6920 - Chemical Engineering Graduate Seminar**

Lec. 1. Cr. 1. Prerequisite: Graduate standing in Chemical Engineering. Current literature in Chemical Engineering and presentation of current or completed graduate research.

#### **CHE 6990 - Research and Thesis**

Cr. 1,3,6,9.

#### **CHE 7030 - Molecular Thermodynamics**

Lec. 3. Cr. 3. Prediction and correlation of thermodynamic properties used in vapor-liquid and liquid-liquid phase equilibrium calculations. Monte-Carlo and Molecular Dynamics Simulation techniques.

#### **CHE 7040 - Thermodynamics of Hydrocarbons**

Lec. 3. Cr. 3. Methods for presenting thermodynamic data of hydrocarbons; P-V-T correlations, K and alpha values, fugacity and activity coefficients.

#### **CHE 7140 - Separation Processes**

Lec. 3. Cr. 3. Separation processes including multicomponent distillation, azeotropic and extractive distillation, gas absorption, and liquid-liquid extraction.

#### **CHE 7220 - Chemical Reactors for Heterogeneous Systems**

Lec. 3. Cr. 3. Design of reactors for heterogeneous systems.

#### **CHE 7230 - Advanced Nanocomposite Engineering Technology**

Lec. 3. Cr. 3. Prerequisite: CHE 6010. Nanoscience requires application of both continuum mechanics and quantum mechanics to aid materials design. The course will reflect interdisciplinary studies in composite engineering and chemistry to illuminate advanced principles of mechanics, characterization and thermodynamics in the emerging field of nanoscience/surface science. Modeling methodologies, scaling and modern processing

techniques are taught.

#### **CHE 7240 - Advances in Fuel Cell Electrocatalysis**

Lec. 3. Cr. 3. Prerequisite: CHE 6010. This course probes the state-of-the-art advances in electrocatalyst development and catalyst layer engineering for a variety of fuel feeds and fuel cell types. Nano-catalyst structure is a central issue. Characterization methodologies, redox reaction mechanisms and durability limitations will be covered.

#### **CHE 7410 - Advanced Topics in Computational Molecular Design**

Lec. 3. Cr. 3. Prerequisite: CHE 6010 and consent of instructor. Strategies, techniques and applications associated with recent advances in the inverse design process of computational molecular design.

#### **CHE 7420 - Advanced Topics in Multi-Scale Simulation of Materials**

Lec. 3. Cr. 3. Prerequisite: CHE 4510 (5510), CHE 6110 or equivalents with consent of instructor. This course will develop the concept of multi-scale analysis and mathematical approaches and illustrate them for a number of applications.

#### **CHE 7430 - Computational Modeling of Electrochemical Systems**

Lec. 3. Cr. 3. Prerequisite: CHE 6110 or similar with consent of the instructor. Modeling methodologies, recent techniques and tools required to simulate electrochemical systems and in particular batteries.

#### **CHE 7440 - Electrokinetics-Based Separations**

Cr. 3. Prerequisite: CHE 6110. This course will focus on the learning of key fundamental principles related to Electrokinetics-Hydrodynamics (EKHD) with selected applications to bio-separation including electrophoresis, electro-field flow fractionation, and electrokinetic-based separations.

#### **CHE 7970 - Selected Topics**

Lec. 3. Cr. 3. Advanced special topics in chemical engineering taught on an as-needed basis.

#### **CHE 7980 - Directed Study**

Cr. 1-3.

#### **CHE 7990 - Research and Dissertation**

Cr. 1,3,6,9.

## **Chemistry**

#### **CHEM 4110 (5110) - Inorganic Chemistry**

Spring. Lec. 3. Cr. 3. Prerequisite: CHEM 2010 and CHEM 3500 or 3510. Correlation of physical and chemical properties of inorganic compounds and atomic structure. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

#### **CHEM 4150 (5150) - Inorganic Chemistry Laboratory**

Lab. 3. Cr. 1. Corequisite: CHEM 4110 (5110). Synthesis, isolation, and characterization of inorganic compounds, using conventional as well as microscale and inert gas techniques. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

#### **CHEM 4210 (5210) - Chemistry of Polymers**

Fall. Lec. 3. Cr. 3. Prerequisite: CHEM 3020, and CHEM 3500 or CHEM 3510. Preparation, structure, physical and chemical properties of organic and inorganic polymers. Experimental determination of average molar mass and its correlation to macroscopic properties. Thermal and viscoelastic behavior.

Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

#### **CHEM 4310 (5310) - Nuclear and Radiochemistry**

Spring. Lec. 2. Lab. 3. Cr. 3. Prerequisite: CHEM 3500 or 3510 (may be taken concurrently). Introduction to theory of nuclear stability and decay processes. The laboratory emphasizes the detection, safe handling, and use of radioisotopes in chemical investigations. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

#### **CHEM 4320 (5320) - Spectrometric Identification of Organic Compounds**

Spring. Lec. 2. Lab. 3. Cr. 3. Prerequisite: CHEM 3020 and CHEM 3500 or 3510. The isolation and identification of organic compounds by both chemical and physical means with emphasis on spectroscopic methods. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

#### **CHEM 4410 (5410) - Forensic Chemistry**

Lec. 3. Lab. 1. Cr. 4. Prerequisite: CHEM 1120, 3020, and 3410. This course will examine the application of chemical concepts and methods to the analysis of crime scene evidence. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

#### **CHEM 4520 (5520) - Instrumental Analysis**

Fall. Lec. 3. Lab. 3. Cr. 4. Prerequisite: CHEM 3410 and 3510. Theory and practice of atomic spectroscopy, chromatography, and electroanalysis; discussion of selected instrumental techniques for analysis of surfaces, molecules, and particles. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

#### **CHEM 4610 (5610) - General Biochemistry**

Fall. Lec. 3. Cr. 3. Prerequisite: CHEM 3010 or 3110. Chemistry of proteins, lipids, carbohydrates, and nucleic acids. Includes study of pH, buffer system and biological separation methods. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

#### **CHEM 4620 (5620) - General Biochemistry**

Spring. Lec. 3. Cr. 3. Prerequisite: CHEM 4610 (5610). Intermediary metabolism, bioenergetics, biosynthesis. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

#### **CHEM 4650 (5650) - General Biochemistry Laboratory**

Spring. Lab. 6. Cr. 2. Prerequisite: CHEM 4610 (5610) or CHEM 4300. Laboratory techniques associated with contemporary general biochemistry to include buffer preparation, pKa determination, amino acid analysis, protein expression, separation and purification techniques, protein determination, enzymology, equilibrium and binding constant determinations, and carbohydrate analysis. The CHEM 5650 student will engage in additional procedures in some of the experiments.

#### **CHEM 4710 (5710) - Environmental Chemistry**

Fall. Lec. 3. Cr. 3. Prerequisite: CHEM 3005 or 3010 CHEM 3410, 3500 or 3510 Basic concepts of environmental chemistry. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

#### **CHEM 4720 (5720) - Advanced Environmental Chemistry**

Lec. 2. Lab. 3. Cr. 3. Prerequisite: CHEM 4710 (5710). Advanced topics within environmental chemistry, including emphasis on organic, inorganic and analytical environmental chemistry. Case studies and contemporary literature in the field will be discussed. CHEM 5720 students will be required to carry out a more

extensive field project and present a paper on an advanced topic in environmental chemistry. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

#### **CHEM 4970 (5970) - Special Topics**

Lec. 1-3. Lab. 0-3. Cr. 1-4. Prerequisite: Consent of instructor. Timely topics in chemistry. Course may be taken for credit more than once. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

#### **CHEM 6110 - Advanced Inorganic Chemistry**

Fall. Lec. 3. Cr. 3. Prerequisite: CHEM 4110 (5110). The correlation of the physical and chemical properties of inorganic compounds with their structure.

#### **CHEM 6210 - Advanced Organic Chemistry**

Spring. Lec. 3 Cr. 3. Prerequisite: CHEM 3120. Application of physical principles to the understanding of the structure and dynamics of organic compounds.

#### **CHEM 6320 - Advanced Physical Chemistry**

Fall. Lec. 3. Cr. 3. Prerequisite: CHEM 3520. Advanced topics in physical chemistry to include aspects of statistical thermodynamics, quantum mechanics, spectroscopy, and kinetics.

#### **CHEM 6410 - Advanced Analytical Chemistry**

Spring. Lec. 2. Lab 3 Cr. 3. Prerequisite: CHEM 4520 (5520). Statistical interpretation of data; electronics of instrumentation; optimization of chromatographic methods; recent developments in spectroscopy, chromatography, and mass spectrometry.

#### **CHEM 6610 - Advanced Biochemistry**

Fall. Lec. 3. Cr. 3. Prerequisite: CHEM 4610 (5610). Current advanced topics in Biochemistry selected from recent peer reviewed literary journals. Instruction, with practical exercises, in the step-by-step stages of grant planning, locating funding sources, and writing successful grant proposals.

#### **CHEM 6900 - Directed Studies in Chemistry**

Lec. 1. Cr. 1. Prerequisite: Graduate standing in chemistry. Investigation of a current area of research which is compatible with the student's interest and abilities. (Maximum credit toward degree is one [1] hour.)

#### **CHEM 6910 - Chemistry Literature Seminar**

Fall, Spring. Lec. 1. Cr. 1. Prerequisite: Consent of thesis advisor. Review and oral presentation of current topic in chemical literature. (Maximum credit toward degree is one [1] hour.)

#### **CHEM 6911 - Chemistry Thesis Seminar**

Fall, Spring. Lec. 1. Cr. 1. Prerequisite: Full standing in Chemistry, M.S. program, and consent of thesis advisor. Oral presentation of student's thesis research. (Maximum credit toward degree is one [1] hour.)

#### **CHEM 6970 - Advanced Special Topics in Chemistry**

Lec. 1-3. Lab.0-3. Cr. 1-4. Prerequisite: Consent of instructor. An advanced course for current topics in chemistry. Course may be taken for credit more than once.

#### **CHEM 6990 - Research and Thesis**

Cr. 1-9.

## **Civil and Environmental Engineering**

#### **CEE 4130 (5130) - Matrix and Finite Element Methods**

Lec. 3. Cr. 3. Prerequisite: CEE 3320 or ME 4640 (5640) and MATH

2010 or MATH 4510 (5510). Matrix formulations using flexibility and stiffness methods for structural analysis of skeletal structures. Finite element formulations and applications. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**CEE 4160 (5160) - Experimental Stress Analysis**

Cross-listing: ME 4160 (5160)

Lec. 2. Lab. 2. Cr. 3. Prerequisite: CEE 3110, MATH 2910.

Introduction to theory of elasticity; photoelasticity; theory and application of strain gages and rosettes; brittle coatings; holographic interferometry; moiré' analysis. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**CEE 4190 (5190) - Advanced Mechanics of Materials**

Cross-listing: ME 4190 (5190)

Lec. 3. Cr. 3. Prerequisite: CEE 3110, MATH 2120, or consent

of instructor. Advanced topics; fracture mechanics, elastic support, noncircular shafts, curved beams, thick-walled cylinders, introduction to plates, thin shells of revolution. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**CEE 4350 (5350) - Advanced Structural Design**

Lec. 3. Cr. 3. Prerequisite: CEE 4310. Special topics in analysis and design of steel structures. Plastic design, composite design, plate girders, special connections, and introduction to timber design. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**CEE 4360 (5360) - Advanced Topics in Structural Concrete Design**

Lec. 3. Cr. 3. Prerequisite: CEE 4320. Special topics in the design of concrete structures. Combined footings; retaining walls, two-way slabs, and prestressed concrete. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**CEE 4380 (5380) - Bridge Design**

Lec. 3. Cr. 3. Prerequisite: CEE 4310. Design of structural steel and reinforced concrete bridges. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**CEE 4410 (5410) - Solid and Hazardous Waste Management**

Lec. 3. Cr. 3. Prerequisite: CEE 3413 or consent of instructor. The collection and disposal of solid wastes. Treatment and disposal technologies of hazardous wastes. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**CEE 4420 (5420) - Engineering Hydrology**

Lec. 3. Cr. 3. Prerequisite: CEE 3420 or consent of instructor.

Fundamental processes in the hydrologic cycle, including precipitation, infiltration, and runoff. Development of quantitative approaches for engineering hydrology problems such as watershed modeling and storm water analysis. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**CEE 4430 (5430) - Water and Wastewater Engineering**

Lec. 3. Cr. 3. Prerequisite: CEE 3413 or consent of instructor.

Analytical methods for use in water quality management of streams, lakes, reservoirs, and groundwater systems. Project design of water and wastewater treatment plants. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**CEE 4440 (5440) - Water Resources Engineering**

Lec. 3. Cr. 3.

Prerequisite: CEE 3420 or consent of instructor. Problems related to the planning and design of systems to manage water resources for flood-damage reduction, hydropower, and river navigation. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**CEE 4450 (5450) - Water Quality Modeling**

Lec. 3. Cr. 3. Prerequisite: CEE 3413 or consent of instructor.

Mathematical modeling of chemical and biological processes occurring in streams, lakes, and estuaries, emphasizing oxygen demand and nutrient processes. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**CEE 4500 (5500) - Engineering Construction Management**

Lec. 3. Cr. 3. Prerequisite: Within two (2) semesters of graduation

or consent of instructor. The design and management of the construction phase of a project: scheduling, estimating, contracts, laws, financing, and safety. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**CEE 4600 (5600) - Civil Engineering Materials II**

Lec. 2. Lab. 2. Cr. 3. Prerequisite: CEE 3030. Design and testing of highstrength Portland Concrete Cement, selfconsolidating PCC, high volume fly ash PCC and pervious PCC. Controlled low-strength materials. Concrete formwork design. Masonry materials evaluation. Aggregate production and improvement. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**CEE 4610 (5610) - Pavement Design**

Lec. 3. Cr. 3. Prerequisite: CEE 3610. Structural design of flexible and rigid pavements. Pavement rehabilitation. Properties of subgrades, base courses and paving materials. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**CEE 4630 (5630) - Traffic Engineering**

Lec. 3. Cr. 3. Prerequisite: CEE 3610. Techniques of traffic engineering measurements, investigations, and data analysis; design, application, and operation of traffic control systems and devices. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**CEE 4640 (5640) - Highway Engineering**

Lec. 3. Cr. 3. Prerequisite: CEE 3610. Theory and practice of highway geometric design; highway plans; construction practices; computer applications to highway design. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**CEE 4660 (5660) - Transportation Planning**

Lec. 3. Cr. 3. Prerequisite: CEE 3610. System planning and evaluation. Characteristics, impacts and costs. User patterns. Alternative analysis. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**CEE 4700 (5700) - Masonry Design**

Lec. 2. Rec. 2. Cr. 3. Prerequisite: CEE 3030 and CEE 4320 or consent of instructor. Masonry materials and construction. Design of masonry beams, walls, and columns. Seismic design of masonry structures. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**CEE 4850 (5850) - Forensic Engineering**

Lec. 3. Cr. 3. Prerequisite: CEE 4800 (CEE 4800 may be taken concurrently) and CEE 4310 or CEE 4320. Forensic case studies related to civil engineering

**CEE 4930 (5930) - Noise Control**

Cross-listing: ME 4930 (5930)

Lec. 2. Lab. 2. Cr. 3. Prerequisite: ME 2129, PHYS 2120.

Identification and description of noise sources and noise radiation, methods of noise measurement and criteria for noise levels, principles and techniques of noise control. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**CEE 4990 (5990) - Special Problems**

Cr. 1-4 per semester. Prerequisite: Approval of Departmental Chairperson. Current topics in civil engineering. May not be repeated to improve a grade.

**CEE 6040 - Intermediate Fluid Mechanics**

Cross-listing: CHE 6040, ME 6040

Lec. 3. Cr. 3. Prerequisite: ME 3720. Formulation of mass and momentum transfer equations; exact solutions of laminar parallel flows; similarity and approximate solutions; potential flow; laminar momentum boundary layers.

**CEE 6100 - Advanced Computer Applications in Civil Engineering**

Lec. 3. Cr. 3. Prerequisite: Consent of instructor. Civil Engineering analysis and design applications using advanced programming languages.

**CEE 6200 - Statistical Inference for Engineers**

Lec. 3. Cr. 3. Prerequisite: Introductory calculus based statistics course or consent of instructor. Decision making with hypothesis testing and confidence intervals. Multiple regression and stepwise regression. Design of one and multifactor experiments. 2k experiments with blocking and fractional factorials. Control charting of time series data.

**CEE 6300 - Multiscale Analysis of Concrete**

Lec. 3. Cr. 3. Prerequisite: CEE 3030. Manufacturing, hydration, and microstructural development of Portland cement. Fresh and hardened concrete properties. Special concrete applications, including fiber-reinforced, high performance, and lightweight concretes.

**CEE 6310 - Bituminous Materials**

Lec. 2. Lab. 2. Cr. 3. Prerequisite: CEE 3030. Production and properties of bituminous materials. Use of asphalts in pavement construction, maintenance, and recycling. Design and construction of surface treatments and overlays.

**CEE 6330 - Advanced Pavement Design**

Lec. 3. Cr. 3. Prerequisite: CEE 4610 (5610) or consent of instructor. Design of low volume road, airport, heavy duty, masonry, and composite pavements. Bases and subgrades. Pavement drainage.

**CEE 6360 - Introduction to Continuum Mechanics**

Cross-listing: ME 6360

Lec. 3. Cr. 3. Prerequisite: Consent of instructor. Tensors, balance, laws, constitutive equations, thermodynamic restrictions, applications.

**CEE 6370 - Vibrations of Continuous Media**

Cross-listing: ME 6370

Lec. 3. Cr. 3. Prerequisite: CEE 3110, MATH 4510 (5510), ME 3050. Governing equations for strings, bars, and membranes; natural frequencies; normal modes; series solutions; wave propagation; transform methods; characteristics.

**CEE 6410 - Traffic Control Systems**

Lec. 2. Lab. 2. Cr. 3. Prerequisite: Consent of instructor. Theory and practical applications of traffic regulatory measures and traffic

control systems, including adaptive, responsive, preemption, and Intelligent Transportation Systems.

**CEE 6430 - Probabilistic Methods in Hydrosceince**

Lec. 3. Cr. 3. Prerequisite: ISE 3200 or consent of instructor.

Advanced concepts of probabilistic approaches with emphasis on hydrosceince applications, mathematical and statistical background for tochastic analysis.

**CEE 6440 - Hydrometeorology**

Lec. 3. Cr. 3. Prerequisite: CEE 4420 (5420), Engineering Hydrology, or consent of instructor. Theory and observations of hydrological processes in land surface and atmosphere. Exchanges of mass, heat and momentum between soil, vegetation, or water surface and overlying atmosphere. Precipitation processes, radiation and clouds, atmospheric boundary layer dynamics, coupled balance of moisture and energy, soil moisture and climate feedbacks, hydroclimatology, monsoonal flow and thunderstorms. Emphasis on recent research and modern methods for data analysis and modeling.

**CEE 6450 - Geometric Design of Roadways**

Lec. 2. Lab. 2. Cr. 3. Prerequisite: Consent of instructor. Advanced concepts of the design of streets and highways. Design criteria, controls and standards for design alignment, cross sections, intersections, and interchanges.

**CEE 6460 - Transportation Safety Engineering**

Lec. 3. Cr. 3. Prerequisite: Consent of instructor. Basic structure of transportation safety, traffic safety analysis and issues to identify, address, and implement countermeasures in crash areas, community oriented safety programs.

**CEE 6470 - Transportation Demand Analysis**

Lec. 3. Cr. 3. Prerequisite: CEE 4660 (5660), ISE 3200, or consent of instructor. Theory and development of models of trip generation, trip distribution, mode choice, and traffic assignment. Transportation supply. Travel survey. Intercity-passenger travel-demand. Demand for air transportation.

**CEE 6520 - Open-Channel Hydraulics**

Lec. 3. Cr. 3. Prerequisite: CEE 3420 or consent of instructor. Advanced topics in open-channel hydraulics, including design of hydraulic structures, gradually varied flow, unsteady flow, and flood routing techniques.

**CEE 6610 - Applied Environmental Chemistry**

Lec. 2. Lab. 3. Cr. 3. Prerequisite: Consent of instructor. Theoretical concepts from inorganic, organic, physical, and biological chemistry as applied to the analysis of environmental engineering problems.

**CEE 6620 - Applied Environmental Chemistry**

Lec. 2. Lab. 3. Cr. 3. Prerequisite: Consent of instructor. Theoretical concepts from inorganic, organic, physical, and biological chemistry as applied to the analysis of environmental engineering problems.

**CEE 6710 - Environmental Engineering Unit Operations and Processes**

Lec. 3. Cr. 3. Prerequisite: Consent of instructor. An advanced study of the physical, chemical and biological unit operations processes for water and wastewater treatment.

**CEE 6720 - Environmental Engineering Unit Operations and Processes**

Lec. 3. Cr. 3. Prerequisite: Consent of instructor. An advanced study of the physical, chemical and biological unit operations processes for water and wastewater treatment.

**CEE 6740 - Industrial Waste Treatment**

Lec. 2. Cr. 2. Prerequisite: Consent of instructor. Characteristics of industrial wastes and of processes producing such wastes. Methods

of treating industrial wastes.

**CEE 6750 - Environmental Modeling**

Lec. 3. Cr. 3. Prerequisite: CEE 4430 (5430) or consent of instructor. Mathematical modeling of chemical and biological processes occurring in streams, lakes, and estuaries, emphasizing oxygen demand and nutrient processes.

**CEE 6760 - Environmental Microbiology**

Lec. 2. Cr. 2. Prerequisite: Consent of instructor. Study of the microorganisms of importance in connection with environmental engineering processes.

**CEE 6770 - Environmental Engineering Laboratory**

Lab. 3. Cr. 1. Corequisite: CEE 6710 and CEE 6720. Environmental engineering laboratory experience related to unit operations and processes and environmental microbiology.

**CEE 6780 - Environmental Engineering Laboratory**

Lab. 3. Cr. 1. Corequisite: CEE 6710 and CEE 6720. Environmental engineering laboratory experience related to unit operations and processes and environmental microbiology.

**CEE 6810 - Advanced Structural Mechanics**

Lec. 3. Cr. 3. Prerequisite: CEE 4130 (5130). Solution of large two- and three-dimensional structural systems by matrix and classical methods, nonprismatic and curved members, introduction to nonlinear problems.

**CEE 6840 - Environmental Applications of Remote Sensing**

Lec. 3. Cr. 3. Prerequisite: CEE 4420 (5420) or consent of instructor. Theory and techniques of remote sensing and their application to environmental analysis. Microwave, infrared, passive and active techniques on orbiting and geostationary platforms. Multi-sensor analysis, current and planned satellite missions, radar altimetry, estimation of precipitation, soil moisture, discharge, land use and land cover. Scale and uncertainty issues.

**CEE 6900 - Special Problems**

Cr. 1-6. Prerequisite: Consent of instructor. Investigation of a topic which is compatible with students' prerequisites, interests, and abilities.

**CEE 6910 - CEE Graduate Seminar**

Lec. 1. Cr. 1. Prerequisite: CEE Graduate Standing. Seminar lectures and research presentations by invited speakers and graduate students in all fields of Civil Engineering. Course may be repeated for Ph.D. students. Only one (1) credit per semester may be earned.

**CEE 6930 - Theory of Elasticity**

Cross-listing: ME 6930

Lec. 3. Cr. 3. Prerequisite: Consent of instructor. Fundamental laws of continuum mechanics; Cartesian tensors; analysis of stress and strain; two-dimensional problems in rectangular and polar coordinates; torsion of various shaped shafts.

**CEE 6980 - Directed Study**

Cr. 1-4 per semester.

**CEE 6990 - Research and Thesis**

Cr. 1,3,6,9.

**CEE 7100 - Advanced Computational Methods in Engineering**

Lec. 3. Cr. 3. Prerequisite: CEE 6930/ME 6930 and an additional graduate level course in engineering mechanics or consent of instructor.

**CEE 7200 - Surface Phenomena of Environmental Processes**

Lec. 3. Cr. 3. Prerequisite: CEE 6710 or consent of instructor. A study of the environmental significance of the physical and chemical processes which occur at the interface between two (2) phases.

**CEE 7210 - Water Quality Aspects of Impoundment**

Lec. 3. Cr. 3. Prerequisite: Consent of instructor. Water quality changes and their causative mechanisms that occur in water stored and released from impoundments. Study of reservoir water quality models.

**CEE 7220 - Finite Element Analysis for Flow in Porous Media**

Lec. 3. Cr. 3. Prerequisite: CEE 6720 or consent of instructor. Numerical analysis is discussed using applied finite element concepts. One- and two-dimensional applications are discussed for various aspects of mass diffusion, seepage, consolidation, and groundwater movement.

**CEE 7300 - Natural Systems Engineering**

Lec. 3. Cr. 3. Prerequisite: CEE 6720 or consent of instructor. A study of treatment of wastes through engineered natural systems. Wetlands, lagoons, and land application.

**CEE 7310 - Hazardous Waste Remediation in Groundwater and Soil**

Lec. 3. Cr. 3. Prerequisite: CEE 6720 or consent of instructor. A study of processes for the remediation of hazardous waste contamination in groundwater and in soil. Water-soil interactions and transport of pollutants.

**CEE 7320 - Degradation of Waste Organics**

Lec. 2. Lab. 3. Cr. 3. Prerequisite: CEE 6760, CEE 6620, or consent of instructor. A study of physical, chemical, and biologically mediated degradation of waste organics. Emphasis is placed upon the catabolism of naturally occurring organic substrates in natural and engineered environments.

**CEE 7360 - Advanced Topics in Prestressed Concrete Design**

Lec. 3. Cr. 3. Prerequisite: CEE 4360 (5360), CEE 6930, and consent of instructor. Advanced topics on analytical methods and design approaches of pre-tensioned and post-tensioned concrete members.

**CEE 7410 - Advanced Travel Demand Modeling**

Lec. 3. Cr. 3. Prerequisite: CEE 6470. Theory of individual choice behavior. Binomial choice models. Multinomial choice models. Aggregate forecasting techniques. Aggregation and sampling of alternatives. Models of multidimensional choice. Transferability and updating of choice models.

**CEE 7420 - Public Transportation**

Lec. 3. Cr. 3. Prerequisite: CEE 6470 or consent of instructor. Public transportation modes and characteristics, planning of public transportation networks, mathematical modeling of the demand for public transportation, and measurement of system performance.

**CEE 7450 - Advanced Topics in Concrete Durability**

Lec. 2. Lab. 2. Cr. 3. Prerequisite: CEE 6300 or consent of instructor. Chemical and physical durability of Portland cement-based materials. Alkali-silica reaction, internal and external sulfate attack, permeability, shrinkage, freeze-thaw durability, and corrosion. Multi-scale (nano-, micro-, and macro-scale) investigations, including economical considerations, mitigation strategies, and advanced nano-/micro-structural characterization techniques.

**CEE 7510 - Theory of Plates and Shells**

Cross-listing: ME 7600

Lec. 3. Cr. 3. Prerequisite: CEE 6930 or consent of instructor. Bending and buckling of thin plates and shells. Vibration analysis of

plates and shells.

### **CEE 7520 - Fluvial Hydraulics**

Lec. 3. Cr. 3. Prerequisite: CEE 6520 or consent of instructor. Advanced topics; fundamental principles, theories, analytical and field methods applied in sediment transport mechanics, fluvial morphology and natural channel design and assessment.

### **CEE 7610 - Finite Element Analysis I**

Cross-listing: ME 7610

Lec. 3. Cr. 3. Prerequisite: CEE 4130 (5130), CEE 6930, or consent of instructor. Analysis of stresses in a continuum by the finite element method. Computer applications.

### **CEE 7620 - Finite Element Analysis II**

Cross-listing: ME 7620

Lec. 3. Cr. 3. Prerequisite: CEE 7610 or consent of instructor. Higher order and isoparametric element formulations. Applications to problems in heat transfer and fluid mechanics. Introduction to commercial programs.

### **CEE 7640 - Theory of Inelastic Material Behavior**

Cross-listing: ME 7640

Lec. 3. Cr. 3. Prerequisite: CEE 6930 or ME 6360. Constitutive equations for classical viscoelasticity. Exact solutions for simple constitutive laws. Incremental stress-strain relations for plasticity; yield surface and deformation theories. Application to engineering problems.

### **CEE 7650 - Continuum Theories of Materials**

Cross-listing: ME 7650

Lec. 3. Cr. 3. Prerequisite: CEE 6930 or ME 6360 or consent of instructor. Continuum thermodynamics; balance laws and constitutive equations; applications for simple fluids, solids, thermoelastic solids, thermodiffusion and electrodynamics.

### **CEE 7710 - Fracture Mechanics**

Cross-listing: ME 7660

Lec. 3. Cr. 3. Prerequisite: CEE 6930. Griffith-Irwin Theory; stress intensity factors; crack tip stresses; plasticity; fatigue crack propagation; fracture toughness testing; experimental aspects; design applications; special topics.

### **CEE 7720 - Fiber-Reinforced Composite Materials**

Cross-listing: ME 7670

Lec. 2. Lab. 2. Cr. 3. Prerequisite: CEE 6930 or ME 6930. Properties of orthotropic lamina; lamination theory; micromechanics; engineering tests; lamina strength theories; laminate strength theories; laminate strength; stress concentration effects.

### **CEE 7810 - Structural Dynamics**

Lec. 3. Cr. 3. Prerequisite: Consent of instructor. Vibration of single and multi degree-of-freedom systems; dynamic analysis of beams, frames and trusses; systems with distributed properties; discretization of continuous system and practical computer solutions.

### **CEE 7820 - Theory of Elastic Stability**

Cross-listing: ME 7680

Lec. 3. Cr. 3. Prerequisite: CEE 6930 or consent of instructor. Beams-columns; elastic buckling of bars and frames; torsional buckling of thin-walled structures; lateral buckling of beams; bending and buckling of thin plates and shells.

### **CEE 7910 - Study of Current Literature in Engineering Mechanics-Theories**

Cr. 1. Prerequisite: Graduate level standing within the College of Engineering and consent of instructor.

### **CEE 7911 - Study of Current Literature in Engineering**

### **Mechanics-Methods**

Cr. 1. Prerequisite: Graduate level standing within the College of Engineering and consent of instructor.

### **CEE 7912 - Study of Current Literature in Engineering Mechanics-Methods**

Cr. 1. Prerequisite: Graduate level standing within the College of Engineering and consent of instructor.

### **CEE 7970 - Selected Topics**

Cr. 1-6.

### **CEE 7980 - Directed Study**

Cr. 1-6.

### **CEE 7990 - Research and Dissertation**

Cr. 1,3,6,9.

## **Communications**

### **COMM 6110 - Leadership and Communication**

Cr. 3. This course focuses on leadership as a function of communication behavior. Through discussion, cases and exercises, participants will explore effective communication strategies within an organizational setting. The course will cover team leadership skills, rhetorical sensitivity, charisma and practical suggestions for improving leadership effectiveness.

## **Computer Science**

### **CSC 4010 (5010) - Programming Languages**

Lec. 3. Cr. 3. Prerequisite: CSC 2710, 3410. Concepts distinguishing modern programming languages with emphasis on language design, implementation, and run-time behavior. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

### **CSC 4020 (5020) - Compiler Construction**

Lec. 3. Cr. 3. Prerequisite: CSC 2710, 3410. Programming language translator design with emphasis on design concepts, parsing, code generation, tools, and code improvement; construction of a small compiler. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

### **CSC 4100 (5100) - Operating Systems**

Lec. 3. Cr. 3. Prerequisite: Grade of 'C' or better in CSC 2110, CSC 2111 and either 'C' or better in CSC 3410 or ECE 3120. An historical perspective of operating systems; overview of modern systems; processor, storage and process management; virtual memory; deadlocks; concurrent processing and programming; protection; case studies. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

### **CSC 4200 (5200) - Computer Networks**

Lec. 3. Cr. 3. Prerequisite: CSC 2400 Data communications and computer networks; network models and protocols; local area networks; data security. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

### **CSC 4240 (5240) - Artificial Intelligence**

Lec. 3. Cr. 3. Prerequisite: CSC 2400, CSC 2710. A unified survey of AI methods and applications; search and problem solving; knowledge representation; methods of reasoning, planning, and uncertainty; learning, perception, and communication; rational agents. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**CSC 4320 (5320) - Computer Architecture**

Lec. 3. Cr. 3. Prerequisite: Grade of 'C' or better in CSC 3410 or equivalent. Computer systems, the CPU, the control unit, microprogramming, parallel organization, RISC architectures. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**CSC 4400 (5400) - Analysis of Algorithms**

Lec. 3. Cr. 3. Prerequisite: CSC 2400. Analysis techniques; search, traversal, string, and graph algorithms; NP-hard and NP-complete problems. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**CSC 4450 (5450) - Introduction to Automata Theory and Computation**

Lec. 3. Cr. 3. Prerequisite: CSC 2710. CSC 2400 recommended. Finite automata; regular sets; context-free languages; pushdown automata; Turing machines; recursive languages; computability; computational complexity. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**CSC 4575 (5575) - Information Assurance and Cryptography**

Lec. 3. Cr. 3. Prerequisite: Junior standing and 'C' or better in CSC 2110, CSC 2111. Course introduces students to the fundamentals of information assurance and cryptographic techniques along with their application to the prevention, detection, and mitigation of cyber threats. Students enrolled in 5000-level course will be required to complete additional work as stated in the syllabus.

**CSC 4710 (5710) - Design and Development of Human and Web Interfaces**

Lec. 3. Cr. 3. Prerequisite: C or better in CSC 2110, CSC 2111, CSC 3030 or CSC 3040. A course in human-computer interaction design and user interface development. It will expose students to tools, techniques, and ideas for designing effective human computer interfaces and discuss practical and legal aspects of accessibility. Graduate students will be required to do additional work on their projects (more functionality) and/or answer additional questions on tests and quizzes. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**CSC 4760(5760) Parallel Programming.**

Lec. 3. Cr. 3. Prerequisite: CSC 2400, CSC 2500 or consent of instructor. Foundations of parallel programming including parallel computer architectures, principles of parallel algorithm design, programming models for shared and distributed-memory systems, along with GPGPU. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**CSC 4800 (5800) - Directed Readings in Computer Science**

Cr. 3. Prerequisite: Consent of instructor. This course provides for individual study under the direction of a faculty member in developing areas of computer science. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**CSC 4901 (5901) - Special Topics**

Cr. 1-3. Prerequisite: Consent of instructor. Timely topics in computer science. May be taken multiple times, provided the topic is different. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**CSC 4902 (5902) - Special Topics**

Cr. 1-3. Prerequisite: Consent of instructor. Timely topics in computer science. May be taken multiple times, provided the topic is different. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**CSC 4903 (5903) - Special Topics**

Cr. 1-3. Prerequisite: Consent of instructor. Timely topics in computer science. May be taken multiple times, provided the topic is different. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**CSC 5750 - Computer Graphics**

Lec. 3. Cr. 3. Prerequisite: MATH 2010 and "C" or better in CSC 2400. Interactive graphical techniques including three-dimensional transformations, hidden surface removal, texture mapping, and shading.

**CSC 6220 - Data Mining**

Lec. 3. Cr. 3. Prerequisite: CSC 4240 (5240) or consent of instructor. Preparing data for mining using preprocessing, data warehouses, and OLAP; data mining techniques, including association rule mining, classification/prediction and cluster analysis; study of recent techniques and issues.

**CSC 6230 - Machine Learning**

Lec. 3. Cr. 3. Prerequisite: CSC 4240 (5240) or equivalent. Introduction to machine learning techniques, such as decision tree induction, k-NN classifiers, and clustering. Emphasis on supervised learning, including classification techniques, feature selection, and evaluation techniques. Unsupervised and reinforcement learning will also be covered.

**CSC 6250 - Knowledge-Based/Expert Systems**

Lec. 3. Cr. 3. Prerequisite: CSC 4240 (5240) or consent of instructor. Knowledge-based systems and logic programming, methods of knowledge representation, and inference. Applications to expert systems and intelligent data bases.

**CSC 6300 - Web-Based Database Systems**

Lec. 3. Cr. 3. Prerequisite: CSC 4300 (5300) or consent of instructor. Advanced concepts in designing database applications, techniques for data storage and retrieval in large databases, etc.

**CSC 6320 - Advanced Computer Architecture**

Lec. 3. Cr. 3. Prerequisite: CSC 4100 (5100), CSC 4320 (5320), or consent of instructor. Analysis and design of large-scale computer systems, such as pipelined and vector architectures, etc.

**CSC 6400 - Internet Algorithms**

Lec. 3. Cr. 3. Prerequisite: CSC 4200 (5200) and CSC 4400 (5400). Crawling, searching, caching, and other algorithms for solving major problems on the Internet, with an emphasis on formal techniques.

**CSC 6450 - Advanced Theory of Computation**

Cross-listing: MATH 6450

Lec. 3. Cr. 3. Prerequisite: Consent of the instructor (previous coursework involving proofs and some programming experience are needed). A rigorous treatment of the theory of computation. Topics such as: computable functions, the Church-Turing thesis, complexity theory, and P vs NP.

**CSC 6460 - Computational Methods for Graphics and Modeling**

Cross-listing: MATH 6460

Lec. 3. Cr. 3. Prerequisite: Consent of the instructor (previous coursework involving proofs and some programming experience are needed). Mathematical methods for graphics and modeling. Topics such as: 3-D transformations, ray tracing, rendering, image processing, and compression.

**CSC 6575 - Internet Security**

Lec. 3. Cr. 3. Prerequisite: CSC 4575 (5575) or consent of instructor. Network and web-based application security issues, such as encryption and decryption, security protocols, digital signatures, etc.

**CSC 6720 - Internet Protocols**

Lec. 3. Cr. 3. Prerequisite: CSC 4010 (5010), CSC 6700, or consent of instructor. A detailed introduction to languages, methods, and techniques involved in programming web-based applications, including associated paradigms for web-based development environments and applications, including operating systems related issues.

**CSC 6730 - Advanced Networking**

Lec. 3. Cr. 3. Prerequisite: CSC 4200 (5200). Computer network protocols that are usually beyond the scope of a standard course in computer networks. Wireless networks and multimedia networks, advanced topics on network protocols, and readings on selected research papers will be discussed.

**CSC 6740. Parallel and Distributed Algorithms**

Lec. 3. Cr. 3 (Syllabus Attached).  
Prerequisites: CSC 4760 or CSC 5760 or consent of the instructor. Design and analysis of parallel and distributed algorithms for modern parallel and distributed architectures.

**CSC 6760 - Grid Computing**

Lec. 3. Cr. 3. Prerequisite: CSC 4200 (5200). Evolution of Grid Computing and its relationship to Cluster Computer, Distributed Computing, Internet Computing, and Peer-to-Peer Computing. Technologies and architectures used to develop Grids test-bed projects using the Globus Toolkit and other software packages. Focus on understanding the different Grid technologies and architectures, such as the Open Grid Specification Architecture (OGSA) and developing higher-level tools using these technologies.

**CSC 6770 - Service-Oriented Computing**

Lec. 3. Cr. 3. Prerequisite: CSC 6720. Advanced concepts in service-oriented computing. Current technologies for designing large scale web services, as well as utilizing enterprise services by combining web services, including transaction management, service discovery, communication, coordination of web services, and collaboration between web services.

**CSC 6780 - Distributed Computing**

Lec. 3. Cr. 3. Prerequisite: CSC 4100 Theories, principles, and practices relevant to the design of distributed systems including synchronization, naming, replication, and consistency, file system and security.

**CSC6801 Directed Independent Study**

Cr. 1

**CSC6802 Directed Independent Study**

Cr. 2

**CSC6803 Directed Independent Study**

Cr. 3

**CSC 6901 Advanced Topics in Computer Science**

Lec. 1, Cr. 1

**CSC 6902 Advanced Topics in Computer Science**

Lec. 2, Cr. 2

**CSC 6903 Advanced Topics in Computer Science**

Lec. 3, Cr. 3

**CSC 6910 - Computer Science Seminar**

Cr. 1.

**CSC 6980 - Graduate Project**

Cr. 3. Prerequisite: Consent of instructor. This course is a requirement for graduate students pursuing the project option. The

course is directed by the student's graduate advisor(s).

**CSC 6990 - Research and Thesis**

Cr. 1,3,6.

**CSC 7210 - Anomaly and Intrusion Detection Systems**

Lec. 3. Cr. 3. Prerequisite: CSC 6220 or CSC 6230. Traditional intrusion and anomaly detection systems, as well as current advances in this ever-growing field. The application of anomaly detection to a wide-range of domains, including fraud, insider threats, and time-series data will be investigated in-depth, as well as network attacks and the systems for detecting oddities such as network intrusions and denial of service attacks. This course will not only cover the subjects through readings, but also through hands-on experience.

**CSC 7240 - Intelligent Information Systems**

Lec. 3. Cr. 3. Prerequisite: CSC 6220 or CSC 6230. Combines fundamental research in artificial intelligence with application-orientated research in knowledge discovery, decision-support systems, and adaptive computing.

**CSC 7575 - Security Topics in the Smart Grid**

Lec. 3. Cr. 3. Prerequisite: Consent of instructor. Timely topics related to security issues, concerns and trends in the modern power grid including threats of and protection for the IT/computer layer of the seven smart grid conceptual framework domains such as bulk generation, customer, distribution, markets, operations, service provider, and transmission.

**CSC 7720 - Distributed Operating Systems**

Lec. 3. Cr. 3. Prerequisite: CSC 6720. Computer operating systems that run on multiple, independent central processing units but appear to the user as an ordinary centralized operating system. Principles, design, and implementation of distributed operating systems, including network technologies, synchronization, distributed resource management, distributed process management, security, and distributed file systems.

**CSC 7730 - Autonomic Computing**

Lec. 3. Cr. 3. Prerequisite: CSC 6780 or CSC 6730. Introduces principles, key concepts, and proposed methodologies underlying the design and engineering of autonomic computing and networking (AC) systems of autonomic computing systems. Investigates the origins, goals, and promises of autonomic computing. Includes complexity of autonomic computing, architecture, algorithms, enabling technology and development tools for autonomic computing.

**CSC 7750 - High Performance Computing**

Lec. 3. Cr. 3. Prerequisite: CSC 6750. Introduces principles, key concepts, and proposed methodologies used in advanced high performance computing. The future of high performance computing is in exploiting the ever-increasing levels of parallelism. This course will investigate the origins, goals, and techniques of these distributed and parallel systems. The course content will include the architecture, algorithms, techniques, and enabling technology and development tools for high performance computing.

**CSC 7970 - Selected Topics**

Cr. 1-6.

**CSC 7980 - Directed Study**

Cr. 1-6.

**CSC 7990 - Research and Dissertation**

Cr. 1, 3, 6, 9.

## Cooperative Education

**COOP 5010 - Co-op Off-Campus Assignments**

Cr. 1. Prerequisite: The individual must have been a fulltime Tennessee Tech graduate student in good standing the prior term. Selections are made by the employer in conjunction with the Office of Career Services. Co-op assignment is full-time, degree-related employment. One (1) hour credit granted per semester; total work experiences must not exceed 24 months. Credit earned will not decrease the normal minimum requirements of a student's program of study. A written report is required each semester from the student. The student's academic advisor evaluates the report and forwards it to the Office of Career Services. A grade of S (satisfactory) or U (unsatisfactory) will be reported for the student to the Records Office.

**COOP 5020 - Co-op Off-Campus Assignments**

Cr. 1. Prerequisite: The individual must have been a fulltime Tennessee Tech graduate student in good standing the prior term. Selections are made by the employer in conjunction with the Office of Career Services. Co-op assignment is full-time, degree-related employment. One (1) hour credit granted per semester; total work experiences must not exceed 24 months. Credit earned will not decrease the normal minimum requirements of a student's program of study. A written report is required each semester from the student. The student's academic advisor evaluates the report and forwards it to the Office of Career Services. A grade of S (satisfactory) or U (unsatisfactory) will be reported for the student to the Records Office.

**COOP 5030 - Co-op Off-Campus Assignments**

Cr. 1. Prerequisite: The individual must have been a fulltime Tennessee Tech graduate student in good standing the prior term. Selections are made by the employer in conjunction with the Office of Career Services. Co-op assignment is full-time, degree-related employment. One (1) hour credit granted per semester; total work experiences must not exceed 24 months. Credit earned will not decrease the normal minimum requirements of a student's program of study. A written report is required each semester from the student. The student's academic advisor evaluates the report and forwards it to the Office of Career Services. A grade of S (satisfactory) or U (unsatisfactory) will be reported for the student to the Records Office.

**COOP 5040 - Co-op Off-Campus Assignments**

Cr. 1. Prerequisite: The individual must have been a fulltime Tennessee Tech graduate student in good standing the prior term. Selections are made by the employer in conjunction with the Office of Career Services. Co-op assignment is full-time, degree-related employment. One (1) hour credit granted per semester; total work experiences must not exceed 24 months. Credit earned will not decrease the normal minimum requirements of a student's program of study. A written report is required each semester from the student. The student's academic advisor evaluates the report and forwards it to the Office of Career Services. A grade of S (satisfactory) or U (unsatisfactory) will be reported for the student to the Records Office.

## Counseling

**COUN 6300 - Introduction to Counseling: Foundations, Ethics, and Legal Issues**

Lec. 3. Cr. 3. Introductory course for all counseling majors. Overview of philosophy, basic elements, ethics, and principles of counseling. Knowledge of ethical standards of practice and legal issues in counseling.

**COUN 6320 - Group Counseling**

Lec. 3. Cr. 3. Prerequisite: COUN 6300, COUN 6360, and COUN 6362. Introductory course in group counseling; objectives, principles, and techniques of group counseling.

**COUN 6360 - Counseling Theories and Techniques I**

Lec. 3. Cr. 3. Study and application of basic counseling skills, the major Psychoanalytic and Existential/Humanistic theories of counseling and practical applications.

**COUN 6362 - Counseling Theories and Techniques II**

Lec. 3. Cr. 3. Study and application of basic counseling skills, the major Cognitive/Behavioral and Postmodern theories of counseling and practical applications.

**COUN 6380 - Introduction to Multicultural Counseling**

Lec. 3. Cr. 3. Study of a broad range of counseling behavior and psychological principles in the therapeutic relationship as they relate to individuals from different ethnic and cultural backgrounds.

**COUN 6410 - Career Development**

Lec. 3. Cr. 3. Types of information for counseling; community resources; principles and techniques of career planning.

**COUN 6460 - Intervention Strategies for Drug Abusers**

Lec. 3. Cr. 3. Focus on the abuser, the abuser's environment, and strategies for rehabilitation.

**COUN 6630 - Theories of Personality**

Lec. 3. Cr. 3. Major theoretical treatments of personality development and structure with emphasis upon generated psychological research.

**COUN 6670 - Assessment in Counseling**

Lec. 3. Cr. 3. This course will focus on the variety of assessment instruments utilized by counseling and psychology professionals and their role in making appropriate recommendations and planning for treatment.

**COUN 6800 - Practicum**

Cr. 3. Prerequisite: COUN 6300, COUN 6320, COUN 6360, COUN 6362, COUN 7600, and PSY 4160 (5160). Supervised practice in counseling; application of theories, principles, and practices; development of counseling techniques.

**COUN 6820 - Internship in Mental Health Counseling**

Cr. 3, 6. Supervised experience in an appropriate community mental health placement. Students must complete 300 hours of supervised mental health counseling work experience. Students must take COUN 6821 after completing COUN 6820.

**COUN 6821 - Internship in Mental Health Counseling**

Cr. 3, 6. Prerequisite: COUN 6820. Supervised experience in an appropriate community mental health placement. Students must complete 300 hours of supervised mental health counseling work experience.

**COUN 6830 - Internship in School Counseling**

Cr. 3, 6. Prerequisite: COUN 6320, COUN 6360, and COUN 6362. Supervised experience in an appropriate school placement.

**COUN 7300 - Seminar in Counseling**

Cr. 3. Prerequisite: Advanced graduate standing and permission of instructor. A critical study of current issues in counseling.

**COUN 7370 - Counseling Techniques II**

Lec. 3. Cr. 3. Prerequisite: COUN 6362, COUN 6800. Emphasis on models on supervision, professional issues, and counseling procedures and skills not stressed in prior classes.

**COUN 7400 - Practicum in Counseling II**

Cr. 3. Prerequisite: COUN 6320, COUN 6360, and COUN 6362. Supervised practice to expand individual and group counseling skills.

**COUN 7600 - Psychopathology**

Lec. 3. Cr. 3. Focus on diagnosis, etiology, treatment options and the assessment of mental disorders.

**COUN 7830 - Internship in School Counseling**

Cr. 3, 6. Prerequisite: COUN 6320, COUN 6360, and COUN 6362. Supervised experience in an appropriate school setting.

**COUN 7940 - Professional Accountability**

Lec. 3. Cr. 3. Offers the emerging professional an opportunity to become familiar with the various uses of data and how to collect, analyze, interpret, report and utilize information. Assist the student in developing effective and legal/ethical critical thinking and problem solving skills, by offering real world situations for examination. Meets an identified state licensing requirement for school and agency concentrations.

## Criminal Justice

**CJ 4010 (5010) - Organized Crime**

Cross-listing: SOC 4010 (5010)

Lec. 3. Cr. 3. Prerequisite: SOC 1010 or 1100 or consent of instructor. Organized crime in America as a product of legal, historical, cultural and economic forces. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**CJ 4040 (5040) - Law and Culture (Anthropology)**

Cross-listing: SOC 4040 (5040)

Lec. 3. Cr. 3. Prerequisite: SOC 1010 or 1100 or consent of instructor. A comparative cross-cultural analysis of primitive, traditional, and modern attitudes toward law, social control, punishment, and individual responsibility. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**CJ 4100 (5100) - Probation and Parole**

Lec. 3. Cr. 3. Probation and parole services with special attention to current practices and issues. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**CJ 4120 (5120) - Treatment Methods**

Lec. 3. Cr. 3. Individual and group methods used in counseling and treating offenders in both the institutional and community setting. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**CJ 4250 (5250) - Drugs and Behavior**

Lec. 3. Cr. 3. Relationships between drugs or drug groupings and human behavior, including toxicity, behavioral symptoms and historical aspects of drug abuse. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**CJ 4660 (5660) - Corrections**

Cross-listing: SOC 4660 (5660)

Lec. 3. Cr. 3. Prerequisite: SOC 1010 or 1100 or consent of instructor. Correctional services, practices and issues with particular attention to the maximum security adult institution. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**CJ 4700 (5700) - Independent Study**

Cr. 1-3. Prerequisite: Consent of instructor. Allows the student to undertake study in an area of criminology or criminal justice where there is no appropriate course. May be taken twice, provided that the topic is different. Students enrolled in the 5000-level course will

be required to complete additional work as stated in the syllabus.

**CJ 4900 (5900) - Internship in Criminal Justice**

Cr. 3. Prerequisite: 9 hours of sociology. See instructor prior to enrolling. Students are placed with and work in a public or private agency which is compatible with their interests. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**CJ 4970 (5970) - Special Topics**

Cr. 1-3. Prerequisite: Consent of instructor. Seminar or lecture course on a selected topic, issue, or interest area in criminology or criminal justice. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**CJ 4980 (5980) - Special Topics**

Cr. 1-3. Prerequisite: Consent of instructor. Seminar or lecture course on a selected topic, issue, or interest area in criminology or criminal justice. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**CJ 4990 (5990) - Special Topics**

Cr. 1-3. Prerequisite: Consent of instructor. Seminar or lecture course on a selected topic, issue, or interest area in criminology or criminal justice. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

## Curriculum

**CUED 4400 (5400) - Teaching Methods for Physical Sciences**

Lec. 3 Cr. 3 Prerequisite: Consent of advisor and advanced graduate standing. This course focuses on teaching methods associated with the physical sciences of physics and chemistry. Students will experience and learn the theories behind inquiry, modeling, and other appropriate classroom instructional methods for physics and chemistry topics. Methods and topics will cover grades K-12 with a strong emphasis on conceptual understanding and vertically-aligned standards-based instruction.

**CUED 5010 - Curriculum Improvement**

Cr. 3. A critical analysis of conventional and innovative approaches to curriculum improvement. The functions of leadership, evaluation, and research.

**CUED 5120 - Materials and Methods for Teaching Speech and Theatre**

Lec. 2. Cr. 2. Corequisite: CUED 6800. Principles, objectives, techniques, evaluation in secondary school teaching of speech and elementary and secondary school teaching of theater. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**CUED 5800 - Practicum in Teaching**

Cr. 1. Supervised work experiences in public schools.

**CUED 5850 - Workshop in Education**

Cr. 1-6. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**CUED 5870 - Supervised Field Experiences in Teaching I**

Cr. 5. Prerequisite: Admission to the Supervised Field Experiences in Teaching Program. Corequisite: CUED 5890. A full day, full semester supervised field experience in an approved public school. The participant will be an employee of the school system and hold an Interim Probationary license or Probationary Permit for the grade/subject of the placement.

**CUED 5880 - Supervised Field Experiences in Teaching II**

Cr. 5. Prerequisite: CUED 5870. Continuation of CUED 5870.

**CUED 5890 - Graduate Seminar for Student Teaching**

Cr. 2. Corequisite: ECED/ELED/SEED/SPED 4870, 4880. Seminar on issues of student teaching with special emphasis on classroom management and professional development.

**CUED 6010 - Curriculum Development and Evaluation**

Lec. 3. Cr. 3. Current trends in curriculum development; defining objectives; planning for improvement; organization of instructional materials; curriculum evaluation.

**CUED 6050 - Readings in Curriculum**

Cr. 3. Readings and independent study involving exploration on a particular topic.

**CUED 6100 - Instructional Strategies**

Lec. 3. Cr. 3. Advanced educational methods for K-12, including an emphasis on current research and best practice in the field.

**CUED 6150 - Middle School Curriculum**

Cr. 3. An examination of the function, organization, curricular offerings, instructional strategies, and trends in middle schools.

**CUED 6250 - School and Community Partnerships**

Lec. 3. Cr. 3. Techniques and procedures for interpreting school programs and building relationships between the school and community, and the improvement of the instructional program through community resources and involvement.

**CUED 6430 - Production of Instructional Materials**

Cr. 3. Prerequisite: Competence in basic computer skills and media or completion of FOED 6320. The course focus is on design, preparation, and production of instructional materials utilizing current trends and technologies in education.

**CUED 6440 - Emerging Technologies in Education**

Online. Cr. 3. Prerequisite: Consent of advisor and advanced graduate standing. This course surveys current and potential classroom technologies that influence teaching and learning. Students will develop and facilitate effective uses of current and emerging digital tools to locate, analyze, evaluate, and use information resources to enrich research, learning and educational practices.

**CUED 6450 - Internet Integration for Teaching and Learning**

Online. Cr. 3. Prerequisite: Consent of advisor and advanced graduate standing. In this course, students will increase their knowledge of internet subject matter, teaching and learning, and technology. These experiences will serve to advance student learning, creativity, and innovation. Students will promote and develop these objectives in both face-to-face and virtual environments.

**CUED 6460 - Constructivist Strategies for Classroom Instruction**

Online. Cr. 3. Prerequisite: Consent of advisor and advanced graduate standing. This course examines constructivist learning strategies for P-16 education. Constructivist theory and classroom implications are analyzed and reviewed. A strong emphasis is placed on infusing technology for instructional and curricular application.

**CUED 6800 - Field Experience**

Cr. 1-3. Practical field experience in student's major area of emphasis.

**CUED 6880 - Student Teaching**

Clinical. Cr. 9. Prerequisite: CUED 6800 and Full admission to the Teacher Education Program. A semester-long performance based clinical experience in authentic settings involving planning appropriate instruction based on student's needs, creating a

positive learning environment, communicating and collaborating with colleagues and others, effectively assessing student learning and reflecting on practice. THIS COURSE REQUIRES A GRADE OF 'B' OR BETTER.

**CUED 6900 - Problems in Curriculum**

Cr. 3. Prerequisite: FOED 6920 or consent of advisor. A study of persistent problems relating to curriculum with special attention to research findings.

**CUED 6920 - Topics**

Cr. 1-6. Laboratory approach providing opportunities for experienced educational personnel to study in-depth educational problems.

**CUED 6921 - Topics**

Cr. 1-3. This course will provide up-to-date content in emerging educational issues for in-service teachers. The specific topic will be designated in the title at each offering. The number of hours of credit will be based on the magnitude of the topic and the clock hours of face-to-face and/or online attendance. Course objectives and grading guidelines will be established by the faculty at the time each course is offered.

**CUED 6922 - Topics**

Cr. 1-3. This course will provide up-to-date content in emerging educational issues for in-service teachers. The specific topic will be designated in the title at each offering. The number of hours of credit will be based on the magnitude of the topic and the clock hours of face-to-face and/or online attendance. Course objectives and grading guidelines will be established by the faculty at the time each course is offered.

**CUED 6923 - Topics**

Cr. 1-3. This course will provide up-to-date content in emerging educational issues for in-service teachers. The specific topic will be designated in the title at each offering. The number of hours of credit will be based on the magnitude of the topic and the clock hours of face-to-face and/or online attendance. Course objectives and grading guidelines will be established by the faculty at the time each course is offered.

**CUED 6924 - Topics**

Cr. 1-3. This course will provide up-to-date content in emerging educational issues for in-service teachers. The specific topic will be designated in the title at each offering. The number of hours of credit will be based on the magnitude of the topic and the clock hours of face-to-face and/or online attendance. Course objectives and grading guidelines will be established by the faculty at the time each course is offered.

**CUED 6925 - Topics**

Cr. 1-3. This course will provide up-to-date content in emerging educational issues for in-service teachers. The specific topic will be designated in the title at each offering. The number of hours of credit will be based on the magnitude of the topic and the clock hours of face-to-face and/or online attendance. Course objectives and grading guidelines will be established by the faculty at the time each course is offered.

**CUED 6926 - Topics**

Cr. 1-3. This course will provide up-to-date content in emerging educational issues for in-service teachers. The specific topic will be designated in the title at each offering. The number of hours of credit will be based on the magnitude of the topic and the clock hours of face-to-face and/or online attendance. Course objectives and grading guidelines will be established by the faculty at the time each course is offered.

**CUED 6927 - Topics**

Cr. 1-3. This course will provide up-to-date content in emerging educational issues for in-service teachers. The specific topic will be designated in the title at each offering. The number of hours of credit will be based on the magnitude of the topic and the clock hours of face-to-face and/or online attendance. Course objectives and grading guidelines will be established by the faculty at the time each course is offered.

#### **CUED 6928 - Topics**

Cr. 1-3. This course will provide up-to-date content in emerging educational issues for in-service teachers. The specific topic will be designated in the title at each offering. The number of hours of credit will be based on the magnitude of the topic and the clock hours of face-to-face and/or online attendance. Course objectives and grading guidelines will be established by the faculty at the time each course is offered.

#### **CUED 6929 - Topics**

Cr. 1-3. This course will provide up-to-date content in emerging educational issues for in-service teachers. The specific topic will be designated in the title at each offering. The number of hours of credit will be based on the magnitude of the topic and the clock hours of face-to-face and/or online attendance. Course objectives and grading guidelines will be established by the faculty at the time each course is offered.

#### **CUED 6990 - Research and Thesis**

Cr. 3,6.

#### **CUED 7010 - Learning Theories**

Lec. 3. Cr. 3. An advanced study of major learning theories with emphasis on making connections to recent instructional trends, teaching innovations and student learning.

#### **CUED 7030 - Rural Schools and Communities**

Lec. 3. Cr. 3. Prerequisite: Graduate Standing. An in depth study of the historical, cultural, and economic characteristics of rural places and the role of schools and agencies in shaping the destiny of those places and their citizens.

#### **CUED 7100 - Improvement in Teaching**

Lec. 3. Cr. 3. Advanced study of innovations, recent trends, research findings, and evaluation relating to the improvement of teaching.

#### **CUED 7430 - Specialized Applications of Technology to Education**

Lec. 3. Cr. 3. Prerequisite: CUED 6430. Application of current media technologies to maximize student learning with instructional design strategies appropriate for each technology.

#### **CUED 7440 - Assistive Technology for Young Children and Families**

Lec. 2. Cr. 2. Prerequisite: CUED 7430. Application of assistive and adaptive technology and related equipment and procedures to support at-risk young children and families.

#### **CUED 7510 - Instructional Design**

Lec. 3. Cr. 3. Prerequisite: Consent of advisor and advanced graduate standing. This course will focus on the tenets of Instructional System Design (IDS), and how it can be used to enhance and enrich the delivery of content in the P-12 classroom. Students will discover how ISD can strengthen instruction by making the acquisition of knowledge more efficient and appealing.

#### **CUED 7520 - Teaching and Learning Online**

Lec. 3. Cr. 3. Prerequisite: Consent of advisor and advanced graduate standing. This course examines the design, delivery, and assessment of successful online pedagogies including virtual classroom, synchronous vs. asynchronous learning, web-based

instruction, and virtual communities. Current research on best practice in online teaching and learning theory will be woven throughout.

#### **CUED 7530 - Designing Integrated Technology Environments**

Lec. 3. Cr. 3. Prerequisite: Consent of advisor and advanced graduate standing. This course will focus on adapting and developing virtual and physical spaces into technology-rich learning environments. Students will evaluate the impact of educational technology by applying theoretical and conceptual models to real-world classrooms and learning environments. Current national standards, state reforms, and technological innovations will be embedded throughout.

#### **CUED 7800 - Laboratory and Field Experiences in Education**

Cr. 3. Prerequisite: Reading Specialists Concentration only. Consent of advisor and advanced graduate standing. Supervised practicums, observation, simulation, internships, and externships in education.

#### **CUED 7801 - Lab and Field Experiences in Education/Technology Focus**

Cr. 3. Prerequisite: Consent of advisor and advanced graduate standing. Consent of advisor and advanced graduate standing. Supervised practicums, observation, simulation, internships, and externships in education. Content focus on technology.

#### **CUED 7802 - Lab and Field Experiences in Education/Grant Writing Focus**

Cr. 3. Prerequisite: Consent of advisor and advanced graduate standing. Supervised practicums, observation, simulation, internships, and externships in education. Content focus on grant writing.

#### **CUED 7803 - Lab and Field Experiences in Education/Autoethnography Focus**

Cr. 3. Prerequisite: Consent of advisor and advanced graduate standing. Supervised practicums, observation, simulation, internships, and externships in education. Content focus on autoethnography.

#### **CUED 7900 - Reading and Research in Education**

Cr. 3. Prerequisite: Advanced graduate standing and consent of advisor. Study on an individual basis in the area of education being emphasized.

#### **CUED 7910 - Advanced Research Project in Education**

Cr. 3. Prerequisite: Consent of advisor and advanced graduate standing. All students who complete requirements for the Ed.S. degree must complete an independent study project.

## **Decision Sciences**

#### **DS 4330 (5330) - Management Systems Analysis**

Lec. 3. Cr. 3. Prerequisite: DS 3840. An applications oriented study of the business systems development life cycle; current systems analysis and design methods are emphasized. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

#### **DS 4630 (5630) - Advanced Quantitative Analysis**

Lec. 3. Cr. 3. Prerequisite: DS 3620. Advanced applications of quantitative methods including forecasting and management science concepts. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

#### **DS 4900 (5900) - Special Topics in Decision Sciences**

Lec. 1-3. Cr. 1-3. Prerequisite: Consent of instructor. Current Topics in Decision Sciences. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**DS 6120 - Operations and Supply Chain Management**

Lec. 3. Cr. 3. A case study course about management decisions on topics relating to design, control, and improvement of operations management systems and processes within the enterprise and in the supply chain.

**DS 6220 - Management of Information Technology**

Lec. 3. Cr. 3. Concepts of current components of information technology and their management as it relates to the support of the strategic business plan.

**DS 6530 - Decision Support Systems**

Lec. 3. Cr. 3. An introduction to expert systems, decision support systems, and executive information systems as they are employed in business organizations.

**DS 6540 - Business Telecommunications Systems**

Lec. 3. Cr. 3. Introduces students to the concepts of telecommunications, wide and local area networks, and other state-of-the-art communications technologies.

**DS 6550 - Data Resources Management**

Lec. 3. Cr. 3. Introduces students to the concepts, terminology, tools, and techniques comprising the general area of data resources management.

**DS 6900 - Special Topics**

Lec. 3. Cr. 3. A case course dealing with current topics in business.

## Early Childhood Education

**ECED 4210 (5210) - Early Childhood Education, Curriculum and Methods**

Lec. 2. Cr. 2. Prerequisite: Full admission to the second level. Corequisite: ECED 4220 (5220). Objectives, curriculum, materials, principles of teaching, and physical facilities for young children. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**ECED 4220 (5220) - Early Childhood Education, Practicum II**

Lab. 10. Cr. 3. Prerequisite: Full admission to the second level and ECED 2850 or consent of instructor. Corequisite: ECED 4210 (5210) or consent of instructor. Participation with children in kindergarten setting. Use of teacher-made materials, units, and innovative methods. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**ECED 4250 (5250) - Language Arts and Communicative Skills**

Lec. 2. Cr. 2. Prerequisite: Full admission to the second level. Relationship of language development and thinking to teaching communication skills to children. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**ECED 4840 (5840) - Seminar: Language Acquisition from Birth to Five Years**

Lec. 1. Cr. 1. Corequisite: ECED 4250 (5250) or permission of instructor. Study of early language development, problems, and acquisition in children from birth to five years of age. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**ECED 6200 - The Young Child**

Lec. 3. Cr. 3. Patterns of growth and development as related to the school curricula.

**ECED 6300 - Math, Science, Social Studies, and Technology for the Young Child**

Lec. 3. Lab. 3. Cr. 3. Examination of methods and techniques

for teaching math, science, social studies, and technology to children Pre K-3. Explores the integration of curriculum with special emphasis on inquiry methods for enhancing diverse learners' critical thinking abilities and includes practicum experience.

**ECED 6400 - Multicultural Education: Perspectives and Instruction**

Lec. 3. Cr. 3. Multicultural knowledge base, cultural themes, and appropriate learning activities for children in a diverse society.

**ECED 6810 - Practicum in Early Childhood Education**

Cr. 3. Practical guided experiences using innovative techniques or materials with children.

**ECED 6900 - Problems in Early Childhood Education**

Cr. 3. A critical study of problems of early childhood education with special attention to research findings.

**ECED 6920 - Topics**

Cr. 1-6 Laboratory approach providing opportunities for experienced educational personnel to study in-depth early childhood education problems.

**ECED 6990 - Research and Thesis**

Cr. 3, 6.

**ECED 7210 - Early Childhood Curriculum**

Lec. 3. Cr. 3. Major trends, programs, research, and innovations in Early Childhood Education with emphasis on curriculum development.

**ECED 7220 - Early Childhood Instruction and Materials**

Lec. 3. Cr. 3. Planning objectives, activities, and materials for children, teaching techniques, and evaluation of curricula.

**ECED 7250 - Assessment and Management**

Lec. 3. Cr. 3. Types, purposes and appropriateness of various assessment procedures and management styles for children, early education environments and curricula.

**ECED 7350 - Advanced Child, Family, and School Relations**

Lec. 3. Cr. 3. Prerequisite: ECED 6200 or consent of instructor. Study and research in social, emotional, cognitive, language, motor and perceptual development and learning with children from birth through age eight (8) in the family and school contexts.

**ECED 7800 - Laboratory and Field Experiences in Education**

Cr. 3-4. Prerequisite: Advanced graduate standing and consent of instructor. Supervised practicums, observation and internships in education.

**ECED 7900 - Readings and Research in Early Childhood Education**

Cr. 1-3. Study on an individual basis of current literature and research in the area of education being emphasized.

**ECED 7910 - Independent Study in Education**

Cr. 3. Prerequisite: Advanced graduate standing and consent of instructor. All students who complete requirements for the Ed.S. degree must complete an independent study project.

## Early Childhood Special Education

**ECSP 5300 - Assessment of Young Children**

Lec. 3. Lab. 4. Cr. 3. Prerequisite: CFS 2400, CFS 2410, or consent of instructor. Theories, principles, and practices associated with child find, assessment, and evaluation of young children, their families, and their environment.

**ECSP 6100 - Foundations of Early Childhood Education**

Lec. 3. Lab. 3. Cr. 3. Examination of major concepts guiding practice in the field of early childhood education. Discussion of various historical and contemporary models and delivery systems for grades Pre K-4 in diverse and inclusive settings and includes practicum experiences.

## Economics

### Econ 4200 (5200) - Environmental Economics

Lec. 3 Cr. 3 Prerequisite: AGBE2100 or ECON2010. A detailed study of the economic foundations of Environmental Policy and common tools used by environmental economists to measure and analyze benefits and costs of environmental regulation and consider the characteristics of efficient regulation.

### ECON 4310 (5310) - Labor Economics

Lec. 3. Cr. 3. Prerequisite: ECON 2020. Labor problems including economics of the labor market, wages, demand and supply of labor, unemployment. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

### ECON 4510 (5510) - International Trade and Finance

Lec. 3. Cr. 3. Prerequisite: ECON 2020. International trade, monetary exchange, balance of payments, and foreign investments. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

### ECON 4520 (5520) - Comparative Economic Systems

Lec. 3. Cr. 3. Prerequisite: ECON 2020. Analysis of essential economic features of the economic systems. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

### ECON 4530 (5530) - History of Economic Thought

Lec. 3. Cr. 3. Prerequisite: ECON 2020. Development of economic doctrines and schools and economic thought from the mercantilist period to the present.

### ECON 4600 (5600) - Economic Growth & Development

Lec. 3. Cr. 3. Prerequisite: ECON 2020. A critical survey of growth and strategies of economic development, including regional growth and development; historical evidence of development. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

### ECON 4640 (5640) - Econometrics

Lec. 3. Cr. 3. Prerequisite: ECON 3630, 3810, 3820, or consent of instructor. An advanced treatment of statistical models applied to economics, including the general linear model, heteroscedasticity, autocorrelation, multi-collinearity, simultaneous equations, and other violations of OLS assumptions. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

### ECON 4900 (5900) - Contemporary Economics Workshop

Cr. 1-6. Thorough and intensive training of public school teachers in fundamental economic principles and current issues. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

### ECON 5030 - Fundamentals of Economics

Lec. 3. Cr. 3. Production and distribution of wealth and income; basic principles of the American capitalistic economy.

### ECON 6050 - Analytical Decision Making

Lec. 3. Cr. 3. Analytical decision making for business operations, including statistics, quantitative methods, and other optimization and simulation models.

### ECON 6900 - Special Topics

Lec. 3. Cr. 3. A case course dealing with current topics in business.

### ECON 6920 - International Economics

Lec. 3. Cr. 3. A case study course emphasizing the global environment in which today's businesses function.

## Educational Leadership and Policy Analysis

### ELPA 6560 - Small Group Leadership

Cr. 3. Through activities in this course, students will explore their leadership skills specifically related to forming compatible achieving groups capable of completing tasks to complement the organizational vision. Students will examine the classic and contemporary literature on topics effecting groups such as conflict, collaboration, negation, power issues, decision making, compromise strategies, and team building.

## Educational Psychology

### EDPY 5850 - Orientation Experience for School Counselor Candidates

Lec. 1. Lab. 1. Cr. 1. The course is designed to meet the recently approved Licensing Standards for School Counselor Pre K-12. School counselor candidates without teaching experience are mandated to have a semester-long orientation experience as an early part of the preparation program. This course utilizes in-school activities designed to provide observation of, participation in, and analysis of classroom instruction. The candidate will engage in teaching experiences (counseling) and feedback regarding the candidate's teaching.

### EDPY 6310 - Educational Statistics

Lec. 3. Cr. 3. An introductory course in statistical methods applied to the solution of educational problems.

### EDPY 6330 - Organization and Administration in School Counseling Programs

Lec. 3. Cr. 3. Major principles of sound administrative practice and organization of school counseling services.

### EDPY 6350 - Measurement and Assessment

Lec. 3. Cr. 3. Principles of measurement and assessment; teacher made tests; standardized tests.

### EDPY 6370 - Family Systems

Lec. 3. Cr. 3. Introduction to family systems and techniques of family counseling.

### EDPY 6450 - Values, Ethics, and Legal Issues

Spring. Lec. 3. Cr. 3. Awareness of self and societal values. Knowledge of ethic standards of practice and legal issues in counseling.

### EDPY 6510 - Field Experiences in Case Management

Cr. 3. Emphasizes the demonstration of professionalism and readiness to enter the case management and supervision job market. This course will provide an internship-like experience.

### EDPY 6640 - Consultation in the Case Management Setting

Lec. 3. Cr. 3. Designed to prepare for the facilitation of behavioral change within a collaborative, indirect service delivery model.

### EDPY 6650 - Organization and Administration of Case Management Programs

Lec. 3. Cr. 3. Introduces and emphasizes the major principles of appropriate case management and supervision of program strategies, administrative practice and organizational leadership techniques.

### EDPY 6900 - Problems in Educational Psychology

Cr. 3. Critical study of problems in educational psychology and/or personnel services.

**EDPY 6930 - Interpreting and Applying Psychological Research**

Lec. 3. Cr. 3. Prerequisite: EDPY 6310 or comparable course. Designed for students selecting the non-thesis option in Educational Psychology and Counselor Education. Designed specifically for the research consumer (practitioner) utilizing field-based applications of research and statistical principles for school and nonschool mental health settings.

**EDPY 6990 - Research and Thesis**

Cr. 6.

**EDPY 7000 - Life Span Development**

Lec. 3. Cr. 3. Focus on developmental theories in understanding the physical, cognitive, and psychological development across the life span.

**EDPY 7170 - Consultation in the Education Setting**

Lec. 3. Cr. 3. Prerequisite: COUN 6362. Study of a broad range of educational and behavioral consultation techniques; specifically designed as an intervention course for the school counselor and other school services personnel. The course emphasizes the use of indirect service delivery and collaborative consultation models with educators and parents.

**EDPY 7200 - Advanced Educational Psychology**

Cr. 3. Recent research in educational psychology and its application for teaching and for educational services in schools and colleges.

**EDPY 7310 - Advanced Educational Statistics**

Lec. 3. Cr. 3. Prerequisite: FOED 6920 and EDPY 6310 or consent of instructor. Review of introductory significance tests and correlational methods; common factorial designs; and common multivariate procedures.

**EDPY 7610 - Introduction to Personality Assessment**

Lec. 3. Cr. 3. Prerequisite: PSY 4250 (5250) and advanced graduate standing. Psychological evaluation; self-report inventories; and introduction to projective techniques.

**EDPY 7730 - Individual Testing**

Lec. 3. Cr. 3. Prerequisite: PSY 4250 (5250), six credits in psychological and/or educational measurement, and permission of instructor. Techniques and practice in individual testing; emphasis on intelligence tests.

**EDPY 7820 - Internship in Agency Counseling**

Cr. 3, 6. Supervised experience in an appropriate agency setting.

**EDPY 7900 - Independent Study in Educational Psychology**

Cr. 3. Prerequisite: Advanced graduate standing and consent of instructor. Study on an individual basis in the area of emphasis.

**EDPY 7910 - Assessment and Intervention**

Lec. 3. Cr. 3. Prerequisite: EDPY 7730 and consent of instructor. Review of psychometric theory; role of the school psychologist; individual and group assessment of cognitive, affective, motor, and academic performance; basic interventions; consultations.

**EDPY 7920 - Assessment and Intervention**

Lec. 3. Cr. 3. Prerequisite: EDPY 7610. Individual assessment of neuropsychological functioning; advanced personality assessment of children and adolescents; advanced interventions; consultations.

**EDPY 7950 - Internship in School Psychology**

Cr. 3. Prerequisite: EDPY 7920 and consent of instructor. A planned developmental experience in a school setting supervised by a licensed or certified psychologist.

## Electrical and Computer Engineering

**ECE 4020 (5020) - Digital Signal Processing**

Lec. 3. Cr. 3. Prerequisite: ECE 3020 and ECE 3120 (ECE 3120 may be taken concurrently). Introduction to the theory and practice of discrete-time signals and systems, A/D and D/A conversion, filter design, DSP architecture and implementation, programming, and DSP applications. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**ECE 4110 (5110) - Digital System Design**

Lec. 3. Cr. 3. Prerequisite: ECE 2110 and ECE 3160. Computer aided combinational and sequential digital logic analysis, design, and applications, utilizing both standard digital components and programmable logic devices. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**ECE 4120 (5120) - Fundamentals of Computer Design**

Lec. 3. Cr. 3. Prerequisite: ECE 3120, ECE 4110 (5110). Continuation of digital system design concepts and applications with emphasis on computer hardware design: CPU sequencers, arithmetic/logic units, fixed and floating point arithmetic implementations, and computer peripheral interfacing, utilizing programmable logic. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**ECE 4130 (5130) - Introduction to Digital VLSI**

Lec. 3. Cr. 3. Prerequisite: ECE 2110 and ECE 3300. Analysis, design, and layout of complex digital integrated circuits in MOS technology. The course emphasizes design through projects and requires extensive use of simulation and layout VLSI CAD tools. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**ECE 4210 (5210) - Control System Design I**

Lec. 3. Cr. 3. Prerequisite: ECE 3210, ECE 3260. Design of compensators using frequency domain techniques; design projects with hardware implementation. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**ECE 4220 (5220) - Control System Design II**

Lec. 3. Cr. 3. Prerequisite: ECE 4210 (5210). Discrete-time systems theory; analysis and design of discrete-time control systems. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**ECE 4230 (5230) - Computer-based Measurement and Control Systems**

Lec. 3. Cr. 3. Prerequisite: ECE 4210 (5210) or consent of instructor. Computer-based control systems, analysis and design of computer-based measurement and data acquisition systems, and virtual instrumentation. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**ECE 4370 (5370) - Mechatronics and Intelligent Machines Engineering**

Cross-listing: ME 4370 (5370)

Lec. 2. Lab. 2. Cr. 3. Prerequisite: ECE 3120, ECE 3160. Mechatronics; number systems; microcontroller technology and architecture of 8-bit microcontrollers (e.g. Motorola MC68HC110); assembly language programming; A/D and D/A conversion; parallel I/O; programmable timer operation; interfacing sensors and actuators; applications; team project on design and implementation of a mechatronic system. Students enrolled in the 5000-level course will be required to complete additional work as stated in the

syllabus.

#### **ECE 4510 (5510) - Electromagnetic Fields II**

Lec. 3. Cr. 3. Prerequisite: ECE 3510. Polarization, Poynting's vector, transmission lines, waveguides, radiation. Students enrolled in the 5000-level course will be required to complete additional work as required in the syllabus.

#### **ECE 4520 (5520) - Optoelectronic Engineering**

Lec. 3. Cr. 3. Prerequisite: ECE 3540. Device theory for optical communication and instrumentation systems. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

#### **ECE 4610 (5610) - Power Systems Analysis**

Lec. 3. Cr. 3. Prerequisite: ECE 3610. Power system components modeling in steady state, per unit calculations, transmission line steady state operation, power flow analysis, and applications of commercial software. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

#### **ECE 4620 (5620) - Power System Operation and Control**

Lec. 3. Cr. 3. Prerequisite: ECE 4610 (5610). Symmetrical components, fault analysis, system protection, transient stability, power system controls including: automatic generation control, voltage regulation, and economic dispatch. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

#### **ECE 4630 (5630) - Power Electronics**

Lec. 3. Cr. 3. Prerequisite: ECE 3300, ECE 3610. Uncontrolled and controlled rectifiers, voltage controllers, chopper, dc motor control, pulse-width modulation inverters, induction motor control, power supplies. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

#### **ECE 4710 (5710) - Principles of Telecommunications**

Lec. 3. Cr. 3. Prerequisite: ECE 3710 and either ECE 3910 or MATH 3470. Performance of analog and digital communication systems in the presence of noise. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

#### **ECE 4720 (5720) - Telecommunication System Design**

Lec. 3. Cr. 3. Prerequisite: ECE 4710 (5710). Link budget, synchronization, frequency synthesis, receiver architecture, noise and distortion, error correction codes, and spread spectrum systems. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

#### **ECE 4990 (5990) - Special Problems**

Cr. 1-4. Prerequisite: Consent of instructor. Current topics in electrical engineering in the form of a reading course or an experimental lecture course. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

#### **ECE 6040 - Signal Analysis**

Lec. 3. Cr. 3. Prerequisite: Graduate standing. Analysis of continuous and discrete signals; orthogonal expansion of signals; sampling and reconstruction; theory and application of Fourier and z-transforms, FFT algorithms and spectral analysis.

#### **ECE 6070 - Digital Image Processing**

Lec. 3. Cr. 3. Prerequisite: Graduate standing. Image processing fundamentals, image transforms, image enhancement, image restoration, image encoding, and image segmentation.

#### **ECE 6110 - Microprocessor Systems**

Lec. 3. Cr. 3. Prerequisite: ECE 3120 and ECE 4110 (5110), or equivalent. Design of microprocessor-based controllers from sensor to output, including hardware and software for control, data acquisition, computation, and I/O.

#### **ECE 6120 - Digital Design Using Hardware Description Languages**

Lec. 3. Cr. 3. Prerequisite: ECE 3120 and ECE 4110 (5110), or equivalent. Hardware description languages. Synthesis, simulation, and design for testability. Study of complex digital structures such as: CPU, memory, FIFO, serial and parallel interfaces, and digital controllers.

#### **ECE 6130 - Computer Architecture**

Lec. 3. Cr. 3. Prerequisite: ECE 4120 (5120) or equivalent. Analysis and design of computing systems. Performance issues, cache and virtual memory structures, and pipelined CPUs.

#### **ECE 6140 - Parallel Processing Systems**

Lec. 3. Cr. 3. Prerequisite: ECE 4120 (5120) or equivalent. Parallel processing hardware and software concepts. Distributed processing. Interconnection networks. RISC/CISC models. Computer arithmetic implementation.

#### **ECE 6150 - Digital VLSI Design**

Lec. 3. Cr. 3. Prerequisite: ECE 4130 (5130) or equivalent. Hierarchical design of NMOS and MOS ASICs, MOS technology and fabrication. Standard cell and full-custom chip layout. FPGAs, FSMs, and iterative networks. Use of CAD tools.

#### **ECE 6160 - Advanced Computer Networks**

Lec. 3. Cr. 3. Prerequisite: CSC 4200 (5200) or equivalent, or consent of instructor. Computer network layered architectures, networking hardware, high-speed networks, storage networks, multimedia networks, wireless networks, and computer network management.

#### **ECE 6170 - High Performance Embedded Systems Design**

Lec. 3. Cr. 3. Prerequisite: ECE 4140. Hardware and software concepts in the design and analysis of embedded systems. Memory types and peripheral interfaces used in embedded systems. Performance analysis of embedded systems designs.

#### **ECE 6200 - Linear Systems Analysis**

Lec. 3. Cr. 3. Prerequisite: ECE 3210 or ME 4810 (5810). State space analysis of multiple-input/multiple-output continuous and discrete-time systems; linear spaces; timevarying systems, controllability, observability, and stability.

#### **ECE 6230 - Linear Multivariable System Design**

Lec. 3. Cr. 3. Prerequisite: ECE 6200, ECE 6250. Optimal control; robust stability; loop shaping design using singular values; loop transfer recovery; survey of other multivariable system designs.

#### **ECE 6240 - Robot Control Theory**

Lec. 3. Cr. 3. Prerequisite: ECE 6200. Overview of robot models; servo and task-level control methods, including model-based, force, and adaptive control; trajectory planning; programming.

#### **ECE 6250 - Random Signals and Systems**

Lec. 3. Cr. 3. Prerequisite: ECE 3910 or equivalent. Probability models used in engineering; transformations of random variables; stochastic processes for engineering applications; linear least-square estimation; spectral analysis; Markoff systems.

#### **ECE 6260 - State Estimation and System Identification**

Lec. 3. Cr. 3. Prerequisite: ECE 6200 (or consent of instructor), ECE 6250. Model structures of stochastic systems. State estimation and Kalman filtering. Parameter estimation and system identification. Estimator performance, optimization, and implementation.

**ECE 6280 - Nonlinear Automatic Control**

Lec. 3. Cr. 3. Prerequisite: ECE 6200. Singular points; limit cycles; perturbation techniques; describing functions; stability.

**ECE 6310 - Integrated Circuit Design**

Lec. 3. Cr. 3. Prerequisite: Consent of instructor. CMOS technology, modeling of devices, design of integrated circuit amplifiers, comparators, A/D converters, operational amplifiers, and oscillators.

**ECE 6510 - Electromagnetic Field Theory I**

Lec. 3. Cr. 3. Prerequisite: Graduate standing in EE. Boundary value problems in electrostatics and magnetostatics; electric and magnetic multipole interactions; Maxwell's stress tensor; Maxwell's equations; EM wave propagation in vacuum and dielectric media.

**ECE 6530 - Quantum Engineering Theory I**

Lec. 3. Cr. 3. Prerequisite: Graduate standing in EE. Introduction to quantum principles, Schrodinger theory, Dirac theory, time-independent perturbation theory, variation method of approximation.

**ECE 6580 - Instrumentation and Transducer Technology**

Lec. 3. Cr. 3. Prerequisite: ECE 4230 (5230) or equivalent. A study of applications of instrumentation systems, transducer and sensor devices, signal conditioning and recording considerations with emphasis on parameters as temperature, velocity, acceleration, pressure, and others. Calibration techniques, error consideration, and new and current instrument developments will be presented.

**ECE 6600 - Computer Methods of Power System Analysis**

Lec. 3. Cr. 3. Prerequisite: ECE 4620 (5620). Power system matrices; fault and contingency analyses, power flow and optimal dispatch methods, state estimation and stochastic methods, automatic generation control and transient stability analyses.

**ECE 6620 - Advanced Electric Machinery**

Lec. 3. Cr. 3. Prerequisite: ECE 3610. Basic principles of energy conversion; reference frame theory; induction machines; synchronous machines; permanent magnet machines and stability analysis.

**ECE 6630 - Power System Protection Against Fault Currents**

Lec. 3. Cr. 3. Prerequisite: ECE 4620 (5620). Fault currents; basic principles and applications of protective relays; theories of circuit interruption; theories and practices of circuit breakers; standards.

**ECE 6640 - Renewable Energy & Distributed Generation**

Lec. 3. Cr. 3. Prerequisite: ECE 4610 (5610). Principles of renewable energy and distributed generation; operation of distributed energy resources (DER)—photovoltaics, wind, fuel cells, etc.; hybrid power generation technology; distributed generation control; economics of DER.

**ECE 6650 - Design and Control of Power Electronics Systems**

Lec. 3. Cr. 3. Prerequisite: Consent of instructor. Phase controlled converter, voltage and current inverters; inverter design and analysis, electric motor control.

**ECE 6670 - Power Flow Control in Modern Power Systems**

Lec. 3. Cr. 3. Prerequisite: ECE 4610 (5610) or equivalent. Flexible AC transmission system, static VAR compensator, unified power flow controller, and enhancement of dynamic stability.

**ECE 6710 - Communication Systems Theory**

Lec. 3. Cr. 3. Prerequisite: ECE 4710 (5710) or consent of instructor. Introduction to systems, theories and inherent problems of modern digital communication systems.

**ECE 6730 - Information Theory and Reliable Communication**

Lec. 3. Cr. 3. Prerequisite: ECE 6250, ECE 6710. A measure of information, theory of source and channel coding, rate distortion,

and channel capacity.

**ECE 6750 - Wireless Communication Systems**

Lec. 3. Cr. 3. Prerequisite: ECE 4710 (5710) or equivalent. Modern wireless systems, including cellular design, propagation modeling, multiple access, and signal process techniques.

**ECE 6900 - Special Problems in Electrical Engineering**

Cr. 1-4. Prerequisite: Consent of instructor. Investigation of a topic pertaining to the area of electrical engineering which is compatible with the student's prerequisites, interest, and ability.

**ECE 6910 - Introduction to Graduate Research**

Lec. 1. Cr. 1. Prerequisite: Graduate student standing. Research tools and written and oral presentations in electrical and computer engineering area; graduate thesis; ethics in research.

**ECE 6970 - Non-Thesis Design Project**

Lec. 3, Cr. 3. Prerequisite: Consent of Instructor, enrolled in Non-thesis MS option. An independent design project that may be implemented either in software or/and hardware. A formal written project report and oral presentation will be given to the student's advisory committee.

**ECE 6980 - Directed Study**

Cr. 1-4.

**ECE 6990 - Research and Thesis**

Cr. 1,3,6,9.

**ECE 7110 - Advanced Digital Design**

Lec. 3. Cr. 3. Prerequisite: Consent of instructor. Advanced design techniques for digital systems including computer aided design and VLSI.

**ECE 7130 - Advanced Computer Architecture**

Lec. 3. Cr. 3. Prerequisite: ECE 6130. Modern high-performance computer structures, memory hierarchy, networked storage systems, multiprocessors and thread-level parallelism, Reliability, Availability, and Scalability (RAS) considerations for computer designs.

**ECE 7170 - Advanced Embedded Systems**

Lec. 3. Cr. 3. Prerequisite: ECE 6170. Advanced topics in the design of FPGA-based embedded systems including data stream management, embedded systems for multi-media, real-time embedded systems, and embedded system security.

**ECE 7270 - Adaptive Control**

Lec. 3. Cr. 3. Prerequisite: ECE 6200, ECE 6260. Model reference adaptive control, model-following, self-tuning controllers, adaptive control of nonlinear systems, adaptive state observers, parametric identification via model-reference adaptive systems.

**ECE 7280 - Digital Control**

Lec. 3. Cr. 3. Prerequisite: ECE 6200, ECE 6250. Sampled data systems with random inputs, multirate sampling, system response between sampling points, choice of sampling interval, quantization effects, implementation via microprocessors and distributed computer networks, real-time operating system.

**ECE 7290 - Stochastic Optimal Control**

Lec. 3. Cr. 3. Prerequisite: ECE 6230, ECE 6260. Controlled Markoff chains; separation theorem; the linearquadratic- Gaussian problem; dual control; computational methods.

**ECE 7510 - Plasma Engineering I**

Lec. 3. Cr. 3. Prerequisite: ECE 6510 or equivalent. Advanced treatment of the principles governing plasma ensembles, from weakly ionized plasmas to fully ionized plasmas.

**ECE 7530 - Quantum Electronics I**

Lec. 3. Cr. 3. Prerequisite: ECE 6540. Review of quantum principles; interaction of radiation with atomic systems; laser theory.

**ECE 7600 - Power System Control**

Lec. 3. Cr. 3. Prerequisite: ECE 6600 or equivalent. Machine voltage control; system voltage control; automatic generation control and inter-area power transfer; stability analysis; analysis and design of power system stabilizers and energy control centers.

**ECE 7620 - Adjustable Speed Drives**

Lec. 3. Cr. 3. Prerequisite: ECE 6620, ECE 6650. Principles of adjustable speed motor drives; direct current motor drives; induction motor drives, field orientation control; adjustable speed synchronous motor drives.

**ECE 7630 - High-Voltage Techniques**

Lec. 3. Cr. 3. Generation and measurement of AC, DC, and impulse voltages, understanding of and prevention of electrical breakdown of an insulating media.

**ECE 7640 - Distributed Energy Systems**

Lec. 3. Cr. 3. Prerequisite: ECE 6640. Instantaneous power theory, active and passive filters, distributed energy resources, modeling and control, interfaces, protection and economics of distributed generation systems.

**ECE 7650 - Design and Finite Element Analysis of Electric Machines**

Lec. 3. Cr. 3. Prerequisite: ECE 6620. Dynamic electromagnetic circuit analysis, calculation of inductances, methods for designing and optimization of electric machines, finite element analysis methods.

**ECE 7660 - Electrical Power Distribution Systems**

Lec. 3. Cr. 3. Prerequisite: ECE 6600. Design of electrical distribution system protection and control. Reconfiguration, capacitor placement, and load management strategies. Analysis and compensation of harmonic loads. Economic decisions.

**ECE 7750 - Advanced Wireless Systems**

Lec. 3. Cr. 3. Prerequisite: ECE 6750 or equivalent. Advanced modulations for fading channels, multiple-input multiple out (MIMO), space-time coding, ultrawideband communications, cognitive radio, and wireless sensor networking.

**ECE 7970 - Selected Topics**

Cr. 1-4.

**ECE 7980 - Directed Study**

Cr. 1-4.

**ECE 7990 - Research and Dissertation**

Cr. 1,3,6,9.

## Elementary Education

**ELED 6120 - Elementary School Programs**

Lec. 3. Cr. 3. The historical development of the elementary school curriculum; factors affecting curriculum planning; analysis of contemporary curricula.

**ELED 6400 - Advanced Studies in Elementary Science Education**

Cr. 3. Explores and analyzes current issues and trends in methods, materials, and content in teaching elementary school science. Special emphasis will be on problem-solving skills.

**ELED 6500 - Diagnostic and Remediation Techniques in Elementary Mathematics**

Cr. 3. Analyzes techniques used by regular classroom teachers in diagnosing and correcting learning difficulties associated with elementary school mathematics.

**ELED 6600 - Organizing Themes for Social Studies**

Cr. 3. Explores the basic organizing themes and conceptual framework utilized in social studies instruction.

**ELED 6900 - Problems in Elementary Education**

Cr. 3. A critical study of problems of the elementary school with special attention to research findings.

**ELED 6920 - Topics**

Cr. 1-6. Laboratory approach providing opportunities for experienced educational personnel to study in-depth educational problems.

**ELED 7400 - The Elementary School Language Arts Program**

Lec. 3. Cr. 3. Current curricular issues concerning elementary school language arts education, including use of storytelling and writing activities to enhance reading and language skills.

## English

**ENGL 4111 (5111) - Chaucer**

Spring (O). Lec. 3. Cr. 3. Selected works of Geoffrey Chaucer. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**ENGL 4121 (5121) - Shakespeare**

Cross-listing: THEA 4121 (5121)  
Lec. 3. Cr. 3. Historical, thematic, and other approaches in the study of Shakespeare. (May be repeated once as an elective, provided the course content is different.) Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**ENGL 4130 (5130) - Milton**

Lec. 3. Cr. 3. Selected works of John Milton. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**ENGL 4140 (5140) - Topics in British Literature to 1667**

Lec. 3. Cr. 3. Topics in Medieval and/or Early Modern British literature. Course may be repeated, provided the content is different each time. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**ENGL 4210 (5210) - Eighteenth-Century British Literature**

Lec. 3. Cr. 3. Studies in eighteenth-century British literature. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**ENGL 4221 (5221) - Romantic Literature**

Lec. 3. Cr. 3. Studies in Romantic literature. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**ENGL 4231 (5231) - Victorian Literature**

Lec. 3. Cr. 3. Studies in Victorian literature. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**ENGL 4240 (5240) - Modern British Literature**

Lec. 3. Cr. 3. Studies in Modern British literature. Course may be repeated, provided the content is different each time. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**ENGL 4250 (5250) - Post Modern Literatures in English**

Lec. 3. Cr. 3. Studies in post modern literary issues of significance in English-speaking cultures outside the United States. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**ENGL 4310 (5310) - Early American Literature**

Lec. 3. Cr. 3. Study of American literature from colonial period through early nationalist period. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**ENGL 4320 (5320) - Nineteenth Century American Literature**

Lec. 3. Cr. 3. Study of the literature and literary movements of the period, with emphasis on romanticism and/or realism. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**ENGL 4330 (5330) - Modern American Literature**

Spring (O). Lec. 3. Cr. 3. Study of the literature and literary movements of the period, with emphasis on the twentieth century and/or contemporary period. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**ENGL 4340 (5340) - Topics in American Literature**

Lec. 3. Cr. 3. Thematic, interdisciplinary, or genre-based approaches to American literary study beyond the usual scope of ENGL 4310 (5310), ENGL 4130 (5130), or ENGL 4330 (5330). Course may be repeated, provided the content is different each time. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**ENGL 4411 (5411) - Writing in the Professions**

Lec. 3. Cr. 3. This course builds on students' present writing competency and focuses on writing in their particular majors and/or professions. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**ENGL 4421 (5421) - Forms of Argumentation and Persuasion: Theory and Practice**

Lec. 3. Cr. 3. Introduces students to various models of argumentation through theory (readings) and practice (analysis and production). Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**ENGL 4430 (5430) - Creative Writing: Fiction**

Lec. 3. Cr. 3. Prerequisite: Grade of C or better in ENGL 3400 or prior consent of instructor. Guided practice in the craft and art of writing short fiction. Course may be repeated, provided the content is different each time. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**ENGL 4440 (5440) - Creative Writing: Essay**

Lec. 3. Cr. 3. Prerequisite: Grade of C or better in ENGL 3400 or prior consent of instructor. Guided practice in the craft and art of writing personal essays. Course may be repeated, provided the content is different each time. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**ENGL 4450 (5450) - Creative Writing: Poetry**

Lec. 3. Cr. 3. Prerequisite: Grade of C or better in ENGL 3400 or prior consent of instructor. Guided practice in the craft and art of writing poems. Course may be repeated, provided the content is different each time. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**ENGL 4511 (5511) - Introduction to Language Description and****Analysis**

Cross-listing: LING 4511 (5511)

Lec. 3. Cr. 3. Introduction to descriptive analysis of language: phonology, morphology, lexicon, and syntax. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**ENGL 4521 (5521) - History of the English Language**

Cross-listing: LING 4521 (5521)

Lec. 3 Cr. 3. History of English from its origins to the present, emphasis upon historical development of English sounds, word structure, and syntax. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**ENGL 4531 (5531) - Grammar and Language**

Cross-listing: LING 4531 (5531)

Lec. 3. Cr. 3. Grammatical structure of English in relation to dialect and register with some emphasis on historical and potential changes in grammar. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**ENGL 4541 (5541) - Topics in Linguistics/Language**

Cross-listing: LING 4541 (5541)

Lec. 3. Cr. 3. Examination of specific aspects of language and/or linguistic study, such as Old and Middle English, the language of dialect literature, or American English dialects. Course may be repeated, provided the content is different each time. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**ENGL 4551 (5551) - Introduction to Rhetoric: Theory and Practice**

Lec. 3. Cr. 3. The course introduces students to rhetoric—history and special topics. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**ENGL 4610 (5610) - Novel**

Fall (O). Lec. 3. Cr. 3. Theory of the novel and a study of selected novels. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**ENGL 4620 (5620) - Poetry: Form, Genre, Theory**

Lec. 3. Cr. 3. The study of poetry written in English and translated from other languages, with attention to such topics as poetic movements, styles, trends, the evolution and development of forms. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**ENGL 4630 (5630) - Literary Criticism and Theory**

Fall (E). Lec. 3. Cr. 3. Major critical doctrines from antiquity through the present. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**ENGL 4640 (5640) - Modern and Contemporary Drama**

Lec. 3. Cr. 3. Study of dramatic texts and performance issues from the late nineteenth century to the present. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**ENGL 4650 (5650) - The Graphic Novel**

Lec. 3. Cr. 3. Theory of comics-format texts and study of selected graphic novels.

**ENGL 4712 (5712) - African American Literature**

Lec. 3. Cr. 3. Studies of African American literature and culture, both oral and printed. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**ENGL 4713 (5713) - Native American Literature**

Lec. 3. Cr. 3. Studies of Native American literature and culture, both oral and printed. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**ENGL 4720 (5720) - Continental Literature**

Lec. 3. Cr. 3. Study of major works and writers from the European continent. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**ENGL 4731 (5731) - Women and Literature**

Lec. 3. Cr. 3. Studies of major women writers or images of women in literature. Course may be repeated, provided course content is different each time. Course may be repeated, provided the content is different each time. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**ENGL 4741 (5741) - Science and Culture**

Lec. 3. Cr. 3. Cultural influences on scientific discourse and literature about science. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**ENGL 4751 (5751) - Topics in Non-Western Literature**

Lec. 3. Cr. 3. Focuses on literature written outside of European literary traditions, either written or translated into English. Course may be repeated, provided the content is different each time. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**ENGL 4810 (5810) - Introduction to Folklore**

Lec. 3. Cr. 3. Generic survey of folklore; possible definitions, varieties, meanings, and methods of study. Stress on verbal traditions (tales, songs, and beliefs). Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**ENGL 4820 (5820) - Upper Cumberland Folklore**

Lec. 3 Cr. 3 Folklore of the Upper Cumberland with emphasis on relationships between regional material and the broad perspective of the humanities. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**ENGL 4830 (5830) - Southern Literature**

Lec. 3. Cr. 3. Major writers of the South, with emphasis on regional themes and on the Southern literary renaissance. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**ENGL 4840 (5840) - The Gothic Tale of Terror**

Lec. 3. Cr. 3. Readings in Gothic poetry and prose. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**ENGL 4910 (5910) - The Literature of Science**

Lec. 2. Cr. 2. Topics in literary nonfiction written by scientists. Note: Students will not receive credit for both ENGL 4910 (5910) and ENGL 4911 (5911). Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**ENGL 4911 (5911) - The Literature of Science**

Lec. 2. Rec. 1. Cr. 3. Topics in literary non-fiction written by scientists. The recitation provides additional writing/discussion opportunities. Note: Students will not receive credit for both ENGL 4910 (5910) and ENGL 4911 (5911). Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**ENGL 4920 (5920) - Literature and Technology**

Lec. 2. Cr. 2. Study of British and American literature which deals with the impact of technology on society. Note: Students will not receive credit for both ENGL 4920 (5920) and ENGL 4921 (5921). Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**ENGL 4921 (5921) - Literature and Technology**

Lec. 2. Rec. 1. Cr. 3. Study of British and American literature which deals with the impact of technology on society. The recitation provides additional writing/discussion opportunities. Note: Students will not receive credit for both ENGL 4920 (5920) and ENGL 4921 (5921). Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**ENGL 4930 (5930) - Literature and the Environment**

Lec. 2. Cr. 2. A study, through literature, of the relationship between humans and the environment. Note: Students will not receive credit for both ENGL 4930 (5930) and ENGL 4931 (5931). Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**ENGL 4931 (5931) - Literature and the Environment**

Lec 2. Rec. 1. Cr. 3. A study, through literature, of the relationship between humans and the environment. The recitation provides additional writing/discussion opportunities. Note: Students will not receive credit for both ENGL 4930 (5930) and ENGL 4931 (5931). Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**ENGL 4970 (5970) - Professional Communication II**

Lec. 3. Cr. 3. Continuation of PC 3250 with emphasis on more complex documents. (Same as PC 4970 (5970)). Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**ENGL 4981 (5981) - Topics**

Cr. 1. Course work or directed individual research in any area where there is no other course offering. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**ENGL 4982 (5982) - Topics**

Cr. 2. Course work or directed individual research in any area where there is no other course offering. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**ENGL 4983 (5983) - Topics**

Cr. 3. Course work or directed individual research in any area where there is no other course offering. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**ENGL 4990 (5990) - Internship**

Cr. 3, 6, 9, 12. Prerequisite: Prerequisite for 5990: graduate status, and consent of instructor. Part-time or full-time employment in a business or institutional setting related to a student's academic and career goals and cannot be taken in place of required or elective English courses, undergraduate or graduate. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**ENGL 6000 - Introduction to Graduate Studies**

Lec. 3. Cr. 3. Bibliography, research methods, current theories, scholarly writing, professional issues and practices, and creation of professional portfolios.

**ENGL 6010 - Teaching Composition**

Spring. Lec. 3. Cr. 3. Theories and pedagogies of teaching writing in the middle schools, secondary schools, and on the college level.

**ENGL 6020 - Seminar in Early British Literature**

Lec. 3. Cr. 3. A study of selected topics and authors of the period.

**ENGL 6080 - Seminar in British Literature 1500-1650**

Lec. 3. Cr. 3. A study of selected topics and authors of the period.

**ENGL 6150 - Seminar in British Literature, 1650-1800**

Lec. 3. Cr. 3. A study of selected topics and authors of the period.

**ENGL 6290 - Seminar in Nineteenth Century British Literature**

Lec. 3. Cr. 3. A study of selected topics and authors of the period.

**ENGL 6350 - Seminar in Twentieth Century British Literature**

Lec. 3. Cr. 3. A study of selected topics and authors of the period.

**ENGL 6400 - Special Topics**

Lec. 3. Cr. 3. Intensive course work or directed individual research of a selected author, movement, or genre.

**ENGL 6520 - Seminar in Early American Literature**

Fall (O). Lec. 3. Cr. 3. A study of selected topics and authors of the period.

**ENGL 6590 - Seminar in Nineteenth Century American Literature**

Lec. 3. Cr. 3. A study of selected topics and authors of the period.

**ENGL 6640 - Seminar in Twentieth Century American Literature**

Lec. 3. Cr. 3. A study of selected topics and authors of the period.

**ENGL 6890 - Directed Research**

Cr. 3. Project paper for students in the non-thesis option.

**ENGL 6990 - Research and Thesis**

Cr. 3, 6.

## English as a Second Language Pedagogy

**ESLP 4100 (5100) - ESL Methodology and Materials for PreK-12**

Lec. 3. Cr. 3. Prerequisite: SEED 4125 (5125) and LING 4511 (5511), or consent of instructor. Current approaches, methodologies, techniques, and materials for teaching ESL primarily in preK-12 situations; developing literacy skills appropriate for age and language proficiency levels. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**ESLP 4200 (5200) - ESL Assessment: Reading and Writing**

Lec. 3. Cr. 3. Prerequisite: ESLP 4100 (5100), SEED 4125 (5125), and LING 4511 (5511), or consent of instructor. Assessing proficiency for ESL placement and eventual integration into school curriculum (mainstreaming) with special emphasis on language literacy skills: reading and writing. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**ESLP 4300 (5300) - Field Experience in ESL**

Cr. 3. Prerequisite: ESLP 4100 (5100) and ESLP 4200 (5200), or consent of instructor. Teaching ESL in preK-12 under supervision of experienced ESL staff: writing objectives, planning lessons, materials evaluation, testing. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

## Environmental and Sustainable Studies

**ESS 4300 (5300) - Environmental Management System**

Cr. 3. The course is a case study that presents the student with the techniques, technologies, regulations, and strategies that define industrial pollution prevention. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**ESS 6510 - Programming GIS**

Lec. 3. Cr. 3. Python is a free and easy to learn language, tightly integrated into ArcGIS 10. This course introduces students to Python scripting to increase productivity and management of GIS data and adding more function to the projects.

**ESS 6520 - GIS Project Development and Management**

Lec. 3. Cr. 3. Prerequisite: Senior Standing. Knowledge and skills for developing GIS projects will be introduced in the course. Students will be exposed to organizational management and design of GIS projects. Students will be introduced to various projects and use the real-world projects as the template to approach GIS project development.

**ESS 6910 - Internship**

Cr. 3. Prerequisite: At least 24 completed credit hours of PSM-EI courses approved by major professor and graduate advisory committee. The internship is the experiential component for the Professional Science Master's designation. It will include a capstone project supervised by faculty and employers, evaluated or graded by faculty, and typically developed with an employer, which integrates the practical application of scientific and professional knowledge, behavior and skills. The internship provides an opportunity for students to demonstrate proficiency in written and oral communications.

## Environmental Sciences Agriculture

**EVSA 6010 - Environmental Agriculture**

Lec. 3. Cr. 3. Provides a summary of the actual and/or relative environmental impacts of existing and emerging agricultural production technologies.

## Environmental Sciences Biology

**EVSB 6010 - Environmental Biology**

Lec. 3. Cr. 3. Biological concepts, community and ecosystem structure and function, population biology, water pollution, land and wildlife resources, endangered and threatened species, resource management, human impact, and environmental economics. This course cannot be taken for credit toward graduation by students with a degree or concentration in biology or wildlife and fisheries sciences.

**EVSB 7050 - Environmental Risk Assessment**

Lec. 2. Lab. 2. Cr. 3. Prerequisite: BIOL 6060 and EVSC 6010. Assessment of ecological risk associated with new chemicals and effluents, existing chemicals and mixtures of chemicals, and human actions.

**EVSB 7060 - Ecological Toxicology**

Lec. 2. Lab. 2. Cr. 3. Prerequisite: BIOL 6060 and EVSC 6010. A study of the mechanisms of toxicity in terrestrial and aquatic ecosystems, including the measurement of response, learning and teaching devices. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus. uptake, metabolism, and excretion of toxicants; design and interpretation of toxicity tests, hazard evaluation, risk assessment, and toxics reduction plans; fate and transport processes and advanced approaches in automated computer-assisted monitoring will be evaluated.

**EVSBS 7110 - Environmental Approaches to Fisheries Management**

Lec. 3. Lab. 2. Cr. 4. Prerequisite: WFS 4710 (5710) or BIOL 6630. An in-depth analysis of current fisheries management practices assessed from the ecosystem perspective.

**EVSBS 7120 - Endangered Species Biology**

Lec. 3. Lab. 3. Cr. 3. The biology, ecology, management, and recovery of threatened and endangered species.

**EVSBS 7130 - Wetlands Ecology**

Lec. 3. Lab. 3. Cr. 4. Ecology and legal issues concerning the management of wetland habitats and species.

**EVSBS 7140 - Wildlife and Fisheries Nutrition**

Lec. 3. Cr. 3. The nutritional and foraging ecology of wild fish, amphibians, reptiles, birds, and mammals.

**EVSBS 7150 - Population and Community Ecology**

Lec. 3. Cr. 3. Prerequisite: BIOL 3130 or WFS 3130. Empirical and theoretical concepts in ecology at the population and community levels, including population growth and regulation, species interactions, community assembly and dynamics, metapopulation ecology, and landscape ecology.

**EVSBS 7210 - New and Re-emerging Environmental Human Pathogens**

Lec. 3. Cr. 3. Prerequisite: 7 hours of microbiology courses or equivalent. Aspects of emerging human pathogens, including case histories of outbreaks, methods of detection in food and water, and techniques for enumeration and identification.

**EVSBS 7220 - Molecular Ecology and Evolution Seminar**

Lec. 1. Cr. 1. Prerequisite: BIOL 3130 and BIOL 4150 (5150). Review of current literature concerning application of modern molecular techniques to solve ecological and evolutionary questions. Course may be taken up to 3 times for credit.

**EVSBS 7230 - Molecular Ecology and Evolution**

Lec. 3. Lab. 3. Cr. 4. Role of molecular techniques in the study of ecology and evolution, including techniques used to study phylogeny, microorganism detection, population structure, gene flow, and kinship.

**EVSBS 7240 - Computers and Molecular Ecology**

Lec. 2. Lab. 3. Cr. 3. Prerequisite: EVSBS 7230. The use and application of computer programs and Internet databases for studying molecular ecology and evolution.

**EVSBS 7310 - Plant Ecology**

Lec. 3. Lab. 3. Cr. 4. Interrelationships between plants and their environment and evaluation of community structure.

**EVSBS 7320 - Aquatic Botany**

Lec. 3. Lab. 3. Cr. 4. Anatomy, ecology, morphology, physiology, reproductive biology, evolution, and taxonomy/systematics of aquatic plants.

**EVSBS 7970 - Topics in Environmental Biology**

Lab. 2-8. Cr. 1-4. Prerequisite: Consent of instructor. Special study in an approved field under the supervision of a member of the graduate faculty. Course may be taken for credit more than once for a maximum of six (6) hours of credit.

**EVSBS 7990 - Research and Dissertation**

Cr. 1-9.

**Environmental Sciences Chemistry****EVSC 6010 - Environmental Chemistry**

Lec. 3. Cr. 3. Prerequisite: Graduate standing in environmental sciences; one (1) year of chemistry. This is a broad based course applying the fundamentals of chemistry to the environment. This course cannot be taken for credit toward graduation by students with a concentration in chemistry.

**EVSC 7110 - Water, Soil, and Air Chemistry—Part I**

Lec. 3. Cr. 3. Prerequisite: CHEM 4520 (5520), CHEM 4710 (5710), or consent of instructor. Composition of waters and soils; kinetics and thermodynamics of environmental chemical and physical processes in waters and soils. Equilibrium modeling exercises are employed to prepare students for professional activities, and to reinforce course material.

**EVSC 7120 - Water, Soil, and Air Chemistry—Part II**

Lec. 3. Cr. 3. Prerequisite: EVSC 7110 or consent of instructor. Electrochemistry and solubility of soil minerals. Kinetics, reaction dynamics, photochemistry, and heterogeneous phase chemistry of the troposphere and stratosphere. Students will become familiar with watershed modeling and the use of geographical information systems in environmental chemistry.

**EVSC 7210 - Organic Chemistry in the Environment**

Lec. 3. Cr. 3. Prerequisite: CHEM 3520 and CHEM 6210 or consent of instructor. Introduction to specific organic compounds, their physical and chemical properties, chemical and photochemical transformation reactions and mechanisms in the environment, and literature case studies effectively used in their decontamination.

**EVSC 7970 - Special Topics in Environmental Chemistry**

Lec. 1-3. Lab. 0-3. Cr. 1-4. Prerequisite: Full Standing in Ph.D. program in environmental sciences or consent of instructor. Timely topics in environmental chemistry. Course may be taken for credit more than once.

**EVSC 7990 - Research and Dissertation**

Cr. 1-9.

**Environmental Sciences Geology****EVSG 6010 - Environmental Geology**

Lec. 3. Cr. 3. Prerequisite: Consent of instructor. Introduction to geology and the application of geologic knowledge to issues and potential solutions of problems arising from the interaction of human activities and natural earth processes.

**Environmental Sciences****EVS 7900 - Scientific Writing and Grantmanship**

Lec. 3. Cr. 3. Prerequisite: Full standing in Environmental Sciences Ph.D. program or consent of instructor. The overall goal of this course is to help students acquire writing skills and Grantmanship skills that will help them become competitive for research funds and be successful in publishing research papers.

**EVS 7910 - Environmental Science Seminar**

Lec. 1. Cr. 1. Discussions and reports on the current literature and research in environmental science.

**Environmental Sciences Social****EVSS 6010 - Environmental Social Policy**

Lec. 3. Cr. 3. Prerequisite: Consent of instructor. Social, political, legal and scientific issues that influence environmental policy decisions.

**Exceptional Learning**

**CFS 6610 - Families: Normative/Catastrophic Issued**

Lec. 3. Cr. 3. In-depth study of family stress and effective coping mechanisms that relate to normative transitions and crisis events.

**EDU 7000 - Trans-Concentration Seminar**

Cr. 1.\* Prerequisite: Admission to Ph.D. program. An introduction to the Ph.D. in Exceptional Learning familiarizing students with the procedures, requirements, and expectations of the program.

**EDU 7010 - Educational Policy and Cultural Diversity**

Lec. 3. Cr. 3. Prerequisite: Admission to Doctoral Program. A study of the impact of culture in society and its significance for formulating policy design to serve diverse groups effectively and equitably.

**EDU 7020 - At-Risk Populations: Research, Service, and Delivery**

Lec. 3. Cr. 3. Prerequisite: Admission to Doctoral Program. A survey of at-risk and diverse populations, their common and unique characteristics, and the research base for designing and implementing effective prevention and intervention strategies.

**EDU 7040 - Program Planning and Proposal Development**

Lec. 3. Cr. 3. Prerequisite: Admission to Doctoral Program. Theoretical perspectives, models, and effective practices in the development, planning, and evaluation of programs and services in a variety of educational settings.

**EDU 7050 - Advanced Learning and Cognition**

Lec. 3. Cr. 3. Prerequisite: Admission to Doctoral Program. Advanced theory, research, and applications in human learning, memory, and cognitive processes, holding at the center of the investigation specifics of diverse and at-risk populations.

**EDU 7060 - Issues in Education**

Lec. 3. Cr. 3. Prerequisite: Admission to Doctoral Program. An examination and analysis of contemporary trends and issues in education, including leadership, legal, and ethical issues.

**EDU 7300 - Research Design**

Lec. 3. Cr. 3. Prerequisite: EDU 7420 and Admission to Doctoral Program. Overview of planning, designing, and conducting experimental and non-experimental research in order to maximize research validity.

**EDU 7310 - Research in Literacy**

Lec. 3. Cr. 3. Prerequisite: EDU 7300. Advanced literacy research, including a study replication with submission of findings for publication.

**EDU 7320 - Single Subject Design**

Lec. 3. Cr. 3. Prerequisite: EDU 7300 and Admission to Doctoral Program. An in-depth analysis of single-subject research design and the application of this research methodology in applied settings.

**EDU 7330 - Qualitative Inquiry in Research**

Lec. 3. Cr. 3. Prerequisite: EDU 7010 and Admission to Doctoral Program. An analysis of assumptions and types of procedures and criteria for evaluation in qualitative and interpretive research methods.

**EDU 7340 - Ethnographic Inquiry in Education**

Lec. 3. Cr. 3. Prerequisite: Admission to Doctoral Program and EDU 7330. An analysis of both theoretical and practical dimensions of conducting qualitative research.

**EDU 7420 - Quantitative Inquiry in Education I**

Lec. 3. Cr. 3. Prerequisite: Admission to Doctoral Program and introductory course in statistics. In-depth training and understanding of common descriptive and inferential statistical techniques for

conducting research and engaging in scholarly activities.

**EDU 7430 - Quantitative Inquiry in Education II**

Lec. 3. Cr. 3. Prerequisite: Admission to Doctoral Program and EDU 7420. In-depth analysis that reinforces and expands common descriptive and inferential statistical techniques and includes advanced material appropriate for more complex research problems.

**EDU 7440 - Technology Applications for Institutional Dissemination of Information**

Lec. 3. Cr. 3. Prerequisite: Admission to Doctoral Program. Analysis of creation, collection, and distribution of institutional information.

**EDU 7920 - Research Seminar in Education**

Lec. 3. Cr. 3. Prerequisite: EDU 7300, EDU 7310, or EDU 7320, EDU 7330, EDU 7340, EDU 7420, EDU 7430 and Admission to Doctoral Program. In depth examination of experimental, quasiexperimental, and evaluation research as applied to dissertation research.

**EDU 7950 - Doctoral Seminar: Special Topics in Education**

Lec. 1-3. Cr. 1-6. Prerequisite: Consent of the student's doctoral chairperson required.

**EDU 7990 - Research and Dissertation**

Cr. 1, 3, 6, 9. Prerequisite: EDU 7300, EDU 7310, or EDU 7320, EDU 7330, EDU 7340, EDU 7420, EDU 7430 and Admission to Doctoral Program.

**EDUS 7500 - STEM Education Foundations**

Lec. 3. Cr. 3. Prerequisite: Admission to doctoral program. Introduction to the educational, political, economic, and socio-cultural foundations of the STEM and STEM education disciplines including the history and development of STEM education with attention to the STEM content in P-16 settings. Topics include: introduction to the nature of each of the STEM and STEM education disciplines; investigation of related political, economic, and socio-cultural foundations; and frameworks for constructing personal perspectives and philosophies of integrative STEM education.

**EDUS 7510 - STEM Curriculum & Assessment**

Lec. 3. Cr. 3. Prerequisite: Admission to doctoral program. Current trends in STEM curriculum development and assessment. Topics include: defining objectives; planning for improvement; organization of instructional materials; and STEM curriculum evaluation.

**EDUS 7515 - STEM Education Seminar**

Lec. 1. Cr. 1. Prerequisite: Admission to doctoral program. Designed as a general exploration into the issues surrounding the development of a STEM literate populace through education. This exploration will be facilitated by a blend of readings, discussions, and personal reflections.

**EDUS 7520 - STEM Technology Seminar**

Lec. 1. Cr. 1. Prerequisite: Admission to doctoral program. Focused on STEM-specific technologies (e.g., Vernier probes, TI-Navigation systems, LoggerPro software, etc.), how to use them, and the issues surrounding their use in STEM education.

**EDUS 7530 - STEM Education Research**

Lec. 3. Cr. 3. Prerequisite: Admission to doctoral program; EDU 7420 and EDU 7010. Survey of the educational research practices of STEM disciplines; investigates the approaches used in studying the teaching/learning processes within the context of each discipline; similarities, distinctions and overlaps among questions posed, research designs, and investigations into best practices with respect to improving teaching and learning among STEM disciplines.

**EDUS 7540 - STEM Education Pedagogy**

Lec. 3. Cr. 3. Prerequisite: Admission to doctoral program. Signature pedagogies unique to the fields of science, technology, engineering, and mathematics (STEM) education; strengths and limitations associated with signature pedagogies; and insights into pedagogical strategies that can serve to enhance practices within chosen STEM fields.

**EDUS 7550 - STEM Education Trends and Issues**

Lec. 3. Cr. 3. Prerequisite: Admission to doctoral program. Introduction to contemporary P-16 STEM education trends and issues, including both integrative and within-discipline trends/issues. Topics such as STEM literacy, integrative STEM teaching/learning, purposeful design and inquiry, legislative initiatives, and change theory are among those addressed in this course.

**EDUS 7560 - STEM Learners and Learning**

Lec. 3. Cr. 3. Prerequisite: Admission to doctoral program. Designed to explore the theoretical bases for STEM learning. Topics will include the development of STEM learning environments; research on learning in STEM; and STEM learner exceptionalities.

**EDUS 7570 - STEM Education Policy & Leadership**

Lec. 3. Cr. 3. Prerequisite: Admission to doctoral program. The course explores topics in STEM education with attention to STEM education policy and leadership.

**EDUS 7580 - STEM Education Field Study**

Lec. 2. Cr. 2. Prerequisite: Admission to doctoral program. Applied study in one or more educational institutions. Research, evaluation, curricular, and instructional STEM projects are examples of appropriate areas of study.

## Exercise Science, Physical Education, and Wellness

**EXPW 5500 - Perspectives on Physical Education, Fitness and Sport Program**

Summer. Cr. 3. An introduction and summary of the body of knowledge and concepts included in the field of physical education, fitness and sport, including the history, people and events, and programs that have led to the current status of these fields. A perspective of the trends in education and their impact on physical education.

**EXPW 5850 - Workshop in Health and/or Physical Education**

Lec. 3. Cr. 3. Laboratory approach providing opportunities for experienced school and nonschool personnel to study in-depth Health and/or Physical Education problems.

**EXPW 5940 - Fitness and Wellness**

Spring. Cr. 3. Basic principles of wellness promotion through exercise and nutrition. Assessment and intervention strategies are included.

**EXPW 6042 - Wellness Promotion**

Spring. Cr. 3. Study of physical activity behavior change models and development/assessment of health promotion programs.

**EXPW 6100 - Instruction in Physical Education**

Lec. 3. Cr. 3. Principles of instruction and application of developmentally appropriate instructional strategies in school-based physical activity settings.

**EXPW 6140 - Assessment and Strategies for Adapted Physical Education**

Fall and Spring. Lec. 3. Cr. 3. Advanced assessment techniques, plus strategies for adapting physical education and sports wellness

for persons with disabilities.

**EXPW 6180 - Analysis and Supervision of Teaching**

Lec. 3. Cr. 3. To critically analyze current systems and trends used for evaluating teacher and student behavior and interaction in the educational setting.

**EXPW 6200 - Curriculum in Physical Education**

Lec. 3. Cr. 3. Emphasis on development and implementation of developmentally appropriate curriculum in school based physical activity settings.

**EXPW 6210 - Curriculum Design in Physical Education**

Fall. Lec. 3. Cr. 3. Current trends, practices, and theories within the discipline of Health and Physical Education with emphasis on research, evaluation, development, organizing of instructional materials.

**EXPW 6220 - Technology in Physical Education**

Spring. Lec. 3. Cr. 3. Utilization of 21st century technology in programs of sport, physical education, and wellness.

**EXPW 6240 - Assessment in Physical Education**

Fall and Spring. Lec. 3. Cr. 3. Application of measurement and evaluation in sport, physical education, and wellness.

**EXPW 6250 - Applied Motor Development and Motor Learning**

Fall and Spring. Lec. 3. Cr. 3. Application of concepts concerning lifelong motor development and motor learning to programs of sport and physical education.

**EXPW 6350 - Instructional Strategies for Physical Education**

Fall. Lec. 3. Cr. 3. Study of research and advanced techniques for teaching elementary and middle school physical education.

**EXPW 6370 - Instructional Strategies for Lifetime Wellness**

Lec. 3. Cr. 3. Study of research and advanced techniques for teaching lifetime wellness.

**EXPW 6440 - Physiology of Exercise**

Summer. Cr. 3. Acute and chronic effects of physical activity on body systems with reference to exercise evaluation and prescription.

**EXPW 6450 - Teaching Middle School Physical Education**

Spring. Lec. 3. Cr. 3. Designed to assist teachers in understanding middle school students and their unique needs, to identify and define the need for quality physical education programs in middle schools, and to prepare teachers for the inclusive duties of a teacher in a quality middle school physical education program.

**EXPW 6510 - Research Methods**

Fall and Spring. Lec. 3. Cr. 3. Methods of research used in sport, physical education, and wellness.

**EXPW 6520 - Research Project**

Cr. 3. Research of the teaching/learning process in sport, physical education, and wellness.

**EXPW 6590 - Field Experience**

Cr. 1-3. Practical field experience in student's major area of emphasis.

**EXPW 6600 - Special Topics**

Cr. 1-3. Special topics related to pedagogy in physical education and wellness.

**EXPW 6710 - Leadership and Management in Sport**

Lec. 3. Cr. 3. Course content covers leadership in sport, human resource management, negotiation, labor relations, organizational behavior, leadership styles, and conflict resolution.

**EXPW 6720 - Legal, Ethical & Risk Management Issues in Sport Management**

Lec. 3. Cr. 3. Course content includes playground safety, facility safety, program safety, ethics in sport, negligence and torts, and managerial duty.

**EXPW 6730 - Administration and Supervision of Sport**

Lec. 3. Cr. 3. This course is designed to examine issues faced by administrators, athletic directors, coaches and recreational professionals. The students will examine effective decision-making specific to planning, organizing and staffing in sport and leisure settings. Content includes budgeting and management specific to facilities, equipment and personnel.

**EXPW 6740 - Sport Marketing and Promotions**

Lec. 3. Cr. 3. Course content includes marketing mix, promotions and sponsorships, consumer behavior, branding, market segmentation, and data-based marketing.

**EXPW 6750 - Design & Management of Leisure & Sport Facilities**

Lec. 3. Cr. 3. This course will cover numerous issues from construction-related concerns to marketing facilities, naming rights, and concession concerns. Also covered will be topics related to the facility management side of the industry, with special attention paid to back-hour operations such as water, heating, cooling, and related activities. This comprehensive course focuses on applied rather than theoretical knowledge.

**EXPW 6760 - Internship in Sport Management**

Lec. 3. Cr. 3. The internship is intended to provide students with work skills knowledge and practices in the world of managing sports. Students will be placed in a sport management environment to successfully complete 120 hours.

**EXPW 6990 - Research and Thesis**

Cr. 3, 6.

## Finance

**FIN 5020 - Basic Finance**

Lec. 3. Cr. 3. Introduction to the concepts and tools needed for basic financial decision-making in a corporate environment.

**FIN 6020 - Financial Management**

Lec. 3. Cr. 3. A case study course surveying tools, techniques, and applications of business financial management.

**FIN 6350 - Small and Micro-Cap Portfolio Management**

Lec. 3. Cr. 3. Prerequisite: FIN 6020. A case course rigorously applying investment theory to the management of a real portfolio of small and micro-capitalization common stocks.

**FIN 6470 - Investment Challenge I**

Lec. 3. Cr. 3. Prerequisite: FIN 6020 and permission of instructor. Advanced portfolio theory through actual management of a real investment portfolio.

**FIN 6480 - Investment Challenge II**

Lec. 3. Cr. 3. Prerequisite: FIN 6020 and permission of instructor. Advanced portfolio theory through actual management of a real investment portfolio.

**FIN 6710 - Perspectives of Risk and Insurance**

Lec. 3. Cr. 3. FIN 6710 examines the economic principles underpinning risk and insurance and introduces key risk and insurance concepts and practices. The causes of change in risk management and insurance are examined through exploration of relevant physical, technological, cultural, regulatory, and other

environmental perspectives.

**FIN 6720 - Corporate Risk Management**

Lec. 3. Cr. 3. Application of the risk management process, including risk control and risk financing techniques, to risk management problems in business. Emphasizes risk identification and evaluation, together with alternative methods of risk control and risk financing techniques.

**FIN 6730 - Risk Management Modeling**

Cr. 3. This course will introduce students to mathematical and simulation modeling of risk. The first part of the course reviews the basic mathematics of optimization, and then develops conceptual models of preference and choice. These models are then used to model uncertainty, risk aversion, and theories of information. The second part of the course reviews statistics, introduces students to simulation, and then provides hands-on experience with simulation modeling.

**FIN 6740 - Current Issues in Risk Management and Insurance**

Lec. 3. Cr. 3. Prerequisite: Either FIN 6710, FIN 6720, or FIN 6730. This course is an in-depth study of current topics in risk management and insurance. Topics will include, but are not limited to, insuring against and managing risks associated with natural and anthropogenic catastrophic events.

**FIN 6900 - Special Topics**

Lec. 3. Cr. 3. A case course dealing with current topics in business.

**FIN 6910 - Multinational Finance**

Lec. 3. Cr. 3. International markets and instruments, global financing strategies, global capital budgeting, global working capital management, international tax planning.

## Foundations of Education

**FOED 6020 - Perspectives in American Education**

Lec. 3. Cr. 3. Study of theory, practice, and reform in American Education: a sociological and historical perspective.

**FOED 6060 - Education in a Diverse Culture**

Lec. 3. Cr. 3. A study of educational practices and diversity from a multicultural perspective.

**FOED 6320 - Educational Applications of Technology**

Lec. 3. Cr. 3. Review and application of basic computer competencies as related to a variety of educational tasks.

**FOED 6400 - Principles and Techniques of Working with Student Teachers**

Lec. 3. Cr. 3. Prerequisite: Consent of instructor. Principles and techniques of cooperative work with student teachers. Includes practical exercises in planning, teaching, and evaluation.

**FOED 6800 - Field Experience**

Cr. 1-3. Practical field experience in student's major area of emphasis.

**FOED 6820 - Applied Educational Assessment**

Lec. 3. Cr. 3. This course considers statistical techniques for describing and summarizing numerical data for educational research studies, and interpretation/evaluation of educational assessment data. Applied descriptive and inferential statistics, classroom test construction and improvement, and standardized testing applications will be considered within the context of the classroom and school improvement.

**FOED 6920 - Educational Research**

Lec. 3. Cr. 3. Qualitative and quantitative research methods in education.

**FOED 6980 - Qualitative Research in Education**

Lec. 3. Cr. 3. A study of Qualitative Research applications and analysis of design and selected research techniques.

**FOED 7020 - Philosophy and Public Policy**

Lec. 3. Cr. 3. A philosophical analysis of educational theories and public policy.

**French****FREN 4100 (5100) - Advanced Listening**

Lec. 3. Cr. 3. Prerequisite: FREN 2020 or equivalent. Development of listening acuity and general comprehension of commercially produced as well as authentic spoken texts. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**FREN 4600 (5600) - Middle Ages and 16th Century Literature**

Sem. 1. Cr. 1. Selections from one (1) or more of: La Chanson de Roland or other epics; Rabelais, Montaigne. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**FREN 4610 (5610) - 17th Century Literature**

Sem. 1. Cr. 1. Selections from one (1) or more of: Pascal, Corneille, Racine, Moliere. students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**FREN 4620 (5620) - 18th Century Literature**

Sem. 1. Cr. 1. Selections from one (1) or more of: Voltaire, Diderot, Rousseau, Marivaux, Beaumarchais. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**FREN 4630 (5630) - 19th Century Literature**

Sem. 1. Cr. 1. Selections from one (1) or more of: Balzac, Stendhal, Lamartine, Vigny, Hugo, Musset. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**FREN 4640 (5640) - 20th Century Literature**

Sem. 1. Cr. 1. Selections from one (1) or more of: Proust, Mauriac, Malraux, Camus, Sartre. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**FREN 6010 - Special Topics in French**

Read. 1-4. Cr. 1-4. Concentrated readings in areas of special interest. Available to graduate students minoring in French, with consent of departmental chairperson. (Maximum of 12 credits.)

**Geography****GEOG 4150 (5150) - Geomorphology**

Cross-listing: GEOL 4150 (5150)  
Lec. 3. Lab. 2. Cr. 4. Prerequisite: GEOL 2500. Analysis of landforms and processes that shape them. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**GEOG 4210 (5210) - Cartography**

Lec. 2. Lab. 2. Cr. 3. Principles and practices of map construction and interpretation. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**GEOG 4410 (5410) - Remote Sensing**

Cross-listing: GEOL 4410 (5410)  
Lec. 2. Lab.2. Cr. 3. Prerequisite: GEOL 2500. Principles and applications of remote sensing. Provides a survey of the concepts

and techniques of remote sensing and image analysis for natural resources, geomorphology and Earth surface processes. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**GEOG 4510 (5510) - Theory of GIS I**

Lec. 3. Cr. 3. Prerequisite: Permission of instructor. Introduction to (1) PC ARC/INFO GIS package, (2) ArcView GIS package, and (3) the integration of Global Positioning Systems (GPS) with GIS. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**GEOG 4511 (5511) - Theory of GIS II**

Lec. 3. Cr. 3. Prerequisite: Consent of instructor and GEOG 4510 (5510). Intermediate principles of GIS using ArcGIS and ArcView packages. Advanced integration of GPS with GIS. Spatial analysis and modeling capabilities of GIS emphasized. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**GEOG 4520 (5520) - Advanced Vector-based Geographic Information Systems (GIS)**

Cr. 3. Prerequisite: GEOG 4510 (5510) and consent of instructor. Selected topics from basic course will be covered in greater detail, and advanced topics will be introduced. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**GEOG 4620 (5620) - Principles of GIS**

Lec. 3. Cr. 3. Introduction to the fundamentals of GIS. Theoretical and technical principles of managing and processing geographic data, nature of geographic data, spatial data models of map projection systems, kriging, structures and spatial analytical and modeling techniques. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

Theoretical and technical principles of managing and processing geographic data, nature of geographic data, spatial data models of map projection systems, kriging, structures and spatial analytical and modeling techniques. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**GEOG 4650 (5650) - Environmental Applications of GIS**

Lec. 3. Cr. 3. Prerequisite: GEOG 4510 (5510). Applications of GIS in environmental sciences and engineering. Main emphasis is on approaches, scripting, and modeling exercises. Covers the scope of ecosystems, forestry, drainage basins, pollution modeling, and spatial analysis of contaminants in various environments using GIS as the main tool of analysis. Completion of a real-world GIS project is required. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**GEOG 4711 (5711) - Hydrogeology**

Cross-listing: GEOL 4711 (5711)  
Lec. 3. Lab. 2. Cr. 4. Prerequisite: GEOL 1040 and GEOL 1045. Occurrence and movement of ground water, well hydraulics, water quality, and pollution. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**GEOG 4850 (5850) - Advanced GIS**

Lec. 3. Cr. 3. Prerequisite: GEOG 4510 (5510)/GEOG 4520 (5520) Advanced topics in GIS, including writing of avenue scripts, writing and importing Visual Basic scripts, customization of the interface; customization of spatial, network and 3D extensions of ArcView and AML. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**Geology**

**GEOL 4150 (5150) - Geomorphology**

Cross-listing: GEOG 4150 (5150)

Lec. 3. Lab. 2. Cr. 4. Prerequisite: GEOL 2500. Analysis of landforms and processes that shape them. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**GEOL 4320 (5320) - Petroleum Geology**

Lec. 2. Lab. 2. Cr. 3. Prerequisite: GEOL 3230 and 4110. Origin and accumulation of petroleum and natural gas. Subsurface exploration techniques involving geophysical well-logs and seismic stratigraphy. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**GEOL 4330 (5330) - Environmental Geology**

Lec. 2. Lab. 2. Cr. 3. Application of geologic knowledge to the solution of problems arising from the interaction of human activities and natural earth processes. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**GEOL 4410 (5410) - Remote Sensing**

Cross-listing: GEOG 4410 (5410)

Lec. 2. Lab. 2. Cr. 3. Prerequisite: GEOL 2500. Principles and application of remote sensing. Provides a survey of the concepts and techniques of remote sensing and image analysis for natural resources, geomorphology and Earth Surface processes. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**GEOL 4650 (5650) - Applied Geochemistry**

Lec. 3. Cr. 3. Prerequisite: GEOL 1040 and CHEM 1110. Application of geochemistry to mineral exploration, environmental pollution, public health and geologic hazards. Three (3) field trips required. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**GEOL 4711 (5711) - Hydrogeology**

Cross-listing: GEOG 4711 (5711)

Lec. 3. Lab. 2. Cr. 4. Prerequisite: GEOL 1040 and GEOL 1045. Occurrence and movement of groundwater, well hydraulics, water quality and pollution. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**GEOL 4720 (5720) - Advanced Hydrogeology**

Lec. 3. Cr. 3. Prerequisite: GEOL 4710 (5710) and MATH 1810 (MATH 1820 is recommended) or consent of instructor. Methods of aquifer remediation and groundwater modeling, case studies of groundwater contamination. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**GEOL 4810 (5810) - Special Problems**

Cr. 1-3. Prerequisite: Major and consent of instructor. Advanced students may do independent investigations in some approved field. May be repeated for credit. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**GEOL 4820 (5820) - Special Problems**

Cr. 1-3. Prerequisite: Major and consent of instructor. Advanced students may do independent investigations in some approved field. May be repeated for credit. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

## German

**GERM 4100 (5100) - Advanced Listening**

Lec. 3. Cr. 3. Prerequisite: GERM 2020 or equivalent. Development of listening acuity and general comprehension of commercially produced as well as authentic spoken texts. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**GERM 4610 (5610) - 18th Century Literature**

Sem. 1. Cr. 1. Selections primarily from Lessing, Schiller, or authors of the Sturm and Drang. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**GERM 4620 (5620) - Goethe**

Sem. 1. Cr. 1. Goethe's poetry, plus, upon demand, Goethe's dramas or prose. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**GERM 4630 (5630) - Romanticism**

Sem. 1. Cr. 1. Selections from the poetry and prose of one or more of the major writers of the period, including Heinrich von Kleist. Students enrolled in the 5000-level course will be required to complete additional work as stated.

**GERM 4640 (5640) - 19th Century Literature**

Sem. 1. Cr. 1. Selections from the prose or drama of one or more of the major writers of the period, including Keller, Storm, Meyer, Hebbel, Hauptmann. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**GERM 4650 (5650) - Thomas Mann**

Sem. 1. Cr. 1. Shorter works such as Tonio Kroeger, Tod in Venedig, Tristan, etc. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**GERM 4660 (5660) - Kafka**

Sem. 1. Cr. 1. A selection of short stories. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**GERM 4670 (5670) - Brecht**

Sem. 1. Cr. 1. One or two selected dramas. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**GERM 4680 (5680) - Post World War II Literature**

Sem. 1. Cr. 1. Choice of authors such as Boell, Grass, Duerrenmatt Frisch, etc. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**GERM 4810 (5810) - Special Topics in German**

Lec. 3. Cr. 3. Prerequisite: GERM 3010. This course may be repeated if the topic is different. Qualified students may be able to take this course without the prerequisite by contacting the instructor. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**GERM 6010 - Special Topics in German**

Read.1-4. Cr. 1-4. Concentrated readings in areas of special interest. Available to graduate students minoring in German, with consent of departmental chairperson. (Maximum of 12 credits.)

## History

**HIST 4010 (5010) - Colonial and Revolutionary Periods**

Lec. 3. Cr. 3. Early American Society; Revolutionary conflict; Confederation and Constitution. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**HIST 4020 (5020) - The Young Republic, 1789-1849**

Lec. 3. Cr. 3. Political, military, social, and cultural history of the U.S., from the era of Washington through the "Age of Jackson" to the Mexican War. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**HIST 4030 (5030) - Civil War and Reconstruction, 1849-1877**

Lec. 3. Cr. 3. Sectionalism and the coming of war; war-time developments; plans of reconstruction and their impact. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**HIST 4040 (5040) - Rise of Modern America, 1877-1912**

Lec. 3. Cr. 3. Industrialism, urbanism, populism, reform and their impact. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**HIST 4050 (5050) - The Transformation of Modern America, 1912-1945**

Lec. 3. Cr. 3. Wilsonian reform, World War I, New Era, New Deal, World War II, with emphasis on changes in politics, the economy, and society. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**HIST 4060 (5060) - Postwar America, 1945-Present**

Lec. 3. Cr. 3. Cold War diplomacy and society, troubled Sixties, post-Watergate politics, contemporary cultural, economic, and social changes. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**HIST 4090 (5090) - 20th Century U.S. Popular Culture**

Lec. 3 Cr. 3 An examination of various themes and genres in 20th Century U.S. Popular Culture in the context of contemporary events.

**HIST 4200 (5200) - The Old South**

Lec. 3. Cr. 3. This course will focus upon the economic, cultural, educational, racial, and political developments in southern society from its colonial beginnings to the Civil War and Reconstruction. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**HIST 4210 (5210) - The New South**

Lec. 3. Cr. 3. This course will focus upon the economic, cultural, educational, racial, and political developments in southern society from the end of Reconstruction to the present. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**HIST 4230-4239 (5230-5239) - Topics in U.S. Economic History**

Lec. 3. Cr. 3. Selected topics in U.S. economic history. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**HIST 4250 (5250) - American Westward Movement**

Lec. 3. Cr. 3. The frontier experience in American history, with emphasis on the trans-Mississippi West. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**HIST 4290 (5290) - Science and Technology in America**

Lec. 3. Cr. 3. Origins and development of science and technology in the U.S. from the colonial period to the present. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**HIST 4310 (5310) - U.S. Diplomacy**

Lec. 3. Cr. 3. The background, origins, and developments of 20th century American foreign relations. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**HIST 4330-4339 (5330-5339) - Religious Studies**

Lec. 3. Cr. 3. Selected topics in religious history. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**HIST 4350-4359 (5350-5359) - Gender Studies**

Lec. 3. Cr. 3. Selected topics in gender history. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**HIST 4360-4369 (5360-5369) - U.S. Social History**

Lec. 3. Cr. 3. Selected topics in U.S. social history ranging from the colonial period to the present. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**HIST 4370 (5370) - Women in American History**

Lec. 3. Cr. 3. Public and private experiences of women in the United States from the colonial period to the present. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**HIST 4390-4399 (5390-5399) - Topics in African American Studies**

Lec. 3-6. Cr. 3-6. Selected topics in African American History. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**HIST 4400 (5400) - Film Studies**

Lec. 2. Lab. 2. Cr. 3. Selected topics in the history of films. A student may take HIST 4400 twice, provided the topic is different each time. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**HIST 4440-4449(5440-5449) - Native American Studies**

Lec. 3. Cr. 3. Selected topics in Native American history ranging from the earliest times to the present. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**HIST 4470-4479(5470-5479) - Sports Studies**

Lec. 3. Cr. 3. Selected topics in the history of sports. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**HIST 4520 (5520) - Medieval Europe**

Lec. 3. Cr. 3. Evolution of medieval culture from the fall of the Roman Empire to the 13th century and its dissolution during the late medieval period.

**HIST 4530 (5530) - Renaissance and Reformation**

Lec. 3. Cr. 3. Europe during age of New Learning; Renaissance and Mannerist art; 16th century Reformation; Wars of Religion. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**HIST 4540 (5540) - Absolutism and Enlightenment**

Lec. 3. Cr. 3. Europe during 17th and 18th centuries; rise of centralized states; dynastic wars, rise of modern science; Enlightenment thought. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**HIST 4550 (5550) - French Revolution and Napoleon**

Lec. 3. Cr. 3. Europe from 1789 to 1815, centering on events in France and political, diplomatic, and military history of the period. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**HIST 4560 (5560) - 19th Century Europe**

Lec. 3. Cr. 3. European politics, diplomacy, society, war, and institutions from 1815 through World War I. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**HIST 4570 (5570) - World War II and the Cold War**

Lec. 3. Cr. 3. Problems of European powers during inter-war years; background, causes, and results of World War II and Cold War. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**HIST 4620 (5620) - Russia**

Lec. 3. Cr. 3. Political, cultural, social, and military history from the Kievan period to the present. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**HIST 4630/5630 - History of France**

Lec. 3. Cr. 3. Prerequisite: None. France has played a significant role in shaping European and world events, both through its international policies and internal developments. This course considers the historical development of France.

**HIST 4640 (5640) - History of Modern Germany**

Lec. 3. Cr. 3. This course will primarily focus on the Germanic states and the rise of Germany in the nineteenth century, and the development, division, and reunification in the twentieth century.

**HIST 4650 (5650) - England to 1688**

Lec. 3. Cr. 3. Roman, Anglo-Saxon, and Medieval England; Tudor and Stuart dynasties. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**HIST 4660 (5660) - Modern England**

Lec. 3. Cr. 3. England since the Glorious Revolution, with special emphasis on the nineteenth and twentieth centuries. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**HIST 4690 (5690) - British Empire and Commonwealth**

Lec. 3. Cr. 3. Origin, development and decline of the British Empire. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**HIST 4710 (5710) - History of Africa**

Lec. 3. Cr. 3. History of Africa with an emphasis on the nineteenth and twentieth centuries.

**HIST 4730 (5730) - The Modern Middle East**

Lec. 3. Cr. 3. Consideration of the traditional cultural background of the region, but with emphasis on the rapid changes experienced during the twentieth century. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**HIST 4740 (5740) - History of Japan**

Lec. 3. Cr. 3. Early Japanese history followed by a comprehensive investigation of the 20th century experience. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**HIST 4750 (5750) - History of China**

Lec. 3. Cr. 3. Early Chinese history followed by an emphasis on the 20th century revolutionary experience. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**HIST 4760 (5760) - Vietnam: Its Wars & Their Aftermath**

Lec. 3. Cr. 3. Overview of Vietnam, the French experience, the U.S. war and its impact on America, followed by developments since

1975. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**HIST 4790-4799(5790-5799) - Latin American Studies**

Lec. 3. Cr. 3. Selected topics in Latin American history.

**HIST 4810 (5810) - Scientific Controversies**

Lec. 3. Cr. 3. Historical analysis of selected controversies in science and their impact within and outside the scientific community. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

## Horticulture

**AGHT 4510 (5510) - Fruit and Vegetable Production**

Lec. 2. Lab. 2. Cr. 3. Prerequisite: AGHT 3400 or 3410, AGRN 4210 (5210), or consent of instructor. Fundamental principles of tree fruit and small fruit, and field and greenhouse vegetable production. Cultural and environmental management; systems of harvesting, storing, marketing. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**AGHT 4530 (5530) - Greenhouse Crop Production**

Lec. 2. Lab. 2. Cr. 3. Prerequisite: AGHT 4420 or consent of instructor. Production, timing, harvesting, and marketing of bedding plants and floricultural crops grown in commercial greenhouses; nutrient film technique. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**AGHT 4940 (5940) - Horticulture Topics**

Cr. 1-4. Prerequisite: Consent of instructor. Special study in an approved area of horticulture under the supervision of a member of the School of Agriculture faculty. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**AGHT 4950 (5950) - Horticulture Topics**

Cr. 1-4. Prerequisite: Consent of instructor. Special study in an approved area of horticulture under the supervision of a member of the School of Agriculture faculty. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

## Human Ecology

**HEC 4200 (5200) - Advanced Nutrition**

Lec. 3. Cr. 3. Prerequisite: HEC 2020, CHEM 3005, BIOL 2350. Interrelationships of nutrients as chemicals in metabolism at the cellular level. Current issues in nutrition. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**HEC 4220 (5220) - Research in Food Science and Nutrition**

Cr. 2. Prerequisite: Junior or senior standing; consent of instructor. Independent work for students with special ability. May be repeated for a total of six (6) credits when content varies. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**HEC 4242 (5242) - Food Systems Administration**

Lec. 3. Cr. 3. Prerequisite: HEC 2240 and HEC 3240. Systems approach to food service management; facilities, financial, personnel, equipment, and legal issues in foodservice. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**HEC 4250 (5250) - Field Experience in School Food Service**

Cr. 4. Prerequisite: HEC 3240, HEC 4242 (5242). Work experience

in school food service management. Supervision by instructor and Tennessee certified school food service supervisor. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

#### **HEC 4271 (5271) - Medical Nutrition Therapy**

Lec. 3. Cr. 3. Prerequisite: HEC 3270. HEC 4200 (5200). Medical nutrition therapy and nutritional status assessment. Students enrolled in the 5000-level course will be required to complete additional work as stated on the syllabus.

#### **HEC 4610 (6610) - Families: Normative/Catastrophic Issues**

Cross-listing: CFS 6610

Lec. 3. Cr. 3. In-depth study of family stress and effective coping mechanisms that relate to normative transitions and crisis events.

#### **HEC 4830 (5830) - Occupational Family and Consumer Sciences Field Experience Child Care Services**

Cr. 1. Prerequisite: Advanced approval of instructor. Supervised field experience and seminar in teaching occupational family and consumer sciences: child care services.

#### **HEC 4831 (5831) - Occupational Family and Consumer Sciences Field Experience Food Service**

Cr. 1. Prerequisite: Advanced approval of instructor. Supervised field experience and seminar in teaching family and consumer sciences related occupations.

#### **HEC 4832 (5832) - Occupational Family and Consumer Sciences Field Experience Fashion and Fabric Services**

Cr. 1. Prerequisite: Advanced approval of instructor. Supervised field experience and seminar in teaching family and consumer sciences related occupations.

#### **HEC 4900 (5900) - Special Topics**

Cr. 1-7. Prerequisite: Junior or senior standing; consent of instructor. Research in contemporary developments in human ecology. May be repeated. Maximum seven (7) hours. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

#### **HEC 4940 (5940) - Nutrition, Fitness, and Wellness**

Lec. 2. Cr. 2. Basic principles of wellness promotion through exercise and nutrition; assessment and intervention strategies are included. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

#### **HEC 4990 (5990) - Internship**

Cr. 3,6,8,12. Prerequisite: Senior standing. Supervised work experience. Application must be submitted to internship coordinator two (2) semesters prior to internship semester. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

#### **HEC 5011 - Personal and Family Finance Education**

Lec. 3. Cr. 3. Advanced study of financial literacy, consumer decision-making and financial responsibilities for individuals and families. Course prepares students for the Personal and Family Financial Educator exam, which with passage to Certification in Personal and Family Financial Educator (CPFFE).

#### **HEC 5201 - Community Nutrition Programs and Services**

Lec. 3. Cr. 3. Introductory nutrition course. Synthesis of social, economic, cultural, and geographic factors on food and nutrition services for families. Analysis of community intervention programs and services as related to disease prevention and food policy issues.

#### **HEC 5420 - Current Housing Issues**

Lec. 3. Cr. 3. New developments in housing including current and emerging trends: Age appropriate needs for housing throughout the

human lifespan.

#### **HEC 5430 - Textiles and Apparel in the Global Economy**

Lec. 3. Cr. 3. Evaluation of key issues facing textiles and apparel businesses operating supply chains and sourcing in the global economy considering economic, political, and social perspectives and professional implications.

#### **HEC 5440 - New Developments in Textiles and Apparel**

Lec. 3. Cr. 3. New developments in textiles and apparel including fiber, yarn, fabric, apparel design, production, evaluation, quality control, retailing and forecasting.

#### **HEC 5810 - Learning and Instructional Strategies in Family Consumer Sciences Education**

Lec. 3. Cr. 3. Responsibilities of the family and consumer sciences teacher in middle and secondary school. Selection, use and evaluation of learning experiences and material, program planning. Includes participation and observation in local schools and extension programs.

#### **HEC 5840 - Occupational Family and Consumer Sciences Education**

Lec. 1. Cr. 1. Organization and operation of Occupational Family and Consumer Sciences Programs at middle school, high school and adult levels.

#### **HEC 6200 - Theories and Applications in Child Development**

Lec. 3. Cr. 3. A topical approach to theories and emerging issues in child development; an exploration of environmental and hereditary factors impacting child development with emphasis on at-risk population and children with exceptionalities.

#### **HEC 6600 - Family Theories and Issues Impacting Families**

Lec. 3. Cr. 3. Examination of selected family theories to provide context of understanding the family as a social system with emphasis on family-professional collaboration.

#### **HEC 6630 - Strategies and Advocacy for Families**

Lec. 3. Cr. 3. Survey of service delivery programs that serve and advocate for families.

#### **HEC 6920 - Research Methods in Family Education and Community Services**

Lec. 3. Cr. 3. An analysis of types, procedures, and criteria in quantitative and qualitative research methods.

#### **HEC 6990 - Problems and Research in Professional Practice**

Lec. 3. Cr. 3. Prerequisite: HEC 6920. Employing strategies for the identification and research on problems in professional practice.

#### **HEC 6994 - Resolution and Reflection of Problems in Professional Practice**

Lec. 3. Cr. 3. Prerequisite: HEC 6990. Employing strategic thinking and ethical reasoning in the process of resolving problems in professional practice.

## **Instructional Leadership**

#### **INSL 4280 (5280) - Legal Aspects**

Lec. 1. Cr. 1. Special topics concerning school law and legal issues in education presented in workshop and seminar formats. Students may repeat the course for credit. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

#### **INSL 6210 - School Finance, Facilities, and Auxiliary Services**

Lec. 3. Cr. 3. Financial issues and budgeting related to school operations, including facility development, transportation, and other auxiliary services.

**INSL 6250 - School and Community Partnerships**

Lec. 3. Cr. 3. Techniques and procedures for interpreting school programs and building relationships between the school and community, and the improvement of the instructional program through community resources and involvement.

**INSL 6280 - Public School Law**

Lec. 3. Cr. 3. A study of court cases, legal principles, school policies, law, and educational regulations applicable to school and classroom situations.

**INSL 6400 - Effective Teaching and Supervision**

Lec. 3. Cr. 3. Principles and practices of effective teaching and supervisory techniques in the school environment enhancing student learning, growth, and development.

**INSL 6420 - Professional Development in Instructional Leadership**

Cr. 1-3. The development of an individualized professional development plan designed to enhance skills as a school leader through an independent, supervised study.

**INSL 6510 - School Leadership, Law, Ethics, and Diversity**

Lec. 6. Cr. 6. A study of content, topics, and competencies required for instructional leaders to engender student achievement and school success. Also, included are studies of court cases, legal principles, school policies, law, and educational regulations applicable to school classroom situations.

**INSL 6520 - School-Based Management and Community Relations**

Lec. 6. Cr. 6. Financial issues and budgeting related to school operations, including facility development, transportation, and other auxiliary services. Techniques and procedures for interpreting the public schools to the community. Principles, practices, and functions of supervision in public schools. Field experience component.

**INSL 6530 - Data Driven Curriculum: Development, Assessment and Evaluation**

Lec. 6. Cr. 6. Using current trends in curriculum development and advanced educational methods for K-12 education, this course is designed to assist Instructional Leadership candidates in the areas of defining objectives, planning for improvement, organization of instructional materials, curriculum evaluation, and a strong emphasis on current research and best practices.

**INSL 6540 - Seminar in INSL: Effective Teaching and Supervision**

Lec. 6. Cr. 6.

**INSL 6550 - Internship and Culminating Experience in INSL**

Lec. 6. Cr. 6.

Prerequisite: INSL 6540.

**INSL 6560 - Technology for Administrators**

Lec. 3. Cr. 3. Course involves a survey of emerging and existing technologies related to school administration (operation), instruction, and planning. Emphasis is placed on effective knowledge, access, and use of available technology with ability to accurately retrieve, analyze, and disseminate school-related area.

**INSL 6800 - School-Based Internship**

Cr. 1-3. School-based experiences to practice and reinforce knowledge and skills in instructional leadership.

**INSL 6900 - Problems in Instructional Leadership**

Cr. 3. Research study of significant problems and issues in instructional leadership related areas.

**INSL 6920 - Topics**

Cr. 1-3. An in-depth study of selected topics and case studies.

**INSL 6990 - Research and Thesis**

Cr. 3, 6.

**INSL 7010 - Instructional Leadership**

Lec. 3. Cr. 3. A study of content, topics, and competencies required for instructional leaders to engender student achievement and school success.

**INSL 7020 - School Personnel and Organizational Improvement**

Lec. 3. Cr. 3. Developing positive relationships, promoting student success, and an examination of organizational behavior, structures, and professional skills impacting on schools.

**INSL 7250 - Public Relations for Schools**

Lec. 3. Cr. 3. Practical, research-based information focused on technology, reform movements, and communication techniques designed to prepare school personnel for positive public relations programs and support for schools.

**INSL 7280 - Legal and Ethical Issues in Schools**

Lec. 3. Cr. 3. Legal and ethical issues impacting on instructional leadership, classroom activities, and other school practices.

**INSL 7400 - School Leadership and Supervision**

Lec. 3. Cr. 3. Emphasis on teaching and leadership roles in the development of effective schools and student learning.

**INSL 7430 - Seminar in Instructional Leadership**

Lec. 3. Cr. 3. A study and examination of relevant theories, problems, case studies, and issues in instructional leadership and classroom practices.

**INSL 7440 - School Finance and Grantsmanship**

Lec. 3. Cr. 3. A study of revenue sources, budgeting techniques, financial management, grant development, and practices relevant to school finance.

**INSL 7480 - Principalship and Leadership**

Lec. 3. Cr. 3. Concepts of school leadership, school operations, learning environment, and building level management.

**INSL 7510 - School Leadership Law and Ethics**

Lec. 3. Cr. 6. A study of content, topics, and competencies required for instructional leaders to engender student achievement and school success. Also, included are legal and ethical issues impacting on instructional leadership, classroom activities, and other school practices.

**INSL 7520 - Human Resources Management and Public Relations**

Lec. 6. Cr. 6. A study of revenue sources, budgeting techniques, financial management, grant development, and practices relevant to school finance. Emphasis on teaching and roles in the development of effective schools and student learning. Practical, research-based information focused on technology, reform movements, and communication techniques designed to prepare school personnel for positive public relations programs and support for schools. Field experience component.

**INSL 7530 - Assessment and Evaluation: Improvement in Teaching**

Lec. 6. Cr. 6. Current trends in curriculum development; defining objectives; planning for improvement; organization of instructional materials; curriculum evaluation. Advanced study of innovations, recent trends, research findings, and evaluation relating to the improvement of teaching.

**INSL 7540 - INSL Seminar: School-Based Leadership and**

## Supervision

Lec. 6. Cr. 6. A study and examination of relevant theories, problems, case studies, and issues in instructional leadership and classroom practices. Concepts of school leadership, school operations, learning environment, and building level management. Emphasis on Teaching and Roles in the development of effective schools and student learning.

### INSL 7550 - INSL Apprenticeship and Portfolio Development

Lec. 6. Cr. 6. Prerequisite: INSL 7540. Supervised practicums, laboratory, and case study experiences, observations, simulations, school site internships, and professional portfolio development.

### INSL 7800 - Laboratory and Field Experience in Education

Cr. 3. Supervised practicums, laboratory, and case study experiences, observations, simulations, and school site internships.

### INSL 7900 - Reading and Research in Instructional Leadership

Cr. 3. Reading and advanced research study in major concentration.

### INSL 7910 - Advanced Research Project in Instructional Leadership

Cr. 3. Supervised research study or approved project in major area of concentration.

## Journalism

### JOUR 4360 (5360) - Magazine Production and Design

Lec. 3. Cr. 3. Current trends in magazine production and design. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

### JOUR 4460 (5460) - Public Relations--Cases and Practices

Lec. 3. Cr. 3. Prerequisite: JOUR 3460. Practical aspects of public relations emphasized. Case studies considered. Builds on knowledge and expertise acquired in JOUR 3460. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

### JOUR 4820 (5820) - Advanced Reporting

Lec. 3. Cr. 3. Prerequisite: JOUR 3220. Writing and reporting for the commercial media. Students will serve as reporters for the campus newspaper. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

### JOUR 4830 (5830) - Feature Writing

Cross-listing: PC 4830 (5830)

Lec. 3. Cr. 3. Prerequisite: JOUR 2220. Recommended: JOUR 4820 (5820). An introductory course in the writing and marketing of feature stories, commentaries and articles for the print and digital media. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

### JOUR 4840 (5840) - Special Problems

Cr. 3. Prerequisite: Senior standing or consent of instructor. Independent work in mass media research and report writing, or internship programs in print or electronic media, public relations, and other areas. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

### JOUR 4850 (5850) - Internship

Cr. 3,6,9,12. Part-time or full-time employment in a business, industrial, or institutional communications setting, related to student academic and career goals. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

### JOUR 4930 (5930) - Advanced Copy Editing

Lec. 2. Lab. 2. Cr. 3. Prerequisite: JOUR 3220. Additional training in editing copy with emphasis on laboratory work on the university student newspaper. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

### JOUR 4940 (5940) - Technical Editing

Lec. 3. Cr. 3. Prerequisite: ENGL 4970 (5970)/PC 4970 (5970). Principles and practices of technical editing. (Same as PC 4940 (5940)). Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

### JOUR 6450 - Public Relations Management

Cr. 3. This program is meant to introduce many of the key aspects of public relations management through the readings of and understanding of public relations principles and case studies.

## Leadership

### LDSP 6000 - Current Issues and Cases in Leadership

Cr. 3. Based on a global and cross-discipline perspective, this course provides a study of the current trends and practices in public and private sector leadership. Students will read and discuss current news, research, and case studies and will be required to complete independent and collaborative projects. Instruction will be provided on where to track trends in leadership and how to use the case method. Specific topics may vary depending upon the current trends but will generally include personal mastery and leadership development, leading organizations into the future, values-based leadership and corporate citizenship, collaborative leadership, global leadership and diversity, stakeholder relations, knowledge management, a comparative study of the roles of leaders in business, public and nonprofit (civil society) organizations, leadership at the grassroots and board levels, the impact of technology on leadership.

## Library Science

### LSCI 4020 (5020) - Storytelling and Traditional Literature

Cross-listing: READ 4020 (5020)

Lec. 3. Cr. 3. Storytelling techniques and literature presentation through storytelling. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

### LSCI 4400 (5400) - Audio-Visual Aids to Teaching

Lec. 2. Cr. 2. Prerequisite: EDPY 2200. Survey of educational media available to educators with emphasis given to effective utilization. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

### LSCI 4500 (5500) - Children's Literature

Lec. 3. Cr. 3. Prerequisite: Full admission to the Teacher Education Program. Survey of elementary school library materials for children, including classic and modern titles. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

### LSCI 4530 (5530) - Books and Related Materials for Infants and Toddlers

Lec. 1. Cr. 1. Survey of developmentally appropriate books and materials for infants and toddlers. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

### LSCI 4540 (5540) - Multiethnic Literature for Infants, Toddlers, and Preschoolers

Cross-listing: READ 4540 (5540)

Lec. 1. Cr. 1. Introduction to preschool trade books and related materials reflecting an understanding of multiethnicity. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**LSCI 4550 (5550) - Multiethnic Literature for Children**

Cross-listing: READ 4550 (5550)

Lec. 1. Cr. 1. Introduction to children's trade books and related materials reflecting an understanding of multiethnicity. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**LSCI 4560 (5560) - Multiethnic Literature for Adolescents and Adults**

Cross-listing: READ 4560 (5560)

Lec. 1. Cr. 1. Introduction to adolescent and adult trade books and related materials reflecting an understanding of multiethnicity. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**LSCI 4570 (5570) - Young Adult Literature**

Cross-listing: READ 4570 (5570)

Lec. 3. Cr. 3. Survey of books and materials for middle level, high school students, and adults focusing on techniques to assist in reading these materials with understanding. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**LSCI 4800 (5800) - Library Practicum**

Cr. 2. Prerequisite: Eight (8) semester hours of LSCI work. Presents library procedure under actual working conditions. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**LSCI 6010 - Classification and Cataloging of Media and Materials**

Lec. 3. Cr. 3. Simplified procedures for organizing, classifying, and cataloging library materials.

**LSCI 6550 - Contemporary Children's Literature**

Cross-listing: READ 6550

Lec. 3. Cr. 3. To introduce students to children's authors and illustrators, poetry and traditional literature written for children and the psychology of reading.

**LSCI 6600 - Literature Across the Curriculum**

Cross-listing: READ 6600

Lec. 3. Cr. 3.

Prerequisite: LSCI 4570 (5570)/READ 4570 (5570). Uses of literature in English/language arts, science, social studies, math, and other curricular areas. Equal emphasis on enhancement of content areas and integration across content areas.

**LSCI 6800 - Library Practicum**

Cr. 3. Presents library procedure under actual working conditions.

**LSCI 7000 - Information Literacy Tools and Services**

Lec. 3. Cr. 3. This course will review basic concepts of reference services and tools. Students will obtain an understanding of print and electronic reference sources, including selection and evaluation, and gain a basic knowledge of providing reference and information services.

**LSCI 7030 - Administration of the School Library Media Center**

Lec. 3. Cr. 3. History, organization, management of school library media programs and librarianship as a profession.

**LSCI 7570 - Contemporary Young Adult Literature**

Lec. 3 Cr. 3 Prerequisite: Consent of advisor and advanced graduate standing. Content focus in Library Science or Curriculum. Course will deeply engage graduate students in young adult literature, including trends over time and the myriad of ideas for incorporating the use of literature into the goals/objectives of the

classroom or library program.

**LSCI 7800 - Field Experience in Library Science**

Cr. 3 Supervised field experience in library science in two (2) or more school libraries at various grade levels.

## Linguistics

**LING 4511 (5511) - Introduction to Language Description and Analysis**

Cross-listing: ENGL 4511 (5511)

Lec. 3. Cr. 3. Introduction to descriptive analysis of language: phonology, morphology, lexicon, and syntax. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**LING 4521 (5521) - History of the English Language**

Cross-listing: ENGL 4521 (5521)

Lec. 3. Cr. 3.

History of English from its origins to the present, emphasis upon historical development of English sounds, word structure, and syntax. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**LING 4531 (5531) - Grammar and Language**

Cross-listing: ENGL 4531 (5531)

Lec. 3. Cr. 3. Grammatical structure of English in relation to dialect and register with some emphasis on historical and potential changes in grammar. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**LING 4541 (5541) - Topics in Linguistics/Language**

Cross-listing: ENGL 4541 (5541)

Lec. 3. Cr. 3. Examination of specific aspects of language and/or linguistic study, such as Old and Middle English, the language of dialect literature, or American English dialects. Course may be repeated, provided the content is different each time. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

## Literacy

**EDUL 7000 - Seminar in Reading and Language Arts**

Lec. 3. Cr. 3. Prerequisite: Admission to Doctoral Program.

Discussion of current issues and materials in reading and language arts.

**EDUL 7800 - Professional Development in the Educational Setting**

Lec. 3. Cr. 3. Prerequisite: Admission to Doctoral Program.

Supervised practicums, observation, simulation, internships, and externships in education.

## Manufacturing and Engineering Technology

**MET 4060 (5060) - CNC Concepts, Advanced Techniques and Applications**

Lec. 2. Lab 2. Cr. 3. Prerequisite: MET 3060. An in-depth study of programming systems, techniques and applications. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**MET 4200 (5200) - Industrial Electronics**

Lec. 2. Lab 2. Cr. 3. Prerequisite: MET 3200. The fundamentals of process control, transducers, signal processing, feedback loops, activators, and analog and digital controllers. Students enrolled in

the 5000-level course will be required to complete additional work as stated in the syllabus.

#### **MET 4210 (5210) - Programmable Logic Controllers and Process Control**

Lec. 2. Lab 2. Cr. 3. Prerequisite: MET 4200. Programmable logic controllers (PLC's) and automated process control; design and implementation of an automatic controlled industrial process. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

#### **MET 4220 (5220) - Industrial Automation and Robotics**

Lec. 2. Lab 2. Cr. 3. Prerequisite: MET 3060. Studies in the theory and application of industrial automation relating to manufacturing. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

#### **MET 4300 (5300) - Advanced CAD Techniques**

Lec. 2. Lab 2. Cr. 3. Prerequisite: MET 3301. An in-depth course using CAD as a design tool that examines multiview drawings, layers, dimensioning, blocks, and sectional views. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

#### **MET 4310 (5310) - Plant Layout and Materials Handling**

Lec. 2. Lab 2. Cr. 3. Prerequisite: MET 3301, MET 3710. An analysis of materials movement within industrial organizations. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

#### **MET 4400 (5400) - Geometric Dimensioning and Tolerancing**

Lec. 2. Lab 2. Cr. 3. Prerequisite: ENGR 1110, MET 3301. This course will cover the geometric conformance and tolerancing theory and application pertaining to ANSI/ASME Y14.5M-1994 via computer graphics and other electronic data systems for design, manufacture, verification, and similar processes. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

#### **MET 4430 (5430) - Industrial Supervision**

Lec. 3. Cr. 3. Prerequisite: Senior. Supervisory responsibilities in an organization and procedures for meeting these responsibilities. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

#### **MET 4450 (5450) - Rapid Prototyping**

Lec. 2. Lab 2. Cr. 3. Prerequisite: MET 3301. This course prepares students to create a rapid prototyping file from a computer aided design file, determine the prototype for the model or part, and create a production plan for the part. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

#### **MET 4500 (5500) - Tool Design**

Lec. 2. Lab 2. Cr. 3. Prerequisite: MET 2063, MET 3301. This course covers and integrated treatment of tool design, specification and application by the use of standard tooling data. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

#### **MET 4550 (5550) - Maintenance, Replacement and Reliability Engineering**

Lec. 3. Cr. 3. Prerequisite: Senior or graduate standing in engineering, engineering technology or business. Reliability networks, failure mode and effect analysis, apportionment, availability, maintainability, fault trees and human reliability. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

#### **MET 4600 (5600) - Product Design and Development**

Lec. 3. Cr. 3. Prerequisite: Senior or graduate standing in engineering, engineering technology or business. This is a project-based course that covers modern tools and methods for product design and development. Topics include identifying customer needs, concept generation, product architecture, industrial design, and design-for-manufacturing. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

#### **MET 4650 (5650) - Lean Six Sigma Manufacturing**

Lec. 3. Cr. 3. Prerequisite: Senior or graduate standing in engineering, engineering technology or business. Review of current engineering and technology techniques relevant to manufacturing, service, quality and productivity. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

#### **MET 6100 - Manufacturing Strategy for Sustainability**

Lec. 2. Lab 2. Cr. 3. Prerequisite: Consent of instructor. This course examines the concept of "Manufacturing Strategy for Sustainability" using green materials, methods and technologies that are energy efficient, sustainable and friendly to the environment. It will cover topics on carbon footprint management, sustainable manufacturing process design, and life-cycle assessment.

#### **MET 6200 - Energy Management Principles**

Lec. 3. Cr. 3. Prerequisite: Consent of instructor. Principles and technical details of the efficient and effective use of energy to maximize profits, minimize cost and enhance competitive positions.

#### **MET 6300 - Alternative Energy Production**

Lec. 3. Cr. 3. Prerequisite: Consent of instructor. Principles and technical details of various renewable energy technologies (solar, biomass, wind, hydroelectric, geothermal, tidal and wave energy) for the sustainable future. Process design, energy analysis, engineering economics and environmental assessment of renewable energy systems.

#### **MET 6990 - Internship**

Cr. 3. Full-time or part-time, on-the-job work performed at a sponsoring entity while under the supervision of an approved advisor in an area related to manufacturing sustainability. Written objectives, a written internship analysis, and a public presentation are required.

## **Marine Biology**

#### **MBIO 4030 (5030) - Marine Invertebrate Zoology**

Summer. Cr. 6. Prerequisite: 16 semester hours of biology. Structure, classification, phylogeny, and function in Protozoa through the Lophophorata. Observation of their ecology and behavior. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

#### **MBIO 4040 (5040) - Parasites of Marine Animals**

Summer. Cr. 6. Prerequisite: BIOL 3110, or 3130, or consent of instructor. Morphology, taxonomy, life histories, and host-parasite relationships. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

#### **MBIO 4050 (5050) - Marine Ecology**

Summer. Cr. 5. Prerequisite: 16 semester hours of biology, including General Zoology, General Botany, and Invertebrate Zoology. Relationship of marine organisms to their environment. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

#### **MBIO 4060 (5060) - Fauna and Faunistic Ecology of Tidal Marshes**

Summer. Cr. 4. Prerequisite: 16 semester hours of biology and Junior standing, or consent of instructor. Taxonomy, distribution, trophic relationships, reproductive strategies and adaptations. emphasis on northern Gulf marshes. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

#### **MBIO 4070 (5070) - Marine Aquaculture**

Summer. Cr. 6. Prerequisite: 16 semester hours of zoology, including invertebrate and vertebrate zoology of ichthyology. Technology, principles, and problems of aquaculture. Emphasis of marine species. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

#### **MBIO 4080 (5080) - Marine Ichthyology**

Summer. Cr. 6. Prerequisite: 12 semester hours of biology and junior standing. Marine Chordata, including lower groups and the mammals and birds. Emphasis on fishes. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

#### **MBIO 4090 (5090) - Marine Microbiology**

Summer. Cr. 5. Prerequisite: BIOL 3110 or consent of instructor. Sampling procedures, taxonomy of marine bacteria, mineralization, microbial, fouling, pollution, and diseases of marine animals. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

#### **MBIO 4100 (5100) - Marine Fisheries Management**

Summer. Cr. 4. Prerequisite: Consent of instructor. Overview of practical marine fishery management program. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

#### **MBIO 4200 (5200) - Marine Phycology**

Summer. Cr. 4. Prerequisite: 8 semester hours of biology, including introductory botany, or consent of instructor. Survey of the principal groups of marine algae and maritime flowering plants. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

#### **MBIO 4210 (5210) - Coastal Vegetation**

Summer. Cr. 3. Prerequisite: 10 semester hours of biology, including general biology. Aspects of coastal vegetation. Emphasis on local examples. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

#### **MBIO 4220 (5220) - Salt Marsh Plant Ecology**

Summer. Cr. 4. Prerequisite: General botany, plant taxonomy, plant physiology, general ecology, or consent of instructor. Identification, composition, structure, distribution, primary productivity, ecology, and development. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

#### **MBIO 4300 (5300) - Comparative Histology of Marine Organisms**

Cr. 1-6. Prerequisite: Consent of instructor. Processing tissues using light, transmission electron, and scanning electron microscopy. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

#### **MBIO 4410 (5410) - Marine Chemistry**

Summer. Cr. 6. Prerequisite: 16 semester hours of chemistry, 3-6 semester hours of biology and geology or consent of instructor. Chemical aspects of oceans and interactions of chemistry, biology, and geology in marine environments. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

#### **MBIO 4440 (5440) - Behavior and Neurobiology of Marine Animals**

Summer. Cr. 4. Prerequisite: 16 semester hours of zoology and/or psychology, or consent of instructor. Behavior, neuroanatomy, and neurophysiology. Emphasis on neural mechanisms underlying behavior. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

#### **MBIO 4570 (5570) - Marine Science for Teachers**

Summer. Cr. 3. Prerequisite: Biology background or consent of instructor. Introduction to marine science. For public school teachers. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

#### **MBIO 4580 (5580) - Marine Science for Elementary Teachers**

Summer. Cr. 3. Prerequisite: 6 semester hours of biology. Materials and methods in teaching marine science to elementary students. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

#### **MBIO 4900 (5900) - Special Problems in Marine Science**

Cr. 1-6. Prerequisite: To be set by problem director. Research oriented problems reported in writing. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

#### **MBIO 4910 (5910) - Special Topics in Marine Science**

Cr. 1-6. Prerequisite: To be set by topics advisor. Special study in a field topic approved by the GCRL topics advisor and the student's institutional advisor. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

#### **MBIO 5990 - Coastal Ecology for Teachers**

Summer. Cr. 4. Designed to provide teachers with a background in coastal ecology.

#### **MBIO 6040 - Early Life History of Marine Fishes**

Summer. Cr. 4. Prerequisite: Ichthyology, Fisheries, Biology, Ecology and/or consent of instructor. Reproductive strategies and early developmental processes.

## **Marketing**

#### **MKT 5200 - Basic Marketing**

Lec. 3. Cr. 3. The structure of markets, techniques, and tools available to the marketing manager; motivations of buyers.

#### **MKT 6100 - Strategic Marketing**

Lec. 3. Cr. 3. Strategic marketing issues and opportunities that impact both the marketing process and marketing program. Decisions will also consider environmental variables as well as the internal elements of an organization.

#### **MKT 6500 - Advanced Marketing Analysis**

Lec. 3. Cr. 3. Prerequisite: MKT 6100. A case course including an intensive study of analysis of marketing information for marketing decisions.

#### **MKT 6510 - Services Marketing**

Cr. 3. This course will focus on service organizations and services marketing issues to make students aware of the unique challenges involved in marketing and managing organizations in sectors such as finance, health care, entertainment, hospitality, professional services, retailing, education and transportation. Specific topics will include learning and developing strategies for real life business cases to close potential service gaps such as customer, knowledge, service development/design, performance, and communication gaps that have negative impact on service performance and quality perceptions of customers about the service offering.

#### **MKT 6630 - Entrepreneurship and Small Business Management**

Lec. 3. Cr. 3. A case course concentrating on the salient issues and

management decisions covering entrepreneurship, the formation and management of new business ventures, and the complex managerial process of small business ownership.

#### **MKT 6900 - Special Topics**

Lec. 3. Cr. 3. A case course dealing with current topics in business.

#### **MKT 6930 - International Marketing**

Lec. 3. Cr. 3. International markets, instruments, and global marketing strategies. This course will focus on the study of consumer behavior and buying cultures in all major regions of the world, and it relates this information to the creation of international marketing plans and strategies.

## **Mathematics**

#### **MATH 4010 (5010) - Modern Algebra I**

Lec. 3. Cr. 3. Prerequisite: Prerequisite: C or better in MATH 2010 or equivalent and C or better in MATH 3400. Groups and subgroups including cyclic, abelian, finite, permutation groups, group homomorphisms, cosets and Lagrange's Theorem, normal subgroups and factor groups. Rings including integral domains, unique factorization domains and Euclidean domains, ideals and factor rings, ring homomorphisms, fields and their extensions, geometric constructions. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

#### **MATH 4020 (5020) - Modern Algebra II**

Lec. 3 Cr. 3. Prerequisite: Prerequisite: C or better in MATH 4010 (5010) . Groups and subgroups including cyclic, abelian, finite, permutation groups, group homomorphisms, cosets and Lagrange's Theorem, normal subgroups and factor groups. Rings including integral domains, unique factorization domains and Euclidean domains, ideals and factor rings, ring homomorphisms, fields and their extensions, geometric constructions. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

#### **MATH 4050 (5050) - Number Theory**

Lec. 3. Cr. 3. Prerequisite: Consent of instructor. Properties of integers, division algorithms, prime numbers, diophantine equations, congruences. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

#### **MATH 4110 (5110) - Advanced Calculus I**

Lec. 3. Rec. 1. Cr. 3. Prerequisite: MATH 4110 (5110): C or better in MATH 3400 or consent of instructor; MATH 4120 (5120): C or better in MATH 4110 (5110). Rigorous treatment of functions of one and several variables, improper integrals, sequences, infinite series, uniform convergence and applications. Students are expected to improve their ability to work in an abstract setting using precise definitions and formal proofs and to present their work in class. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

#### **MATH 4120 (5120) - Advanced Calculus II**

Lec. 3. Rec. 1. Cr. 3. Prerequisite: MATH 4110 (5110): C or better in MATH 3400 or consent of instructor; MATH 4120 (5120): C or better in MATH 4110 (5110). Rigorous treatment of functions of one and several variables, improper integrals, sequences, infinite series, uniform convergence and applications. Students are expected to improve their ability to work in an abstract setting using precise definitions and formal proofs and to present their work in class. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

#### **MATH 4210 (5210) - Numerical Analysis I**

Lec. 3. Cr. 3. Prerequisite: MATH 4210 (5210): C or better in

MATH 1920 (or consent of instructor for MATH 5210); MATH 4220 (5220): C or better in MATH 2120 or consent of instructor. Iterative methods for nonlinear equations, computational error analysis, convergence of iterative techniques, interpolation, numerical differentiation and integration, approximate solutions of initial-value problems, boundary-value problems, and nonlinear systems, direct and iterative methods for linear systems. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

#### **MATH 4220 (5220) - Numerical Analysis II**

Lec. 3. Cr. 3. Prerequisite: MATH 4210 (5210): C or better in MATH 1920 (or consent of instructor for MATH 4210 (5210)); MATH 4220 (5220): C or better in MATH 2120 or consent of instructor. Iterative methods for nonlinear equations, computational error analysis, convergence of iterative techniques, interpolation, numerical differentiation and integration, approximate solutions of initial-value problems, boundary-value problems, and nonlinear systems, direct and iterative methods for linear systems. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

#### **MATH 4250 (5250) - Advanced Ordinary Differential Equations I**

Lec. 3. Cr. 3. Prerequisite: MATH 4250 (5250): C or better in MATH 2110 and MATH 2120 (or consent of instructor for MATH 5250); MATH 4260 (5260): C or better in MATH 4250 (5250). Systems of ordinary differential equations, matrix methods, approximate solutions, stability theory, basic theory of nonlinear equations and differential systems, trajectories, phase space stability, construction of Liapunov functions. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

#### **MATH 4260 (5260) - Advanced Ordinary Differential Equations II**

Lec. 3. Cr. 3. Prerequisite: MATH 4250 (5250): C or better in MATH 2110 and MATH 2120 (or consent of instructor for MATH 4250 (5250)); MATH 4260 (5260): C or better in MATH 4250 (5250). Systems of ordinary differential equations, matrix methods, approximate solutions, stability theory, basic theory of nonlinear equations and differential systems, trajectories, phase space stability, construction of Liapunov functions. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

#### **MATH 4310 (5310) - Introduction to Topology I**

Lec. 3. Cr. 3. Prerequisite: MATH 4310 (5310): C or better in MATH 3400 (or consent of instructor for MATH 5310); MATH 4320 (5320): C or better in MATH 4310 (5310). Topological spaces, continuity, connectedness, compactness, separation axioms, function spaces, and fundamental groups. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

#### **MATH 4320 (5320) - Introduction to Topology II**

Lec. 3. Cr. 3. Prerequisite: MATH 4310 (5310): C or better in MATH 3400 (or consent of instructor for MATH 4310 (5310)); MATH 4320 (5320): C or better in MATH 4310 (5310). Topological spaces, continuity, connectedness, compactness, separation axioms, function spaces, and fundamental groups. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

#### **MATH 4350 (5350) - Introductory Combinatorics**

Lec. 3. Cr. 3. Prerequisite: C or better in MATH 3400 or consent of instructor. Topics to be covered include permutations, combinations, multisets, partitions, recurrence relations, generating functions, and the principle of inclusion-exclusion. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

#### **MATH 4360 (5360) - Graph Theory**

Lec. 3. Cr. 3. Prerequisite: C or better in MATH 3400 or consent of instructor. Fundamental concepts of undirected and directed graphs, trees, connectivity, traversability, planarity, colorability, network flows, and matching theory. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**MATH 4410 (5410) - Differential Geometry**

Lec. 3. Cr. 3. Prerequisite: C or better in MATH 2010, 2110, and 3400 (or consent of instructor for MATH 5410). Geometry of curves and surfaces in three dimensional space. Calculus on surfaces, curvature and Riemannian geometry. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**MATH 4470 (5470) - Probability and Statistics I**

Lec. 3. Cr. 3. Prerequisite: C or better in MATH 2110 or consent of instructor. Mathematical foundations of elementary statistical methods, application and theory, probability in discrete and continuous distribution, correlation and regression, sampling distributions, significance tests. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**MATH 4480 (5480) - Probability and Statistics II**

Lec. 3. Cr. 3. Prerequisite: C or better in MATH 2110 or consent of instructor. Mathematical foundations of elementary statistical methods, application and theory, probability in discrete and continuous distribution, correlation and regression, sampling distributions, significance tests. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**MATH 4510 (5510) - Advanced Mathematics for Engineers**

Lec. 3. Cr. 3. Prerequisite: C or better in MATH 2120 and MATH 2120. Fourier series, Sturm-Liouville problems, orthogonal functions, Legendre polynomials, Bessel functions, separable partial differential equations (e.g., heat, wave, and Laplace equations), and other topics. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**MATH 4530 (5530) - Linear Algebra I**

Lec. 3. Cr. 3. Prerequisite: MATH 4530 (5530): C or better in MATH 2010 and MATH 3400; MATH 4540 (5540): C or better in MATH 4530 (5530). A theoretical study of vector spaces, bases and dimension, subspaces, linear transformations, dual spaces, eigenvalues and eigenvectors, inner product spaces, spectral theory, duality, quadratic and bilinear forms. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**MATH 4540 (5540) - Linear Algebra II**

Lec. 3. Cr. 3. Prerequisite: MATH 4530 (5530): C or better in MATH 2010 and MATH 3400; MATH 4540 (5540): C or better in MATH 4530 (5530). A theoretical study of vector spaces, bases and dimension, subspaces, linear transformations, dual spaces, eigenvalues and eigenvectors, inner product spaces, spectral theory, duality, quadratic and bilinear forms. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**MATH 4610 (5610) - History of Mathematics I**

Lec. 3. Cr. 3. Prerequisite: C or better in MATH 3400 (or consent of instructor for MATH 5610). The development of mathematics and its relation to the development of civilization prior to the beginnings of calculus. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**MATH 4620 (5620) - History of Mathematics II**

Lec. 3. Cr. 3. Prerequisite: C or better in MATH 3400 (or consent of instructor for MATH 5620). History of mathematics from the beginnings of calculus through the modern times. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**MATH 4710 (5710) - Vector Analysis**

Lec. 3. Cr. 3. Prerequisite: C or better in MATH 2110. The algebra and the differential and integral calculus of vectors; applications to geometry and mechanics. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**MATH 4750 (5750) - Category Theory of Sets**

Lec. 3. Cr. 3. Prerequisite: C or better in MATH 3400 (or consent of instructor for MATH 5750). Abstract sets and mappings, categories, sums, universal property, monomorphisms and parts, finite inverse limits, colimits, epimorphisms, the Axiom of Choice, mapping sets and exponentials, covariant and contravariant functoriality of function spaces, Cantor's diagonal argument, power sets, variable sets, models of additional variation, selected applications. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**MATH 4850 (5850) - Computational Algebraic Geometry I**

Lec. 3. Cr. 3. Prerequisite: C or better in MATH 2010, and C or better in MATH 3400 or equivalent; or consent of instructor. Additional recommended prerequisite: MATH 3510 or any other 4000/5000 level mathematics course in which proofs are required. Affine varieties and polynomial ideals. Groebner bases, elimination theory, Hilbert's Nullstellensatz, Zariski closure, decomposition into irreducible varieties.

**MATH 4860 (5860) - Computational Algebraic Geometry II**

Lec. 3. Cr. 3. Prerequisite: C or better in MATH 4850 (5850). Polynomial and rational functions on a variety, projective varieties, the dimension of a variety, selected applications in robotics, automatic theorem proving, and invariant theory of finite groups.

**MATH 4910 (5910) - Directed Readings**

Cr. 1-3. Prerequisite: Consent of instructor. These courses provide an opportunity for individual reading and study under the supervision of a qualified staff member. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**MATH 4920 (5920) - Directed Readings**

Cr. 1-3. Prerequisite: Consent of instructor. These courses provide an opportunity for individual reading and study under the supervision of a qualified staff member. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**MATH 4950 (5950) - Topics in Mathematics**

Lec. 3. Cr. 3. Prerequisite: Consent of instructor. A formal course in any area where there is no other course offering. May be taken more than once, provided that the topic is different. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**MATH 6010 - Functional Analysis I**

Lec. 3. Cr. 3. Prerequisite: C or better in MATH 4120 (5120) or consent of instructor. Metric spaces, normed and Banach spaces, inner product and Hilbert spaces. Fundamental theorems for normed and Banach spaces and their applications. Linear operators on normed and Hilbert spaces.

**MATH 6020 - Functional Analysis II**

Lec. 3. Cr. 3. Prerequisite: C or better in MATH 6010. Metric spaces, normed and Banach spaces, inner product and Hilbert

spaces. Fundamental theorems for normed and Banach spaces and their applications. Linear operators on normed and Hilbert spaces.

#### **MATH 6070 - Applied Linear Statistical Methods I**

Lec. 3. Cr. 3. Prerequisite: Consent of instructor. Regression analysis in the context of classical linear, nonlinear, generalized linear, and time series models.

#### **MATH 6080 - Applied Linear Statistical Methods II**

Lec. 3. Cr. 3. Prerequisite: B or better in MATH 6070 or consent of instructor. Regression analysis in the context of classical linear, nonlinear, generalized linear, and time series models.

#### **MATH 6110 - Abstract Algebra I**

Lec. 3. Cr. 3. Prerequisite: C or better in MATH 4010 (5010) or consent of instructor. An extensive treatment of groups, semigroups, integral domains, rings and ideals, fields, and Galois fields.

#### **MATH 6120 - Abstract Algebra II**

Lec. 3. Cr. 3. Prerequisite: C or better in MATH 4020 (5020) and C or better in MATH 6110, or consent of instructor. An extensive treatment of groups, semigroups, integral domains, rings and ideals, fields, and Galois fields.

#### **MATH 6150 - Mathematical Modeling**

Lec. 3. Cr. 3. Prerequisite: Consent of instructor. Applications of mathematics to real world problems with emphasis on problem definition, research, solution, and written report presentation.

#### **MATH 6170 - Experimental Design I**

Lec. 3. Cr. 3. Prerequisite: Consent of instructor. Introduction to basic concepts of experimental design, fundamental assumptions in analysis of variance, multiple comparison tests, complete randomized design, general linear model approach to ANOVA, various experimental designs, incomplete block designs, factorial experiments, fractional factorial experiments, response surface methods, repeated measure designs.

#### **MATH 6180 - Experimental Design II**

Lec. 3. Cr. 3. Prerequisite: C or better in MATH 6170. Introduction to basic concepts of experimental design, fundamental assumptions in analysis of variance, multiple comparison tests, complete randomized design, general linear model approach to ANOVA, various experimental designs, incomplete block designs, factorial experiments, fractional factorial experiments, response surface methods, repeated measure designs.

#### **MATH 6210 - Topology I**

Lec. 3. Cr. 3. Prerequisite: C or better in MATH 4320 (5320) or consent of instructor. Topics in point-set topology, homotopy theory, triangulated spaces, homology theory, other topics in topology.

#### **MATH 6220 - Topology II**

Lec. 3. Cr. 3. Prerequisite: C or better in MATH 6210. Topics in point-set topology, homotopy theory, triangulated spaces, homology theory, other topics in topology.

#### **MATH 6270 - Mathematical Statistics**

Lec. 3. Cr. 3. Prerequisite: Consent of instructor. Statistical hypothesis, uniform most powerful tests, sufficient statistics, completeness, Rao-Cramer inequality, sequential probability ratio test, analysis of variance, multiple comparisons, nonparametric techniques.

#### **MATH 6310 - Complex Analysis I**

Lec. 3. Cr. 3. Prerequisite: C or better in MATH 4120 (5120) or consent of instructor. Complex numbers, calculus of complex variables, analytic function. Cauchy's Theorem and complex

integration, power series including Taylor's and Laurent's, residue theory with applications, conformal mapping with physical applications.

#### **MATH 6320 - Complex Analysis II**

Lec. 3. Cr. 3. Prerequisite: C or better in MATH 6310. Complex numbers, calculus of complex variables, analytic function. Cauchy's Theorem and complex integration, power series including Taylor's and Laurent's, residue theory with applications, conformal mapping with physical applications.

#### **MATH 6370 - Probability Theory and Stochastic Processes I**

Lec. 3. Cr. 3. Prerequisite: C or better in MATH 4480 (5480) or consent of instructor. Probability theory of sets, random variable distribution and characteristic functions, convergence, limits and law of large numbers, convolutions, compound distribution, recurrent events, random walk models, Markov chains, homogeneous, nonhomogeneous, and queuing processes.

#### **MATH 6380 - Probability Theory and Stochastic Processes II**

Lec. 3. Cr. 3. Prerequisite: C or better in MATH 6370. Probability theory of sets, random variable distribution and characteristic functions, convergence, limits and law of large numbers, convolutions, compound distribution, recurrent events, random walk models, Markov chains, homogeneous, nonhomogeneous, and queuing processes.

#### **MATH 6410 - Real Analysis I**

Lec. 3. Cr. 3. Prerequisite: C or better in MATH 4120 (5120) or consent of instructor. Theory of Lebesgue measure and integration,  $L_p$  spaces. Integration in locally compact space.

#### **MATH 6420 - Real Analysis II**

Lec. 3. Cr. 3. Prerequisite: C or better in MATH 6410. Theory of Lebesgue measure and integration,  $L_p$  spaces. Integration in locally compact space.

#### **MATH 6450 - Advanced Theory of Computation**

Cross-listing: CSC 6450

Lec. 3. Cr. 3. Prerequisite: Consent of the instructor (previous coursework involving proofs and some programming experience are needed). A rigorous treatment of the theory of computation. Topics such as: computable functions, the Church-Turing thesis, complexity theory, and P vs. NP.

#### **MATH 6460 - Computational Methods for Graphics and Modeling**

Cross-listing: CSC 6460

Lec. 3. Cr. 3. Prerequisite: Consent of the instructor (previous coursework involving proofs and some programming experience are needed). Mathematical methods for graphics and modeling. Topics such as: 3-D transformations, ray tracing, rendering, image processing, and compression.

#### **MATH 6470 - Environmental Statistics**

Lec. 3. Cr. 3. Prerequisite: MATH 6070 or MATH 6170 or their equivalents. This course covers statistical analysis used in environmental modeling. Topics include finite population parameter estimation, spatial sampling techniques, animal population size estimation, variogram estimation, kriging, logistic regression, and survival analysis. Familiarity with computers is necessary. Also necessary is a background in calculus including differentiation and integration of transcendental functions and series.

#### **MATH 6510 - Finite Difference Solutions of Partial Differential Equations**

Lec. 3. Cr. 3. Prerequisite: C or better in MATH 4510 (5510) or consent of instructor. Approximate solutions of boundary and initial value problems using the finite difference method. Elliptic, parabolic, and hyperbolic PDE's. Numerical differentiation. Solution methods

for linear systems.

#### **MATH 6520 - Finite Element Solutions of Partial Differential Equations**

Lec. 3. Cr. 3. Prerequisite: C or better in MATH 4510 (5510) or consent of instructor. Mathematical foundations of the finite element method. Approximate solutions of PDE's. Polynomial interpolation. Variational techniques. Numerical integration. Solution methods for linear systems. Isoparametric technique.

#### **MATH 6530 - Integral Equations and Applications**

Lec. 3. Cr. 3. Prerequisite: Consent of instructor. Volterra and Fredholm equations. Green's functions, Hilbert-Schmidt and Fredholm theories. Neumann series, iterative methods.

#### **MATH 6540 - Calculus of Variations and Applications**

Lec. 3. Cr. 3. Prerequisite: Consent of instructor. Euler equation, constraints, Lagrange multipliers, Ritz method, applications.

#### **MATH 6610 - Operational Mathematics**

Lec. 3. Cr. 3. Prerequisite: Consent of instructor. Integral transforms (Laplace, Fourier) inversion and convolution theorems, applications.

#### **MATH 6810 - Partial Differential Equations**

Lec. 3. Cr. 3. Prerequisite: Consent of instructor. First and second order PDE's, wave, heat, and Laplace's equations, applications to boundary and eigen-value problems of mathematics, physics, and engineering.

#### **MATH 6900 - Mathematics Seminar**

Lec. 1. Cr. 0-1.

#### **MATH 6910 - Special Topics in Mathematics**

Lec. 3. Cr. 3. Prerequisite: Consent of the instructor. Individual study of advanced mathematical topics in fields of interest under the supervision of a qualified staff member.

#### **MATH 6920 - Special Topics in Mathematics**

Cr. 1-3. Prerequisite: Consent of instructor. Individual study of advanced mathematical topics in fields of interest under the supervision of a qualified staff member.

#### **MATH 6950 - Advanced Topics in Mathematics**

Lec. 3. Cr. 3. Prerequisite: Consent of instructor. A formal course in any area in which there is no other course offering. May be taken more than once provided the content is different.

#### **MATH 6990 - Research and Thesis**

Cr. 3,6.

#### **MATH 6991 - Research and Independent Study**

Lec. 1-3. Cr. 1-3. Prerequisite: Consent of instructor. The purpose of this course is to foster research and independent study at the graduate level in mathematics or statistics. Students will independently study a chosen area of mathematics, explore open and significant problems, draw conclusions, and, if applicable, participate in problem solving via consulting. Students will be required to give presentations on their own investigations and conclusions, and write a research paper.

## **Mechanical Engineering**

#### **ME 4020 (5020) - Applied Machine Design**

Lec. 2. Lab. 2. Cr. 3. Prerequisite: ME 4010. Design for strength and rigidity under dynamic loads; shaft design; design of joints (threaded fasteners, welds, springs, keys, etc.); design of gear trains; lubrication and bearing design; finite element analysis; and optimization, and statistical consideration in design. Students enrolled in the 5000-level course will be required to complete

additional work as stated in the syllabus.

#### **ME 4060 (5060) - Machine Vibrations**

Lec. 3. Cr. 3. Prerequisite: ME 3050. Linear vibration of machine elements, lumped parameter multidegree of freedom, and continuous system solutions; computer-aided solutions of linear and nonlinear systems; simple laboratory vibration measurement and comparative vibration analysis. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

#### **ME 4120 (5120) - Intermediate Dynamics**

Lec. 3. Cr. 3. Prerequisite: ME 2330. Rigid-body kinematics, plane and three-dimensional rigid-body kinetics, Lagrangian mechanics, orbital motions, variable mass rockets. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

#### **ME 4140 (5140) - Introduction to Robotics**

Lec. 3. Cr. 3. Prerequisite: ECE 3810, 3860; ME 3050, 3060. Robotic concepts and subsystems; mechanics of robots; sensors and intelligence; actuators; trajectory planning and control. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

#### **ME 4160 (5160) - Experimental Stress Analysis**

Cross-listing: CEE 4160 (5160)

Lec. 2. Lab. 2. Cr. 3. Prerequisite: CEE 3110, MATH 2910.

Introduction to theory of elasticity; photoelasticity; theory and application of strain gages and rosettes; brittle coatings; holographic interferometry; moire' analysis. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

#### **ME 4180 (5180) - Finite Element Methods in Mechanical Design**

Lec. 3. Cr. 3. Prerequisite: CEE 3110. Fundamental concepts; displacement-based finite element formulation using energy methods; one-dimensional and two-dimensional finite elements; modeling considerations and convergence; programming and an introduction to a commercial program. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

#### **ME 4190 (5190) - Advanced Mechanics of Materials**

Cross-listing: CEE 4190 (5190)

Lec. 3. Cr. 3. Prerequisite: CEE 3110, MATH 2120, or consent of instructor. Advanced topics; fracture mechanics, elastic support, noncircular shafts, curved beams, thick-walled cylinders, introduction to plates, thin shells of revolution. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

#### **ME 4260 (5260) - Energy Conversion and Conservation**

Lec. 3. Cr. 3. Prerequisite: ME 3220, 3710, or equivalent An in-depth study of industrial steam, pumping and compressed air systems in terms of how to reduce system energy consumption.

#### **ME 4310 (5310) - Gas Dynamics**

Lec. 3. Cr. 3. Prerequisite: ME 3220 and ME 3720. Balance laws, shock waves, Prandtl/Meyer expansion, flow through ducts and nozzles, unsteady wave motion, linearized supersonic thin airfoil theory.

#### **ME 4370 (5370) - Mechatronics and Intelligent Machines Engineering**

Lec. 2. Lab. 2. Cr. 3. Prerequisite: ECE 3810, 3860; ME 3050, 3060. Mechatronics; number systems; microcontroller technology and architecture of 8-bit microcontrollers (e.g. Motorola MC 68H110); assembly language programming; A/D and D/A conversion; parallel I/O; programmable timer operation; interfacing

sensors and actuators; applications; team project on design and implementation of a mechatronic system. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**ME 4450 (5450) - Design for Manufacturability**

Lec. 3. Lab. 2. Cr. 3. Prerequisite: ME 3010, CEE 3110. Material and manufacturing process constraints on design shape, size, and quantity; plastic and fibrous composite parts manufacturing; rapid prototyping; design for X; dimensions and tolerances. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**ME 4460 (5460) - Mechanical Properties of Materials**

Lec. 3. Cr. 3. Prerequisite: CEE 3110, ME 3010, or consent of instructor. Elastic and anelastic properties, dislocations, slip, plastic deformation, fracture mechanics, creep, fatigue and fatigue crack propagation, materials testing, and introduction to failure analysis.

**ME 4470 (5470) - Interdisciplinary Studies in Ceramic Materials Processing**

Cross-listing: CHE 4470 (5470)

Lec. 2. Lab. 2. Cr. 3. Prerequisite: Senior standing in engineering, mathematics, chemistry (calculus-based), or physics. Selected materials synthesis for metals, ceramics and their composites, application of fracture mechanics and failure models, mechanical, chemical, and morphological characterization theory and practice, and materials design. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**ME 4480 (5480) - Microstructure Analysis**

Lec. 2. Lab. 2. Cr. 3. Prerequisite: ME 4460 (5460). Techniques and applications of microstructural analysis; optical microscopy; metallography; electron microscopy; and fractography and failure analysis. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**ME 4490 (5490) - Properties and Selection of Engineering Materials**

Lec. 3. Cr. 3. Prerequisite: ME 3010. An intermediate course in materials engineering emphasizing the interrelations among material properties, microstructure and optimum material selection for design applications. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**ME 4510 (5510) - Aerodynamics**

Lec. 3. Cr. 3. Prerequisite: ME 3720. Atmospheric fluid statics, ideal fluid dynamics, potential flow, lift and drag estimation, powered flight, glides, takeoffs, landings.

**ME 4620 (5620) - Turbomachinery**

Lec. 3. Cr. 3. Prerequisite: ME 3720. Presents a generalized description and unified theory pertaining to the classification, operation, selection and basic design of rotating turbomachines - pumps, fans, compressors, and turbines; topics of current interest. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**ME 4640 (5640) - Dynamics of Machinery—II**

Lec. 3. Cr. 3. Prerequisite: ME 3610. Graphical and analytical synthesis of linkage mechanisms for function generation, motion generation, and path generation. Kinetostatic analysis of linkage mechanisms; engine dynamics, balancing; rigid-body dynamics, time response analysis. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**ME 4730 (5730) - Numerical Heat Transfer**

Lec. 3. Cr. 3. Prerequisite: ME 3710, ME 3720. Fundamentals of numerical methods; steady and unsteady one-dimensional heat conduction; steady and unsteady multidimensional heat conduction; fully-developed duct flows; one- and two-dimensional convection heat transfer; flow through porous media. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**ME 4810 (5810) - Automatic Control**

Lec. 3. Cr. 3. Prerequisite: ME 3050. Mathematical modeling of physical systems, control algorithms, stability, transient response, and frequency response.

**ME 4930 (5930) - Noise Control**

Cross-listing: CEE 4930 (5930)

Lec. 2. Lab. 2. Cr. 3. Prerequisite: MATH 2120 and PHYS 2110. Identification and description of noise sources and noise radiation, methods of noise measurement and criteria for noise levels, principles and techniques of noise control. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**ME 6010 - Conduction Heat Transfer**

Lec. 3. Cr. 3. Conduction in steady, periodic, and transient systems; analytical and numerical techniques. Undergraduate level courses in heat transfer and introduction to partial differential equations needed for this course.

**ME 6030 - Radiation Heat Transfer**

Lec. 3. Cr. 3. Properties and laws of radiation; black and gray absorbing and emitting media, real and ideal systems. Undergraduate level courses in heat transfer and introduction to partial differential equations needed for this course.

**ME 6040 - Intermediate Fluid Mechanics**

Cross-listing: CEE 6040, CHE 6040

Lec. 3. Cr. 3. Formulation of mass and momentum transfer equations; exact solutions of laminar parallel flows; similarity and approximate solutions; potential flow; laminar momentum boundary layers. Undergraduate level courses in fluid mechanics and introduction to partial differential equations needed for this course.

**ME 6050 - Convection Heat Transfer**

Lec. 3. Cr. 3. Prerequisite: ME 6040, or consent of instructor. Formulation of energy equation; forced and natural convection heat transfer; heat and momentum transfer analogies, exact and approximate solutions; thermal boundary layers.

**ME 6210 - Advanced Thermodynamics**

Lec. 3. Cr. 3. Thorough, in-depth study of the first and second laws of thermodynamics from a macroscopic perspective, concept of energy and availability, general thermodynamic property relationships, property representation for computerized analyses, mixtures and solutions, chemical reactions. One (1) year of undergraduate thermodynamics is needed for this course.

**ME 6360 - Introduction to Continuum Mechanics**

Cross-listing: CEE 6360

Lec. 3. Cr. 3. Prerequisite: Consent of instructor. Tensors, balance, laws, constitutive equations, thermodynamic restrictions, applications.

**ME 6370 - Vibrations of Continuous Media**

Cross-listing: CEE 6370

Lec. 3. Cr. 3. Governing equations for strings, bars, and membranes; natural frequencies; normal modes; series solutions; wave propagation; transform methods; characteristics. Undergraduate level courses in mechanics of materials, introduction to partial differential equations, and vibrations are needed for this course.

**ME 6430 - Fundamentals of Acoustics**

Lec. 3. Cr. 3. Prerequisite: MATH 4510 (5510) or consent of instructor. Wave equation and one-dimensional solutions; Reflection and transmission; Absorption of sound waves; sources and receivers.

**ME 6440 - Applied Acoustics**

Lec. 3. Cr. 3. Three-dimensional plane, cylindrical, and spherical waves; waves in enclosures, in horns; architectural acoustics; ultrasonics. Undergraduate introduction to partial differential equations or consent of instructor needed for this course.

**ME 6510 - Motion Programming of Planar Mechanisms**

Lec. 3. Cr. 3. Structural analysis and synthesis of mechanisms; mobility of mechanisms; Burmester theory; instantaneous kinematics and curvature theory; design of planar mechanisms for prescribed finite positions, higher order motions, mixed positions, and complex motions; computer aided linkage synthesis. Undergraduate level courses in Dynamics of Machinery, Dynamics of Machinery II, or Robotics needed for this course.

**ME 6610 - Fatigue and Wear in Mechanical Design**

Lec. 3. Cr. 3. Design for life and reliability, consideration of stress-life fatigue, strain-life fatigue, fatigue crack growth, and wear; applications and analysis tools. Undergraduate level course in applied machine design or consent of instructor needed for this course.

**ME 6620 - Plasticity and Creep in Mechanical Design**

Lec. 3. Cr. 3. Design for static strength and creep resistance, consideration of plastic mechanical and thermal stress-strain states; applications and analysis tools. Undergraduate level courses in applied machine design or consent of instructor needed for this course.

**ME 6640 - Advanced Robotics**

Lec. 2. Lab.2. Cr. 3. Design, analysis, programming, dynamics, and control of robotic systems; mobile robots; walking robots; redundancy and manipulability, applications and projects. Undergraduate level courses in robotics needed for this course.

**ME 6710 - Advanced Dynamics of Machinery**

Lec. 3. Cr. 3. Prerequisite: ME 4640 (5640). Relative motion of two- and three-dimensional systems; dynamics of particles and machine elements; Lagrangian mechanics; energy methods, equations of motion and computer-aided solution methods, analysis and synthesis of linear and nonlinear mechanical dynamic systems; dynamics of planar linkages, gear trains, and cam-follower systems; balancing of rotors and mechanisms; engine dynamics.

**ME 6730 - Modal Vibration Analysis**

Lec. 2. Lab. 2. Cr. 3. Fourier transforms. Linear vibration analysis of n degree of freedom mechanical structures. Laboratory experience with rectangular and curved structures. Evaluation of mode shape, natural frequencies and damping coefficients. Computer model compared to a laboratory solution. Undergraduate level course in machine vibrations needed for this course.

**ME 6810 - Advanced Materials Science-I**

Lec. 3. Cr. 3. Diffusion in the solid state, binary and ternary phase diagrams, reaction kinetics, alloy design, and advanced materials characterization. Undergraduate level course in materials and processing needed for this course.

**ME 6830 - Advanced Computer-Aided Design and Manufacturing**

Lec. 2. Lab. 2. Cr. 3. Modeling and simulation methods to understand the impact of product design on manufacturing; transforming CAD geometry into useful modeling representations; thermal and dynamics loads, geometric and material; and structural

optimization. Undergraduate level course in machine design and finite element analysis or consent of instructor needed for this course.

**ME 6900 - Special Topics in Mechanical Engineering**

Cr. 1-6. Prerequisite: Approval by departmental chairperson. Lecture and/or laboratory and library work on special topics or problems of current interest in mechanical engineering.

**ME 6930 - Theory of Elasticity**

Cross-listing: CEE 6930

Lec. 3. Cr. 3. Prerequisite: Consent of instructor. Fundamental laws of continuum mechanics; Cartesian tensors; analysis of stress and strain; two-dimensional problems in rectangular and polar coordinates; torsion of various shaped shafts.

**ME 6990 - Research and Thesis**

Cr. 1, 3, 6, 9.

**ME 7040 - Mass Transfer**

Lec. 3. Cr. 3. Prerequisite: ME 6050. Mass diffusion in solids, liquids, and gases; transport equations for multicomponent systems; laminar forced and natural convective mass transfer; mass transfer in turbulent flows; interface mass transports.

**ME 7070 - Fluid Mechanics of Suspensions**

Lec. 3. Cr. 3. Prerequisite: ME 6040, or ME 6360, or consent of instructor. Balance laws; constitutive equations; exact solutions; applications.

**ME 7080 - Advanced Viscous Flow**

Lec. 3. Cr. 3. Prerequisite: ME 6040, or ME 6360, or consent of instructor. Steady and transient solutions of Navier- Stokes equations; advanced similarity solutions; flows with variable thermal properties and viscous dissipation; elementary non-Newtonian flow; stability of laminar flow and transition to turbulence.

**ME 7090 - Computational Fluid Dynamics**

Lec. 3. Cr. 3. Prerequisite: ME 6040, or ME 6360, or consent of instructor. Computation of inviscid, boundary-layer, supersonic, and transonic flows; models of turbulence; compressible Navier-Stokes equations.

**ME 7100 - Turbulence**

Lec. 3. Cr. 3. Prerequisite: ME 6040, or ME 6360, or consent of instructor. Balance laws; Reynolds stresses; microscale transport equations; shear layers, statistical theories, measurements.

**ME 7510 - Space Mechanisms**

Lec. 3. Cr. 3. Prerequisite: ME 6360, or ME 6930, or consent of instructor. Methods of analysis and synthesis of spherical and spatial manipulators/mechanisms using displacement matrices, screw vectors, screw matrices and quaternions, type of space mechanisms, mobility criteria; and transmission criteria.

**ME 7600 - Theory of Plates and Shells**

Cross-listing: CEE 7510

Lec. 3. Cr. 3. Prerequisite: CEE 6930 or consent of instructor. Bending and buckling of thin plates and shells. Vibration analysis of plates and shells.

**ME 7610 - Finite Element Analysis I**

Cross-listing: CEE 7610

Lec. 3. Cr. 3. Prerequisite: CEE 4130 (5130), CEE 6930, or consent of instructor. Analysis of stresses in a continuum by the finite element method. Computer applications.

**ME 7620 - Finite Element Analysis II**

Cross-listing: CEE 7620

Lec. 3. Cr. 3. Prerequisite: CEE 7610 or consent of instructor.

Higher order and isoparametric element formulations. Applications to problems in heat transfer and fluid mechanics. Introduction to commercial programs.

#### **ME 7640 - Theory of Inelastic Material Behavior**

Cross-listing: CEE 7640

Lec. 3. Cr. 3. Prerequisite: CEE 6930 or ME 6360. Constitutive equations for classical viscoelasticity. Exact solutions for simple constitutive laws. Incremental stress-strain relations for plasticity; yield surface and deformation theories. Application to engineering problems.

#### **ME 7650 - Continuum Theories of Materials**

Cross-listing: CEE 7650

Lec. 3. Cr. 3. Prerequisite: CEE 6930 or ME 6360 or consent of instructor. Continuum thermodynamics; balance laws and constitutive equations; applications for simple fluids, solids, thermoelastic solids, thermodiffusion and electrodynamics.

#### **ME 7660 - Fracture Mechanics**

Cross-listing: CEE 7710

Lec. 3. Cr. 3. Prerequisite: CEE 6930/ME 6930 Griffith-Irwin Theory, stress intensity factors; crack tip stresses; plasticity; fatigue crack propagation; fracture toughness testing; experimental aspects; design applications; special topics.

#### **ME 7670 - Fiber-Reinforced Composite Materials**

Cross-listing: CEE 7720

Lec. 2. Lab. 2. Cr. 3. Prerequisite: ME 6930/CEE 6930 Properties of orthotropic lamina; lamination theory; micromechanics; engineering tests; lamina strength theories; laminate strength theories, laminate strength; stress concentration effects.

#### **ME 7680 - Theory of Elastic Stability**

Cross-listing: CEE 7820

Lec. 3. Cr. 3. Prerequisite: CEE 6930 or consent of instructor. Beams-columns; elastic buckling of bars and frames; torsional buckling of thin-walled structures; lateral buckling of beams; bending and buckling of thin plates and shells.

#### **ME 7720 - Transfer Function Synthesis of Dynamic Systems**

Lec. 2. Lab. 2. Cr. 3. Prerequisite: ME 6710, ME 6730. Analysis of transfer function derivation, signature analysis of pulse excitation, transfer function synthesis from experimental data.

#### **ME 7810 - Advanced Materials Science-II**

Lec. 3. Cr. 3. Prerequisite: ME 6810 or equivalent. Advanced materials science with emphasis on solid state theories. Free electrons. The crystal lattice. Electrons in the lattice. Defect interactions.

#### **ME 7970 - Selected Topics**

Cr. 1-6.

#### **ME 7980 - Directed Study**

Cr. 1-6.

#### **ME 7990 - Research and Dissertation**

Cr. 1,3,6,9.

## **Music**

#### **MUS 4110 (5110) - History and Literature of Jazz**

Lec. 2. Cr. 2. Jazz traced from its multiethnic origin to its present day form and its influences on American culture. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

#### **MUS 4120 (5120) - Contemporary Music**

Lec. 2. Cr. 2. Prerequisite: MUS 3010 or 3020, MUS 2110-2120.

The culture of musical pluralism since World War II, including art music, jazz, rock, and folk. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

#### **MUS 4150 (5150) - Computer Applications in Music**

Lec. 3. Lab. Arr. Cr. 3. Prerequisite: MUS 2130. An introduction to computer applications in music performance, composition, teaching, and related fields. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

#### **MUS 4250 (5250) - Recording Techniques**

Lec. 2. Lab. Arr. Cr. 2. Prerequisite: MUS 2130. An introduction to sound recording, including analog and digital formats. Emphasis on applications appropriate to performing musicians. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

#### **MUS 4400 (5400) - Composition**

Cr. 1-3. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

#### **MUS 4500 (5500) - Conducting**

Cr. 1-3. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

#### **MUS 4710 (5710) - Supervised Teaching Experience I**

Cr. 1-3. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

#### **MUS 4720 (5720) - Supervised Teaching Experience II**

Cr. 2. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

#### **MUS 6000 - Ensemble Performance**

Lab. 2-5. Cr. 1. Participation in music ensemble with the area of specialization. May be repeated for credit.

#### **MUS 6010 - Research Techniques in Music**

Lec. 3. Cr. 3. An overview of bibliographic sources in music research. Scholarly writing and presentation in area of emphasis.

#### **MUS 6100 - Proseminar in Style and Analysis**

Lec. 3. Cr. 3. In-depth analysis of all parameters of selected musical examples; compositional procedures as a means of developing an intelligent rationale for interpretation.

#### **MUS 6110 - Score Study and Realization**

Lec. 3. Cr. 3. Techniques, principles, and practices of musical score preparation and analysis including solfeggio and appropriate keyboard skills.

#### **MUS 6120 - Seminar in Music Education**

Lec. 3. Cr. 3. A study of current methods and materials in Music Education (K-12) with an emphasis on research findings and applications.

#### **MUS 6200 - Seminar in Music History**

Lec. 3. Cr. 3. Focus on major genre, styles, or selected composers for an in-depth study of a particular topic.

#### **MUS 6220 - Survey of Literature for Homogeneous Ensembles**

Lec. 3. Cr. 3. A survey of the history and development of literature for homogeneous ensembles from early origins to the present.

#### **MUS 6330 - Advanced Choral/Instrumental Techniques**

Lec. 3. Cr. 3. Techniques and methodologies for teaching performing ensembles, grades 6-12.

#### **MUS 6400 - Applied Study**

Lec. 1-2. Cr. 1-2. Private study in the specialized medium of

performance. May be repeated for credit.

#### **MUS 6800 - Graduate Recital Performance**

Cr. 1. Performance of representative literature for the appropriate area of specialization.

#### **MUS 6900 - Graduate Performance Document**

Cr. 2. A scholarly paper reporting the results of research into problems such as style or analysis, which correlates with the Graduate Recital Performance MUS 6800.

## **Music Education**

#### **MUED 4850 (5850) - Workshop in Music Education**

Cr. 1-3. Laboratory approach providing opportunities for experienced music education personnel to study in depth music educational problems. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

#### **MUED 6600 - Foundations of Music Education**

Lec. 3. Cr. 3. A study of the historical foundations, aesthetic philosophies, practices, and reforms in music education.

#### **MUED 6920 - Topics**

Cr. 1-6. Laboratory approach providing opportunities for experienced music educators to study specialty areas.

## **Nursing**

#### **NURS 4210 - Health Care Research**

Cr. 3. Prerequisite: Statistics and/or permission of the instructor. This course builds upon the student's liberal arts background and basic health care knowledge, utilizing systematic inquiry and analysis by reinforcing the problem-solving method to utilize research in the improvement of health care practice to effect positive outcomes.

#### **NURS 4211 - Nursing Leadership and Management**

Cr. 3. Prerequisite: Admission to RODP-MSN program as a "bridge" student, or special permission; current RN licensure; completed bachelor's degree. This course examines managerial and leadership concepts, issues, roles, and functions as applied to the role of the professional nurse in various healthcare settings.

#### **NURS 4212 - Trends and Issues in Nursing and Healthcare**

Cr. 3. Prerequisite: Admission to RODP-MSN as a "bridge" student, or special permission; RN licensure; bachelor's degree. This course explores and analyzes socioeconomic and political variables that affect professional nursing and healthcare.

#### **NURS 4213 - Community Health**

Cr. 3. Prerequisite: Admission to the RODP-MSN program as a "bridge" student. Community Health provides a theoretical background for the study of community health nursing and is based on the synthesis of nursing theory and public health science. Emphasis is on health promotion, health maintenance and disease prevention among populations. The course assists students to recognize and analyze the interrelationships between individuals, families, population groups, and communities in determining the health status of each. The impact of political, economic, social, environmental, and cultural concerns on the health of populations is examined.

#### **NURS 6000 - Theoretical Foundations**

Cr. 3. Prerequisite: Admission to the RODP-MSN program or permission of Coordinator. This course provides the student with the theoretical foundations for advanced nursing. The focus of the course is on the critical components of contemporary nursing

knowledge; exploration of the nature of theory development in nursing; examination of relevance of concepts from basic and applied sciences; analysis and evaluation of nursing and related theories; and relevance of theory in terms of impact on professional nursing practice, and individuals, families, groups as clients in health care systems.

#### **NURS 6001 - Health Care Policy**

Cr. 3. Prerequisite: Admission to the RODP-MSN program or permission of Coordinator. The primary focus of this course is the analysis of healthcare systems. Public and private healthcare delivery systems are examined. Students explore future challenges and processes to improve systems.

#### **NURS 6002 - Advanced Nursing Research**

Cr. 3. Prerequisite: Admission to the RODP-MSN program or permission of Coordinator. This course involves the systematic examination and application of the research process. The concept of evidenced-based practice and its application to nursing is critically examined.

#### **NURS 6003 - Advanced Role Development**

Cr. 3. Prerequisite: Admission to the RODP-MSN program. This course provides students with an in-depth understanding of the legal, historical, political, social, and ethical aspects of advanced nursing. Traditional and emerging roles for advanced nursing are examined.

#### **NURS 6101 - Advanced Health Assessment**

Cr. 3. Prerequisite: Admission to the RODP-MSN program. This course prepares the Advanced practice nurse to conduct focused and comprehensive health assessments of clients across the lifespan. The process of diagnostic reasoning is emphasized as the primary means of collecting and analyzing data obtained from the client history, physical examination, and diagnostic procedures.

#### **NURS 6102 - Advanced Health Assessment - Clinical**

Cr. 1. Prerequisite: Admission to the RODP-MSN program or permission of coordinator. Corequisite: NURS 6101. This clinical course emphasizes the application of advanced assessment techniques to perform focused and comprehensive health assessments of clients across the lifespan. Clinical analysis and synthesis of physical assessment data and diagnostic reasoning skills are developed.

#### **NURS 6103 - Advanced Pathophysiology**

Cr. 3. Prerequisite: Admission to the RODP-MSN program. An in-depth scientific knowledge base relevant to selected pathophysiological states confronted by advanced practice nurses is explored. This course provides a basis for the foundation of clinical decisions related to selected diagnostic tests and the initiation of therapeutic regimens. Pathophysiology across the lifespan is correlated to clinical diagnoses and management.

#### **NURS 6104 - Advanced Pharmacology**

Cr. 3. Prerequisite: Admission to the RODP-MSN program. This course provides advanced pharmacology and therapeutics used in the treatment of selected health conditions commonly encountered by the advanced practice nurse. Emphasis focuses on the decision making process utilized to prescribe and monitor pharmacotherapeutics appropriate to the client situation.

#### **NURS 6201 - Theories of Nursing Education**

Cr. 3. Prerequisite: NURS 6000. This course explores major research-based theories of Adult learning and knowledge development in nursing. These theories will be examined for their utility across a variety of settings/and or levels of education.

#### **NURS 6202 - Teaching Strategies and Evaluation**

Cr. 3.

Prerequisite: Admission to the RODP-MSN program. This course provides the learner with knowledge necessary for competent classroom and clinical teaching. Methods of teaching students at the university, community college, and healthcare settings in classroom, seminar and electronic formats are explored. Evaluation methods used in the classroom and in clinical instruction are included.

#### **NURS 6203 - Curriculum Design Advanced**

Cr. 3. Prerequisite: NURS 6201. This course introduces the student to traditional and contemporary considerations for curriculum planning and design as applied to nursing education. Emphasis is placed on philosophy, theory, objectives, curriculum designs, and total program evaluation.

#### **NURS 6207 - Clinical Focus Practicum**

Cr. 2. (8 contact hours) Prerequisite: NURS 6103, 4 hours (2 courses) in selected clinical focus area. This practicum experience focuses on the synthesis of previously gained knowledge and skills in the provision of advanced nursing care to individuals, families and communities. Emphasis is placed on management of clients within a clinical focus area.

#### **NURS 6209 - Nursing Education Practicum**

Cr. 4. Prerequisite: NURS 6201, NURS 6202, NURS 6203, NURS 6207. This practicum experience is designed to integrate theory in a reality context of the teaching role. Opportunities are provided to participate in all phases of the teaching role, including clinical instruction in an area of specialization, and to experiment with different teaching methods.

#### **NURS 6301 - Nursing Administration I**

Cr. 3. Prerequisite: Admission to the RODP-MSN program. Comprehensive analysis of concepts required for effective performance of the nurse executive's role in organizations. Management as a function of the total organizational system is evaluated. Organizational designs and interpersonal relationships in the healthcare organization are critiqued.

#### **NURS 6302 - Nursing Administration II**

Cr. 3. Prerequisite: NURS 6301. A synthesis of concepts used for effective performance of the nurse executive's role in organizations. The use of human and financial resources in organizational development is explored.

#### **NURS 6303 - Health Care Economics**

Cr. 3. Prerequisite: Admission to the RODP-MSN program. Introduction to accounting and financial management focusing on the health care industry; includes understanding financial reports, cost behavior and profit analysis, cost allocation, pricing and service decisions, managerial accounting, planning and budgeting, time value analysis, and financial risk.

#### **NURS 6304 - Human Resources Management Quality**

Cr. 3. Prerequisite: NURS 6301. Personnel and human resource issues including labor management in nursing and health care settings.

#### **NURS 6305 - Management in Nursing and Health Care**

Cr. 3. Prerequisite: NURS 6301. Analysis of quality management system models in health care.

#### **NURS 6307 - Nursing Management Practicum**

Cr. 2. Prerequisite: NURS 6000, NURS 6001, NURS 6002, NURS 6003, NURS 6301, NURS 6302, NURS 6304. NURS 6305 This practicum experience integrates theory into a reality context of the nurse manager's role. Students will participate in various functions and phases of the nurse manager role. Students, faculty, and preceptors will evaluate the student's strengths and weaknesses related to the skills and competencies of nursing management.

Course includes 120 clock hours of clinical time.

#### **NURS 6309 - Nursing Administration Practicum**

Cr. 4. Prerequisite: NURS 6301, NURS 6302, NURS 6303, NURS 6304, NURS 6305. This practicum experience is designed to integrate theory in a reality context of the administrator's role. Opportunities are provided to participate in all phases of the executive role in different administrative settings.

#### **NURS 6401 - Introduction to Healthcare Informatics**

Cr. 3. Prerequisite: Digital Literacy. This course is the foundation of informatics study. It provides the theoretical framework for information management within various healthcare settings. Topics will include an overview of healthcare information systems and applications and national healthcare information management initiatives.

#### **NURS 6402 - Health Care Information Systems and Technology Integration**

Cr. 3. Corequisite by instructor/advisor permission only. NURS 6401. This course focuses the healthcare professional on the foundations of information system hardware and software interaction inclusive of the structure and function of networks and the Internet. Strategic planning tactics for technology assessment and integration will prepare students to lead technology integration projects in practice. Additional topics will include computer hardware found in healthcare information systems, interface standards, as well as human-computer interaction, such as ergonomics and workflow analysis.

#### **NURS 6403 - Project Management in Systems Analysis and Design**

Cr. 3. Prerequisite: NURS 6401. This course will explore the project management concepts and skills related to the analysis and design of information systems. Topics will include project management, systems lifecycle and solution design, vendor and system selection, and evaluating solutions against strategic objectives.

#### **NURS 6404 - Project Management in System Implementation and Evaluation**

Cr. 3. Prerequisite: NURS 6403. This course will explore the project management concepts and skills related to the implementation and evaluation of information systems. Topics will include project management, systems testing, implementation strategies, and solution valuation.

#### **NURS 6406 - Health Care Data Analysis and Evidence-Based Practice**

Cr. 2. Prerequisite: MS NURS 6002 and NURS 6402; MPS Prerequisite STAT 5140 and NURS 6402. This course presents the concepts related to complex data analysis within the healthcare environment and will focus on healthcare practice outcomes for quality improvement. Principles of data collection, organization, statistical analysis and interpretation will be presented. Students will use data analysis as a tool for problem identification and data mining.

#### **NURS 6407 - Informatics Applications I**

Cr. 2. Prerequisite: NURS 6402. This applications course integrates informatics concepts with tools used in healthcare informatics practice. Topics include database design, concept mapping, workflow analysis, and solution modeling.

#### **NURS 6409 - Informatics Applications II**

Cr. 2. Prerequisite: NURS 6404. This applications course integrates further informatics concepts with tools used in healthcare informatics practice. Topics include web applications, website and media design, and data presentation.

#### **NURS 6410 - Informatics Practicum**

Cr. 4. This practicum provides students with the opportunity to gain informatics-related experiences in the healthcare setting. Students will complete a minimum of 200 hours in the clinical setting functioning under the supervision of an informatics professional. Specific learning objectives will be developed based upon the clinical placement. Students will be eligible to write the ANCC certification exam following this practicum course.

**NURS 6501 - Advanced Adult Health Nursing I**

Cr. 3. Prerequisite: NURS 6000. This course focuses on the theoretical and conceptual basis for nursing management of the acutely ill client from social, cultural, psychological, physical, spiritual and economic perspectives.

**NURS 6503 - Advanced Adult Health Nursing II**

Cr. 3. Prerequisite: NURS 6000, NURS 6103, NURS 6501. This course focuses on the theoretical and conceptual basis for nursing management of clients experiencing chronic illness from social, cultural, psychological, physical, spiritual, and economic perspectives.

**NURS 6511 - Psychiatric Nursing Care I**

Cr. 3. Prerequisite: NURS 6103. This course will provide a foundation in the specialty care of individuals and families experiencing a psychiatric disorder.

**NURS 6513 - Psychiatric Nursing Care II**

Cr. 3. Prerequisite: NURS 6103. This course provides students with a conceptual theory-base for implementing advanced practice psychiatric nursing psychotherapy interventions.

**NURS 6522 - Core Concepts in Critical Care I**

Cr. 3. Prerequisite: NURS 6103. This course focuses on advanced concepts of critical care related to multiorgan/ system function and dysfunction. Nursing care relating to physiology, assessment, pathophysiology, system failure, and clinical management of the cardiovascular system, pulmonary system, renal system, and endocrine system are addressed. Core concepts of complex pathophysiology, current treatment modalities, and advanced nursing roles are integrated in discussions of providing care to critically ill patients.

**NURS 6523 - Core Concepts in Critical Care II**

Cr. 3. Prerequisite: NURS 6103. This course focuses on advanced concepts of critical care related to multi organ/system function and dysfunction. Nursing care relating to physiology, assessment, pathophysiology, system failure, and clinical management of the defense systems (infection, sepsis, organ/bone marrow transplant), shock, trauma, neurological system, hepatic system and gastrointestinal systems are addressed. Integrative core concepts with more complex pathophysiology and advanced treatment modalities of advanced nursing care are integrated to provide care to critically ill patients.

**NURS 6541 - Women's Health and Perinatal Nursing I**

Cr. 3. Prerequisite: NURS 6103. This course focuses on evidence-based care of the women experiencing common health alterations and developmental transitions. Nursing strategies will include health promotion, prevention of disease, maintenance, and restoration.

**NURS 6543 - Women's Health and Perinatal Nursing II**

Cr. 3. Prerequisite: NURS 6103, NURS 6541. This course focuses on evidence-based management and care of the pre-gestational, antepartum, intrapartum, and the puerperium woman. Focus will include selected alterations of pregnancy. In addition, management and care of the adaptive transitional stages of the newborn and parenting education are explored.

**NURS 6601 - Family Nurse Practitioner I**

Cr. 3. Prerequisite: NURS 6101, NURS 6102, NURS 6103, NURS

6104. Corequisite: NURS 6602. This course focuses on advanced practice nursing and health care management of women in diverse populations. Course content includes bio-psychosocial interactions, affecting women throughout the lifespan.

**NURS 6602 - Family Nurse Practitioner I - Clinical**

Cr. 2. Prerequisite: NURS 6101, NURS 6102, NURS 6103, NURS 6104. Corequisite: NURS 6601. The focus of this clinical course is delivery of advanced nursing care to women. Various clinical settings with diverse populations will be employed for clinical practice.

**NURS 6603 - Family Nurse Practitioner II**

Cr. 3. Prerequisite: NURS 6101, NURS 6102, NURS 6103, NURS 6104. Corequisite: NURS 6604. This course focuses on advanced practice nursing and healthcare management of adults and older adults in diverse populations. Course content includes developmental, physiological, pathological, and psychosocial changes relative to health maintenance, acute and chronic illnesses and life transitions.

**NURS 6604 - Family Nurse Practitioner II - Clinical**

Cr. 4. Prerequisite: NURS 6101, NURS 6102, NURS 6103, NURS 6104. Corequisite: NURS 6603. This clinical course is designed to provide the student with opportunities to deliver advanced nursing care to adults and older adults. The student is expected to complete health assessments of adults and older adults and develop comprehensive plans of care.

**NURS 6605 - Family Nurse Practitioner III**

Cr. 3. Prerequisite: NURS 6101, NURS 6102, NURS 6103, NURS 6104. Corequisite: NURS 6606. The focus of this course is on advanced nursing and healthcare management of children and adolescents. Course content includes developmental, physiological, pathological, and psychosocial changes relative to health maintenance, acute and chronic illnesses, and developmental transitions within the family context.

**NURS 6606 - Family Nurse Practitioner III - Clinical**

Cr. 2. Prerequisite: NURS 6101, NURS 6102, NURS 6103, NURS 6104. Corequisite: NURS 6605. This clinical course is designed to provide the student with opportunities to deliver advanced nursing care to children and adolescents in families and communities. In collaboration with nursing faculty and clinical preceptors various primary care settings will be employed for clinical practice.

**NURS 6609 - Advanced Family Nurse Practitioner Practicum**

Cr. 4. Prerequisite: NURS 6000, NURS 6101, NURS 6102, NURS 6103, NURS 6104, NURS 6605, NURS 6606. This practicum experience focuses on the synthesis of previously gained knowledge and skills in the provision of advanced nursing care to individuals, families and communities. Emphasis is placed on health promotion, disease prevention and clinical management of clients with common acute and chronic illness.

**NURS 6631 - Pediatric Nursing I**

Cr. 3. Prerequisite: NURS 6000, NURS 6101, NURS 6102. This course focuses on health maintenance and health promotion for well children and their families.

**NURS 6633 - Pediatric Nursing II**

Cr. 3. Prerequisite: NURS 6000, NURS 6101, NURS 6102. This course is designed to provide the advanced practice nurse with the necessary knowledge base to provide care for children and their families experiencing minor acute illness and chronic illness/disabilities. Content will emphasize common minor acute illnesses and chronic illness/disabilities typically seen in the ambulatory clinic site.

**NURS 6990 - Scholarly Synthesis/Research**

Cr. 3.

## Physics

### PHYS 5900 - Selected Topics in Physics

Cr. 3,6,9. Topics covered will be chosen on the basis of student interest and need.

## Pop Culture

### POPC 4010 (5010) - Topics

Lec. 1-3. Cr. 1-3. Special topics in popular culture. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

### POPC 4050 (5050) - Science Fiction and Fantasy

Lec. 3. Cr. 3. Analysis and discussion of themes, conventions, and stereotypes in short stories, novels, and films. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

### POPC 4060 (5060) - Detective Fiction

Lec. 3. Cr. 3. Private detectives, policemen, spies in fiction. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

## Professional Administration

### PADM 6310 - Leadership in Organizations

Cr. 3. This course is structure in survey format in order to inform the student about organizational theories and administrative behavior practices pertinent to organizations in America. The purpose of this course is to familiarize the student with a theoretical base for understanding organizations in America. Furthermore, this course will attempt to instruct the student on how to apply organizational theory to the practice of everyday life experiences within their respective organizations. Students will be expected to display their knowledge of "why" and "how" organizations look and function the way they do in various discussions, presentations, papers, and examinations.

## Professional Communications

### PC 4850 (5850) - Internship

Cr. 3,6,9,12. Part-time or full-time employment in a business, industrial, or institutional communications setting, related to student academic and career goals. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

### PC 4940 (5940) - Technical Editing

Lec. 3. Cr. 3. Prerequisite: PC 4970 (5970)/ENGL 4970 (5970) Principles and practices of technical editing. Same as JOUR 4940 (5940). Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

### PC 4970 (5970) - Professional Communication II

Lec. 3. Cr. 3. Continuation of PC 3250 with emphasis on more complex documents. (Same as ENGL 4970 (5970)). Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

### PC 4990 (5990) - Seminar in Professional Communication

Lec. 3. Cr. 3. Integrative course focusing on major concepts of professional communication. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

## Professional Studies

### PRST 6040 - Human Resources Management

Cr. 3. Analysis of theories, policies, procedures, practices and regulations relevant to attracting, retaining and directing a competent work force. Analysis of the basic personnel function with emphasis on the fact that all managers are "personnel managers." Integration of scientific theory, procedures, instruments, and federal regulations into personnel selections, placement, and security programs.

### PRST 6100 - Professional Environment: Issues and Ethics

Cr. 3. Overview of ethics in general, with practical tools for assessing ethical dimensions of professional life, diagnosing or identifying the moral issues at hand, and then developing reasonable options to address particular moral and ethical issues.

### PRST 6105 - Project Planning and Scheduling

Cr. 3. Contemporary methods used in project planning and scheduling; emphasis on critical path method (CPM) with computer application; solution of actual problems stressed. This graduate level course has a required text that includes a trial version of MS Project software that will be used during the semester. The course is project based.

### PRST 6200 - Globalization and the Professions

Cr. 3. The purpose of this course is to assess the impact of globalization on professional life. The course examines globalization as it relates to commerce, information flow, mass media, government, health care and education.

### PRST 6300 - Research Methods

Cr. 3. The student and application of research methods appropriate to professional studies. The course will provide a general introduction to research methods, as well as providing practical exposure to Problem Statements, Literature Reviews, Writing the Research Proposal, and Organization of the Research Report. Quantitative and Qualitative Research methodologies will be covered.

### PRST 6310 - Leadership in Organization

Cr. 3. Designed to inform the individual about the structure and behavior of actors at all levels of the organization. Through various exercises such as written assignments and discussion, the student will be able to understand "why" and "how" organizations operate and function under dynamic leadership.

### PRST 6400 - Instructional Design for Training and Development

Cr. 3.

### PRST 6410 - Evaluation of Learning

Cr. 3.

### PRST 6420 - Organizational Needs Analysis

Cr. 3.

### PRST 6430 - Instructional Design for Electronic Training

Cr. 3. This course will provide an overview of instructional design principles and best practices for implementing online training and professional development. The course will focus on using technology to facilitate development and delivery of training and professional development activities in a synchronous and asynchronous environment. It is designed for training and development specialist involved in support of the organizational mission.

### PRST 6440 - Teaching Online

Cr. 3. Prerequisite: PRST 6430.

### PRST 6450 - Computer-based Instruction

Cr. 3. Prerequisite: PRST 6430 and PRST 6440.

**PRST 6470 - Facilitation of Learning**

Cr. 3.

**PRST 6500 - Foundations of Leadership**

Cr. 3. Students will study leadership from a historical and contemporary perspective. Topics cover historical development, leadership theories, personal assessment, values and ethics, motivation, power, followership, group dynamics, diversity, controversy with civility, change process, and citizenship.

**PRST 6530 - Healthcare Systems Economics**

Cr. 3. It is expected that this course will facilitate your understanding of the traditional issues in health economics. This course will improve and broaden your knowledge of healthcare systems economics by exploring historical and current economic principles that guide the healthcare system. You will realize how the economy of our healthcare systems has reached the current status. This realization will be as a result of better understanding the impact of an aging population, the malpractice risk, the role of competition and government regulation, and the incentives used by pharmaceuticals and managed care insurers as they drive the healthcare systems. We will explore the health insurance market and managed care, the market for physicians' services, cost of healthcare in hospitals and other healthcare venues, labor issues, cost effectiveness analysis, equity and efficiency, role of government in the health economy, Medicaid and Medicare, international comparisons, and national health insurance.

**PRST 6540 - Health Informatics**

Cr. 3. This course is intended to expose students to the field of health informatics and to give them an understanding in the history, processes, and application of this field in the healthcare delivery system in the United States. Since health informatics is interdisciplinary, students must have already completed introductory courses in statistics, public health (or related subject), computer programming, and economics. Upon completion of this course, students will have a better understanding of healthcare delivery, the specific areas within health informatics, the application of computer technology in healthcare delivery, and the techniques, methodologies, and tools used in health informatics.

**PRST 6550 - Computer Based Decision Modeling for Healthcare Administrators**

Cr. 3. This course will provide an introduction to the principles and practice of decision modeling for financial and operational evaluation in the healthcare industry. Basic business spreadsheet techniques will be used to create models for strong decision support to assist in optimizing business decisions. It will introduce the use of statistical analysis and model development to health administration, healthcare program develop and evaluation, healthcare information management, emphasizing the use of computer technology (specifically MS Excel) across these areas.

**PRST 6560 - Biological Sciences for Healthcare Administrators**

Cr. 3. The focus of the course is to provide healthcare administrators with a basic understanding of the pathophysiological principles, as well as drug classes used, in the treatment of common medical diagnoses requiring admission to healthcare facilities.

**PRST 6570 - Public Health**

Cr. 3. The focus of this course is to explore the history and impact of public health initiatives in the United States and globally. Students will become familiar with public and private organized measures to prevent disease, promote health, and increase the quality of life among diverse populations. Students will learn to assess and monitor the overall health of populations, and use data to contribute to public health policy.

**PRST 6600 - Statistical Analysis**

Cr. 3. Prerequisite: PRST 6300. Analytical decision making including statistics, quantitative methods, and other optimization and simulation models.

**PRST 6700 - Conflict Management and Negotiation**

Cr. 3. Negotiation and Conflict Management presents negotiation theory—strategies and styles—within an employment context. A different topic will be presented each week. In addition to the theory and exercises presented in class, students practice negotiating with role-playing simulations in threaded discussions and chat. Students also learn how to negotiate in difficult situations, which include abrasiveness, racism, sexism, whistle blowing, and emergencies. The course covers conflict management from two (2) perspectives. From a first party perspective you will be directly engaged. As a third party, you will develop and enhance your skills in helping others deal directly with their conflicts, mediation, investigation, arbitration, and helping the system change as a result of a dispute.

**PRST 6770 - Computer-Based Decision Modeling**

Cr. 3. Topics covered within the course include basic business spreadsheet modeling, decision support using spreadsheet models, and optimization of business decisions using spreadsheet models. Models will be multidisciplinary in nature, stemming from areas such as operations, finance, and management. The contextual interpretation of results and their use in decisions will be emphasized.

**PRST 6800 - Organizational Skills and Development**

Cr. 3. Analysis of theory, practice and skills involved in leading organizational change, including: aligning change with the organizational strategy, understanding changes as part of a system, understanding the dynamics of and managing resistance to change, creating a vision to inspire others to become a part of the change process, the use of goal setting, feedback and incentives to promote change, and aligning individual's roles to support change. The course will blend learning from the texts and skill building.

**PRST 6810 - Masters of Professional Studies Internship**

Cr. 3. Internships offer the student an opportunity to observe and work in a professional setting while gaining valuable 'on the job training'. Internships for the MPS program should fit within the framework of the intern's concentration area (Strategic Leadership, Human Resource Leadership or Training and Development). The intern must complete the equivalent of 10 hours per week for 15 weeks (one semester) to receive three hours of credit (150 hours total). Course objectives will be established by the instructor in collaboration with the intern and field supervisor for the internship. The field supervisor will coordinate the work of the intern and provide and evaluation at the conclusion of the internship while the instructor for the course will be responsible for assigning the final grade.

**PRST 6910 - Employment and Human Resources Law**

Cr. 3.

**PRST 6920 - Diversity in the Workplace**

Cr. 3.

**PRST 6930 - Compensation and Benefits**

Cr. 3.

**PRST 6940 - Recruitment, Selection, and Retention**

Cr. 3.

**PRST 6998 - Professional Project**

Cr. 3. The Professional Project is the last requirement for the MPS Degree, serving as the integrative culmination of the program of study. It should be a substantial piece of independent research or a significant professional project that is logically consistent with

the theme and content of the program of study. Student's work should demonstrate familiarity with and understanding of a body of professional literature related to a specific topic. The Project should grow out of the program of study and should demonstrate the student's ability to use the knowledge gained from this program of study.

## Program Planning and Evaluation

### EDUP 7410 - Advanced Program Planning and Evaluation Methods I

Lec. 3. Cr. 3. Prerequisite: EDPY 7310, Advanced Educational Statistics, and EDU 7040, Program Planning and Evaluation. Exploration of advanced quantitative methods used to evaluate programs and improvement initiatives.

### EDUP 7420 - Advanced Program Planning and Evaluation Methods II

Lec. 3. Cr. 3. Prerequisite: EDU 7040 and EDUP 7410. Integration of assessment data into the strategic planning process.

### EDUP 7810 - Supervised Practicum in Program Planning and Evaluation

Cr. 3-9. Prerequisite: Consent of the student's doctoral chairperson required.

## Psychology

### PSY 4050 (5050) - Learning and Cognition

Lec. 3. Cr. 3. Theory, research, and applications in human learning, memory and cognitive processes. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

### PSY 4100 (5100) - Child Psychology

Lec. 3. Cr. 3. Prerequisite: PSY 2010 and PSY 3200. Hereditary and environmental influence on physical and psychological growth. Cognitive, affective, and language development of infant and child with emphasis on disorders and problems in development. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

### PSY 4130 (5130) - Physiological Psychology

Lec. 3. Cr. 3. Prerequisite: PSY 2010 and 3 additional PSY credits. Biological approach to understanding behavior. Students will focus on the anatomy and physiology of the nervous system in reference to behavior, perception, mental disorders, and drug addiction. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

### PSY 4140 (5140) - Health Psychology

Lec. 2. Lab. 2. Cr. 3. Prerequisite: Minimum grade of C in PSY 3110 or consent of instructor. Biopsychosocial approach to examining how stress, personality, and lifestyle are related to physical health. Students will experientially explore a variety of coping strategies and relaxation techniques geared toward self-assessment and understanding. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

### PSY 4150 (5150) - Psychology of Personality

Lec. 3. Cr. 3. Application of psychological principles to an understanding of personality, development, and interpersonal adjustments. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

### PSY 4200 (5200) - Adolescent Psychology

Lec. 3. Cr. 3. Origin and principles of behavior with emphasis on educational problems in guiding growth and development of adolescents. Students enrolled in the 5000-level course will be

required to complete additional work as stated in the syllabus.

### PSY 4250 (5250) - Introduction to Psychological Testing

Lec. 3. Cr. 3. Basic concepts in psychological testing; interpreting test scores; types of standardized tests. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

### PSY 4300 (5300) - Adult Psychology

Lec. 3. Cr. 3. Physical, cognitive, and psychological development in young adulthood, middle age, and old age. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

### PSY 4320 (5320) - Introduction to Therapeutic Techniques

Lec. 3. Cr. 3. Prerequisite: PSY 4150 (5150), PSY 4160 (5160), or consent of instructor. An introduction to various therapeutic techniques including analytic, nondirective, and broadly based behavioral approaches. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

### PSY 4400 (5400) - Psychopharmacology

Lec. 3. Cr. 3. Prerequisite: Junior standing. Drugs: the interaction between psychological and physiological effects on behavior. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

### PSY 4600 (5600) - Microcomputers in Psychological Research

Lec. 1. Lab. 4. Cr. 3. Prerequisite: PSY 3010 or consent of instructor. Introduction to the use of microcomputers in psychological research. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

### PSY 4800 (5800) - History of Psychology

Lec. 3. Cr. 3. Theoretical systems, experiments, and personalities in the development of modern psychology. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

### PSY 4810 (5810) - Concepts of Gerontology

Lec. 3. Cr. 3. Prerequisite: PSY 3200 or 3300 or SOC 1010. Physical and psychosocial aging processes. Issues in the care of the senior adult. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

### PSY 4903 (5903) - Special Topics

Cr. 3. Prerequisite: Junior standing or consent of instructor. Concentration on a special topic in psychology. Course may be repeated if topic is different. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

### PSY 4913 (5913) - Special Topics

Cr. 3. Prerequisite: Junior standing or consent of instructor. Concentration on a special topic in psychology. Course may be repeated if topic is different. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

### PSY 4920 (5920) - Special Topics

Cr. 1-3. Prerequisite: Consent of departmental chairperson. Concentration on a special topic in psychology. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

## Reading

### READ 4020 (5020) - Storytelling and Traditional Literature

Cross-listing: LSCI 4020 (5020)

Lec. 3. Cr. 3. Storytelling techniques and literature presentation through storytelling. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**READ 4310 (5310) - Reading-Writing Assessment and Intervention Strategies: K-8**

Lec. 2. Cr. 2. READ 3300 or READ 6340. Holistic views of reading and writing, naturalistic assessment, and appropriate intervention strategies. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**READ 4411 (5411) - Reading Writing Connections: Secondary**

Lec. 3. Cr. 3. Prerequisite: Full admission to Teacher Education. Explores the connection between the reading and writing process as a means of mutual improvement. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**READ 4540 (5540) - Multiethnic Literature for Infants, Toddlers, and Preschoolers**

Cross-listing: LSCI 4540 (5540)

Lec. 1. Cr. 1. Introduction to preschool trade books and related materials reflecting an understanding of multiethnicity. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**READ 4550 (5550) - Multiethnic Literature for Children**

Cross-listing: LSCI 4550 (5550)

Lec. 1. Cr. 1. Introduction to children's trade books and related materials reflecting an understanding of multiethnicity. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**READ 4560 (5560) - Multiethnic Literature for Adolescents and Adults**

Cross-listing: LSCI 4560 (5560)

Lec. 1. Cr. 1. Introduction to adolescent and adult trade books and related materials reflecting an understanding of multiethnicity. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**READ 4570 (5570) - Young Adult Literature**

Cross-listing: LSCI 4570 (5570)

Lec. 3. Cr. 3. Survey of books and materials for middle level, high school students, and adults focusing on techniques to assist in reading these materials with understanding. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**READ 6100 - Uses of Technology in Reading and Language Instruction**

Lec. 3. Cr. 3. Analysis of technological applications in literacy instruction; emphasis on computer uses in reading and language arts instruction.

**READ 6310 - Assessment and Intervention**

Cr. 3. Prerequisite: One reading course. Nature and causes of reading difficulties. Diagnostic and remedial procedures. Supervised practice in testing and remedial teaching.

**READ 6340 - Elementary and Middle School Reading Program**

Lec. 3. Cr. 3. Developmental reading skills, instructional procedures, materials, and evaluation.

**READ 6350 - Secondary School Reading Program**

Lec. 3. Cr. 3. Advanced reading skills, content area reading skills, organization and supervision of secondary reading programs.

**READ 6550 - Contemporary Children's Literature**

Cross-listing: LSCI 6550

Lec. 3. Cr. 3. To introduce students to children's authors and illustrators, poetry and traditional literature written for children and the psychology of reading.

**READ 6600 - Literature Across the Curriculum**

Cross-listing: LSCI 6600

Lec. 3. Cr. 3. Uses of literature in English/language arts, science, social studies, math, and other curricular areas. Equal emphasis on enhancement of content areas and integration across content areas.

**READ 6800 - Lab and Field Experiences in Education**

Cr. 3.

**READ 6900 - Problems in Reading**

Cr. 3. Prerequisite: Admission to candidacy. Independent study of pertinent issues in reading.

**READ 6920 - Topics**

Cr. 1-6. Independent study of reading-related issues.

**READ 6990 - Research and Thesis**

Cr. 6.

**READ 7000 - Seminar in Reading and Language Arts**

Lec. 3 Cr. 3. An examination and analysis of research, trends, and topics related to literacy education.

**READ 7010 - Literacy Across the Curriculum**

Lec. 3. Cr. 3. Explores applications of literacy skills and strategies in all curricular areas.

**READ 7020 - Family Literacy**

Lec. 3. Cr. 3. Issues related to enhancing literacy of all family members.

**READ 7370 - Linguistics: Theory and Application for Educations**

Cr. 3. Explores language structures (semantics, syntax, morphology, and phonology) and first and second language acquisition and development.

## Secondary Education

**SEED 4120 (5120) - Materials and Methods of Teaching English**

Lec. 3. Cr. 3. Corequisite: FOED 3820 or CUED 6800. Principles, objectives, techniques, evaluation in secondary school teaching of English. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**SEED 4121 (5121) - Materials and Methods of Teaching Career Technical Education**

Lec. 3. Cr. 3. Principles, objectives, Techniques, evaluation in secondary school teaching of occupational education. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**SEED 4122 (5122) - Materials and Methods of Teaching Mathematics**

Lec. 3. Cr. 3. Corequisite: FOED 3820 or CUED 6800. Principles, objectives, techniques, evaluation in secondary school teaching of Mathematics. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**SEED 4123 (5123) - Materials and Methods of Teaching the Sciences**

Lec. 3. Cr. 3. Corequisite: FOED 3820 or CUED 6800. Principles, objectives, techniques, evaluation in secondary school teaching of the sciences. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**SEED 4124 (5124) - Materials and Methods of Teaching Social Studies**

Lec. 3. Cr. 3. Corequisite: FOED 3820 or CUED 6800. Principles, objectives, techniques, evaluation in secondary school teaching of Social Studies. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**SEED 4125 (5125) - Materials and Methods of Teaching Foreign Languages**

Lec. 3. Cr. 3. Corequisite: FOED 3820 or CUED 6800. Principles, objectives, techniques, evaluation in secondary school teaching of Foreign Languages. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**SEED 4322 (5322) - Teaching Algebra in Middle/High School**

Cr. 3. Topics in Algebra, philosophy, new trends, and methods of teaching algebra in Grades 5-12.

**SEED 6120 - Seminar in Secondary Education**

Lec. 3. Cr. 3. A study of English Education with emphases on current research, traditions, and the teaching of Secondary English.

**SEED 6121 - Seminar in Secondary Industrial Education**

Lec. 3. Cr. 3. A study of Industrial Education past and present with emphasis on implications on the future for curriculum development, evaluation, and methods of teaching.

**SEED 6122 - Seminar in Secondary Social Studies Education**

Lec. 3. Cr. 3. Analysis of the history and assumptions of major curricular traditions, related research, and instructional strategies will be stressed.

**SEED 6123 - Seminar in Secondary Mathematics & Science**

Cr. 3. A study of science and math education with emphasis on trends and present practices.

**SEED 6210 - Secondary School Programs**

Lec. 3. Cr. 3. A study of curricular and instructional issues in various secondary school content areas as they relate to high school programs.

## Sociology and Political Science

**SOC 4010 (5010) - Organized Crime**

Cross-listing: CJ 4010 (5010)

Lec. 3. Cr. 3. Prerequisite: SOC 1010 or 1100 or consent of instructor. Organized crime in America as a product of legal, historical, cultural, and economic forces. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**SOC 4040 (5040) - Law and Culture (Anthropology)**

Cross-listing: CJ 4040 (5040)

Lec. 3. Cr. 3. Prerequisite: SOC 1010 or 1100 or consent of instructor. A comparative cross-cultural analysis of primitive, traditional, and modern attitudes toward law, social control, punishment, and individual responsibility. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**SOC 4080 (5080) - Sociology of Appalachia**

Lec. 3. Cr. 3. Prerequisite: SOC 1010 or 1100 or consent of instructor. An exploration of the people, culture, and political economy of Appalachia. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**SOC 4090 (5090) - Cross Cultural Communications and Cultural Diversity**

Lec. 3. Cr. 3. Prerequisite: SOC 1010 or 1100 or consent of instructor. An examination of the socio-cultural context of communication with emphasis upon enhancing communication skills across cultures. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**SOC 4120 (5120) - Sociology of Death and Dying**

Lec. 3. Cr. 3. Prerequisite: SOC 1010 or SOC 1100 or consent of the instructor. The social and cultural dimensions of death and dying in American society with emphasis on the meaning of death, the death industry, the social context of death and dying, and bereavement. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**SOC 4210 (5210) - Race, Ethnicity and Multiculturalism**

Lec. 3. Cr. 3. Prerequisite: SOC 1010 or 1100 or consent of instructor. Ethnic and cultural variations in the U.S. and similar mass societies. Emphasis on economic, political, and social relationships between ethnic groups. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**SOC 4220 (5220) - Sociology of Mass Communications**

Lec. 3. Cr. 3. Prerequisite: SOC 1010 or 1100 or consent of instructor. Historical and organizational analysis of various mass media and their content. Social issues and the mass media. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**SOC 4320 (5320) - Sociology of Religion**

Lec. 3. Cr. 3. Prerequisite: SOC 1010 or 1100 or consent of instructor. Cross-cultural analysis of religion as a social factor at the societal, organizational, and personality systems levels. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**SOC 4330 (5330) - Population and Social Process**

Lec. 3. Cr. 3. Prerequisite: SOC 1010 or 1100 or consent of instructor. Sociological analysis of the interrelationship between particular population characteristics and patterns of social organization. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**SOC 4430 (5430) - People in Organizations**

Lec. 3. Cr. 3. Prerequisite: SOC 1010 or 1100 or consent of instructor. Analysis of the structures and processes of large bureaucratic organizations, with emphasis on individuals' relationships to them. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**SOC 4500 (5500) - Sociology of Alcohol Abuse and Alcoholism**

Lec. 3. Cr. 3. Prerequisite: SOC 1010 or 1100 or consent of instructor. Sociological analysis of alcohol abuse and alcoholism; issues in prevention and rehabilitation; implications for education. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**SOC 4510 (5510) - Social Deviance**

Lec. 3. Cr. 3. Prerequisite: SOC 1010 or 1100 or consent of instructor. Examination of various groups who are identified as deviant due to their unacceptable behavior and relative powerlessness. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**SOC 4610 (5610) - Contemporary American Family**

Lec. 3. Cr. 3. Prerequisite: SOC 1010 or 1100 or consent of instructor. Models of family organization; variations in the institutional pattern; kinship; basic social trends affecting the family. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**SOC 4660 (5660) - Corrections**

Cross-listing: CJ 4660 (5660)

Lec. 3. Cr. 3. Prerequisite: SOC 1010 or 1100 or consent of instructor. Correctional services, practices and issues with particular attention to the maximum security adult institution. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**SOC 4810 (5810) - Concepts of Gerontology**

Lec. 3. Cr. 3 Prerequisite: PSY 3200 or 3300 or SOC 1010. Physical and psychosocial aging processes. Issues in the care of the senior adults. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**SOC 4830 (5830) - Medical Sociology**

Lec. 3. Cr. 3. Prerequisite: SOC 1010 or 1100 or consent of instructor. Examination of the significance of the complex relationship between attitudes, beliefs relating to the underlying causes of disease, the level of health characteristics, appropriate treatment practices and the role of the healer in various groups and societies. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**SOC 4860 (5860) - Social Movements and Social Change**

Lec. 3. Cr. 3. Prerequisite: SOC 1010 or 1100 or consent of instructor. Analysis of social movements and other kinds of planned and unplanned change in society. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**SOC 4900 (5900) - Internship in Sociology**

Lec. 3. Cr. 3. Prerequisite: 9 hours of sociology. See instructor prior to enrolling. Students are placed with and work in a public or private agency which is compatible with their interests. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**SOC 4910 (5910) - Independent Study (Anthropology)**

Cr. 1-3. Prerequisite: Consent of instructor. Allows the student to undertake study in an area of anthropology where there is no appropriate course. May be taken twice, provided that the topic is different. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**SOC 4920 (5920) - Data Analysis and Management**

Lec. 3. Cr. 3. Prerequisite: SOC 3910 or consent of instructor. The techniques of management and analysis of quantitative social science data from primary and secondary sources. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**SOC 4930 (5930) - Field Research Methods**

Lec. 3. Cr. 3. Prerequisite: SOC 2900 or consent of instructor. An in-depth examination and direct involvement with various qualitative research tools and techniques used by sociologists. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**SOC 4950 (5950) - Independent Study**

Cr. 1-3. Prerequisite: Consent of instructor. Allows the student to undertake study in an area of sociology where there is no appropriate course. May be taken twice, provided that the topic is different. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**SOC 4960 (5960) - Special Topics (Anthropology)**

Cr. 3. Prerequisite: Consent of instructor. Seminar or lecture course on a selected topic, issue, or interest area in anthropology. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**SOC 4970 (5970) - Special Topics**

Cr. 1-3. Prerequisite: Consent of instructor. Seminar or lecture course on a selected topic, issue, or interest area in sociology. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**SOC 4980 (5980) - Special Topics**

Cr. 1-3. Prerequisite: Consent of instructor. Seminar or lecture course on a selected topic, issue, or interest area in sociology. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**SOC 4990 (5990) - Special Topics**

Cr. 1-3. Prerequisite: Consent of instructor. Seminar or lecture course on a selected topic, issue, or interest area in sociology. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**SOC 5680 - Seminar in Comparative Family Institutions**

Lec. 3. Cr. 3. Cross-cultural analysis of family institutions, focusing mainly on a comparative study of social organizations.

## Spanish

**SPAN 4010 (5010) - Introduction to the Literature of Spain**

Lec. 3. Cr. 3. Prerequisite: SPAN 3010 or equivalent. Selections from the literature of Spain. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**SPAN 4020 (5020) - Introduction to the Literature of Spanish America**

Lec. 3. Cr. 3. Prerequisite: SPAN 3010 or equivalent. Selections from the literature of Spanish America. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**SPAN 4110 (5110) - Culture and Civilization of Spain**

Lec. 3. Cr. 3. Prerequisite: SPAN 3010 or equivalent. Lectures, readings, and discussion in Spanish on the culture and civilization of Spain. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**SPAN 4120 (5120) - Culture and Civilization of Spanish America**

Lec. 3. Cr. 3. Prerequisite: SPAN 3010 or equivalent. Lectures, readings, and discussion in Spanish on the culture and civilization of Spanish America. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**SPAN 4810 (5810) - Special Topics in Spanish**

Lec. 3. Cr. 3. Prerequisite: SPAN 3010. This course may be repeated if the topic is different. Qualified students may be able to take this course without the prerequisite by contacting the instructor. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**SPAN 6010 - Special Topics in Spanish**

Read. 1-4. Cr. 1-4. Concentrated readings in areas of special interest. Available to graduate students minoring in Spanish, with consent of departmental chairperson. (Maximum of 12 credits.)

## Special Education

**SEED 5422 (4422) - Teaching Secondary Mathematics Using Technology**

Cross-listing: Exploring technologies specific to mathematics teaching and appropriate applications of these technologies in the classroom.

Lec. 3. Credit 3.

**SPED 4000 (5000) - Introduction to Communication Disorders**

Lec. 3. Cr. 3. Principles of and therapeutic approaches to speech, language, and hearing disorders. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**SPED 4040 (5040) - Introduction to Education of Gifted and Talented**

Lec. 3. Cr. 3. Topics to include: characteristics, incidence, identification, diagnosis and educational needs of gifted and talented children/youth. Graduate work would include but not be limited to a case study of gifted persons. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**SPED 4050 (5050) - Sign Language I**

Lec. 3. Cr. 3. Introduction to and development of a basic vocabulary in Signed English and concepts in the use of alternated methods of communication. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**SPED 4090 (5090) - Sign Language II**

Lec. 3. Cr. 3. Prerequisite: SPED 4050 (5050) Continuation of vocabulary development in signed English and appreciation of practical situations in various professional fields. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**SPED 4130 (5130) - Methods for Teaching Persons with Mild and Moderate Disabilities**

Lec. 3. Cr. 3. Prerequisite: SPED 4320 or SPED 6320. Designed to empower the preservice special educator with skills necessary to implement an integrated curriculum in a variety of placements. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**SPED 4140 (5140) - Curriculum Development and Education of Gifted and Talented Children/Youth**

Lec. 3. Cr. 3. Topics to include: school programs, curricula, materials, and methods for the education of gifted and talented. Graduate work would include but not be limited to comparing and contrasting three models in gifted education. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**SPED 4150 (5150) - Speech and Language Acquisition and Development**

Lec. 3. Cr. 3. Normal speech/language development, anatomy of speech structures, distinctive features and implications of process and analysis systems. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**SPED 4160 (5160) - Speech Pathology in the Schools**

Lec. 3. Cr. 3. Prevalence and types of speech/language disorders in school-aged children. Programs for identification, conservation and remediation. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**SPED 4200 (5200) - Teaching Students with Autism Spectrum Disorders**

Lec. 3. Cr. 3. Within the context of persons with ASD, this course is designed to provide the student with a model of the teaching process progressing from identification, to instructional design, to the use of research-validated methods for instructional delivery and the provision of needed educational, social, academic, and behavioral supports.

**SPED 4340 (5340) - Systematic Instruction of Persons with Comprehensive Disabilities**

Lec. 3. Cr. 3. Prerequisite: SPED 4030 and full admission to the second level. Corequisite: SPED 382C. Examination of assessment procedures, effective and efficient instructional approaches for achievement of learning mastery and proficiency. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**SPED 4850 (5850) - Workshop in Education**

Cr. 1-6. Laboratory approach providing opportunities for experienced education personnel to study in-depth special education problems. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**SPED 5010 - Survey of Early Childhood Special Education**

Lec. 3. Cr. 3. Overview including history, current status, trends, and best practices specific to assessment, intervention, and family empowerment.

**SPED 6000 - Behavioral Interventions and Supports**

Lec. 3. Cr. 3. The design, implementation, and evaluation of behavioral interventions and individualized behavioral supports for children and youth with disabilities who display challenging behavior.

**SPED 6010 - Survey of Disability Characteristics, Procedures, and Methods in Special Education**

Lec. 3. Cr. 3. A survey of the characteristics and educational needs of persons with disabilities; educational methods and procedures.

**SPED 6020 - Intellectual Disability**

Lec. 3. Cr. 3. Prerequisite: SPED 6010 or consent of instructor. An overview of historical and current concepts and practices concerning children who are mentally retarded.

**SPED 6030 - Learning Disabilities**

Lec. 3. Cr. 3. Prerequisite: SPED 6010. A detailed overview of historical and contemporary concepts and practices concerning children with specific learning disabilities.

**SPED 6040 - Youth with Emotional Disturbance**

Lec. 3. Cr. 3. Prerequisite: SPED 6010 or consent of instructor. An analysis of theories, identification, diagnosis, treatment, and education of children and youth with emotional behavior disorders.

**SPED 6050 - Introduction to Applied Behavior Analysis**

Lec. 3. Cr. 3. An introduction to the application of applied behavior analysis including the theoretical origins and development of behavioral supports for individuals with learning and behavioral challenges.

**SPED 6060 - Education of Orthopedic and Motor Impaired**

Lec. 3. Cr. 3. Prerequisite: SPED 6010. Research and program intervention in learning abilities of individuals with orthopedic and neurologic limitations and other health-related programs.

**SPED 6120 - Early Childhood Special Education Assessment**

Lec. 3. Cr. 3. Prerequisite: CFS 2400 and CFS 2410 or SPED 5010 or consent of instructor. Assessment, planning, and intervention procedures specific to child, environment, and family. Design and evaluation of intervention plans.

**SPED 6320 - Assessment of Persons with Disabilities**

Lec. 3. Cr. 3. Prerequisite: SPED 6010. Provides the student with knowledge and skills in the administration and interpretation of educational assessment instruments used in the evaluation of persons with disabilities.

**SPED 6490 - Readings and Research in Special Education**

Cr. 1-9. Prerequisite: (SPED faculty sponsor required.) Supervised

study and analysis of selected timely issues in professional special education research.

**SPED 6810 - Practicum and Seminar in Special Education**

Cr.1-9. Prerequisite: SPED 6010 and prerequisite or corequisite of SPED 5130 or SPED 5340. Supervised participation and seminar in special education programs for exceptional children.

**SPED 6900 - Problems in Special Education**

Cr. 3. A critical study of problems of special education with special attention to research findings.

**SPED 6920 - Topics**

Cr. 1-9. Laboratory approach providing opportunities for experienced educational personnel to study in-depth special education problems of persons with disabilities.

**SPED 6990 - Research and Thesis**

Cr. 3,6.

**SPED 7110 - Family Collaboration in Special Education**

Lec. 3. Cr. 3. Concepts, intervention strategies, and issues related to working with parents of exceptional children.

**SPed 7300 - Seminar in Special Education**

Cr. 1-9. A critical study of current issues in Special Education (variable topics).

**SPED 7800 - Laboratory and Field Experiences in Education**

Cr. 3-4. Supervised practicum, observation, simulation, internships, and externships in education, including direct instruction in and/or supervision of education programs serving exceptional children, youth, and adults.

**SPED 7810 - Internship and Seminar in Special Education**

Cr. 1-9. Prerequisite: Advanced graduate standing or permission of instructor. Supervised participation in community-based special education programs for exceptional individuals.

**SPED 7910 - Advanced Research Project in Special Education**

Cr. 3. Individually designed to meet the needs of the graduate student, including research skills and study (faculty sponsor required).

## Speech

**SPCH 4000 (5000) - Introduction to Communication Disorders**

Lec. 3. Cr. 3. Principles of and therapeutic approaches to speech, language, and hearing disorders. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**SPCH 4150 (5150) - Speech and Language Acquisition and Development**

Lec. 3. Cr. 3. Normal speech/language development, anatomy of speech structures, distinctive features and implications of process and analysis systems. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**SPCH 4320 (5620) - Advanced Public Speaking**

Fall (E). Lec. 3. Cr. 3. Prerequisite: SPCH 2410. Advanced oral communications as practiced from the platform, with emphasis on special types of speaking. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**SPCH 4430 (5430) - Interpersonal Communication**

Lec. 3. Cr. 3. Communication theory applied to informal and face-to-face situations. Students enrolled in the 5000-level course will be

required to complete additional work as stated in the syllabus.

**SPCH 4620 (5620) - Advanced Public Speaking**

Lec. 3. Cr. 3. Prerequisite: SPCH 2410. Advanced oral communications as practiced from the platform, with emphasis on special types of speaking.

**SPCH 4630 (5630) - Persuasion**

Lec. 3. Cr. 3. Prerequisite: SPCH 2410 or consent of instructor. Promotes intellectual understanding and critical application of how individuals and groups influence the attitudes, beliefs, and behaviors of others. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**SPCH 5410 - Organizational Communication**

Lec. 3. Cr. 3. Prerequisite: Graduate-level status or by permission of the instructor. An exploration of communication principles operant in modern organizations and approaches to the understanding of communicative culture in these organizations.

**SPCH 5601 - Special Topics in Speech Communication**

Lec. 1. Cr. 1. Prerequisite: Graduate-level status. May be repeated to a maximum of nine (9) hours with change in course content. Presentation of directed, individual research in selected topics in speech communication beyond regular course offerings. Subjects will vary and will be specified at time of offering.

**SPCH 5602 - Special Topics in Speech Communication**

Lec. 2. Cr. 2. Prerequisite: Graduate-level status. May be repeated to a maximum of nine (9) hours with change in course content. Presentation of directed, individual research in selected topics in speech communication beyond regular course offerings. Subjects will vary and will be specified at time of offering.

**SPCH 5603 - Special Topics in Speech Communication**

Lec. 3. Cr. 3. Prerequisite: Graduate-level status. May be repeated to a maximum of nine (9) hours with change in course content. Presentation of directed, individual research in selected topics in speech communication beyond regular course offerings. Subjects will vary and will be specified at time of offering.

## Theatre

**THEA 4100 (5100) - Advanced Acting**

Lec. 3. Cr. 3. Prerequisite: THEA 2100. Advanced voice and movement study for the stage with an emphasis on period acting styles; in-depth script and character analysis; advanced scene study. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**THEA 4121 (5121) - Shakespeare**

Cross-listing: ENGL 4121 (5121)  
Fall. Lec. 3. Cr. 3. Historical, thematic, and other approaches in the study of Shakespeare. (May be repeated once as an elective, provided the course content is different.) Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

**THEA 4400 (5400) - Dramatic Literature**

Lec. 3. Cr. 3. Study of representative plays drawn from the classical through contemporary periods. Students enrolled in learning and teaching device. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus. The 5000-level course will be required to complete additional work as stated in the syllabus.

**THEA 4500 (5500) - Creative Dramatics**

Lec. 3. Cr. 3. Use of an individual's dramatic imagination as a learning and teaching device. Students enrolled in the 5000-level

## Governance

### Tennessee Board of Regents State University and Community College System of Tennessee

The Honorable Bill Haslam (ex officio), Chairman  
Governor of Tennessee

Mr. Gregory Duckett, Vice-Chair  
9th Congressional District (Memphis)

Mr. John Farris  
At-Large, West Tennessee (Memphis)

Mr. Darrell S. Freeman  
7th Congressional District (Nashville)

Mr. Tom Griscom  
3rd Congressional District (Chattanooga)

The Honorable Kevin S. Huffman (ex officio)  
Commissioner of Education, Tennessee

Ashley Humphrey, Student Regent  
(Lakesite)

The Honorable Julius Johnson (ex officio)  
Commissioner of Agriculture, Tennessee

Mr. Jonas Kisber  
8th Congressional District (Jackson)

Ms. Fran Marcum  
4th Congressional District (Tullahoma)

Dr. Richard G. Rhoda, Executive Director,  
Tennessee Higher Education Commission

Mr. Howard Roddy  
At-Large, East Tennessee (Chattanooga)

Ms. Emily J. Reynolds  
At-Large, Middle Tennessee (Nashville)

Mr. J. Parker Smith  
1st Congressional District (Kingsport)

Dr. John D. Styles  
6th Congressional District (Cookeville)

Mr. Robert P. Thomas  
5th Congressional District (Nashville)

Ms. Dannie Varlan, Faculty Regent  
(Knoxville)

Ms. Deana Wallace, Faculty Regent  
(Waverly)

### Presidents of Tennessee Technological University

**Philip Oldham** 2012 - present  
B.S., Freed-Hardeman University, 1980;  
Ph.D., Texas A&M University, 1985.

**Robert R. Bell** 2000 - 2012  
B.S., University of Florida, 1969;  
M.A., 1970; Ph.D., 1972.

**Angelo Anthony Volpe** 1987 - 2000  
B.S., Brooklyn College, 1959;  
M.S., University of Maryland, 1962;  
Ph.D., 1966.

**Wallace Samuel Prescott** 1985 - 1987  
B.S., Tennessee Polytechnic Institute, 1946;  
M.S., The University of Tennessee, 1952  
Ph.D., University of Illinois, 1961.

**Arliss Lloyd Roaden** 1974 - 1985  
A.A., Cumberland Junior College, 1949;  
B.A. Cum Laude, Carson-Newman College, 1951;  
M.S., The University of Tennessee, 1958;  
Ed.D., 1961.

**William Everett Derryberry** 1940 - 1974  
B.A., Summa Cum Laude, The University of Tennessee,  
1928;  
B.A., (Honours) School of English Language and  
Literature; and M.A., Oxford University, Oxford, England,  
1932;  
D.Litt., University of Chattanooga, 1965;  
LL.D., Pepperdine College, 1967.

**James Millard Smith** 1938 - 1940  
B.S., West Tennessee State Teachers College, 1929;  
M.A., George Peabody College for Teachers, 1930.

**Quentin Miller Smith** 1920 - 1938  
B.S., George Peabody College for Teachers, 1917;  
M.A., 1927.

**Thomas Alva Early** 1916 - 1920  
University of Georgia

## Academic and Administrative Officers

**Dr. Philip Oldham**, President

**Dr. Bahman Ghorashi**, Provost and Vice President for Academic Affairs

**Dr. Mark Stephens**, Senior Associate Provost and Dean of the College of Graduate Studies

**Mr. Marc Burnett**, Vice President for Student Affairs, Vice President for Extended Programs and Regional Development; Dean, College of Interdisciplinary Studies

**Dr. Claire Stinson**, Vice President for Business and Fiscal Affairs

**Mr. Jeff Young**, Associate Vice President for Business and Fiscal Affairs

**Mr. Jack L. Butler**, Associate Vice President of Facilities and Business Services

**Dr. Francis O. Otuonye**, Associate Vice President for Research

**Mr. Reid Christenberry**, Chief Information Officer of Information Technology Services

**Dr. Sharon Huo**, Associate Provost

**Dr. Lizabeth Self-Mullens**, Dean of the College of Agriculture and Human Ecology

**Dr. Paul Semmes**, Dean of the College of Arts and Sciences

**Dr. Kenneth Wiant**, Dean of the College of Business

**Dr. Jennifer Shank**, Interim Dean of the College of Education

**Dr. Joseph Rencis**, Dean of the College of Engineering

**Mr. Jeffrey Adams**, Director of Craft Center

**Dr. Douglas Bates**, Dean of University Library and Learning Assistance

**Mr. Edwin Boucher**, Dean of Students

**Mr. John Brooks**, Associate Vice President of Human Resources

**Dr. Alice Camuti**, Associate Dean of the College of Graduate Studies

**Ms. Kae Carpenter**, University Counsel

**Ms. Evelyn Chambers**, Assistant Director of Human Resources

**Mr. Jim Cobb**, Director of Campus Safety and Environmental Services

**Dr. Theresa Ennis**, Director of University Assessment

**Dr. Billye Foster**, Director, School of Agriculture

**Ms. Elizabeth Gays**, Manager of Human Resources

**Dr. Melissa Geist**, Dean of the College of Interdisciplinary Studies

**Dr. Chester Goad**, Director of Disability Services

**Ms. Lynn Haley**, Interim Director Career Services

**Dr. Bobby Hodum**, Associate Vice President of Enrollment Management

**Dr. Glenn James**, Director of Institutional Research

**Prof. Regina Lee**, Head of Library Government Publications; Secretary of the Faculty Senate

**Mrs. Karen Lykins**, Associate Vice President of Communications and Marketing

**Mr. Lester McKenzie**, Director of Financial Aid

**LTC Dominic Ciaramitaro**, Director of Military Science

**Ms. Deanna Metts**, Director of Internal Audit

**Dr. Brian O'Connor**, Associate Professor of Mathematics; President of the Faculty Senate

**Dr. Robert Owens**, Director of Minority Affairs

**Ms. Brandi Hill**, Interim University Registrar of Records and Registration

**Mr. Tiff Rector**, Associate Vice President University Development

**Ms. Bedelia Russell**, Dean of Whitson-Hestor School of Nursing

**Ms. Gay Shepherd**, Director of University Police

**Ms. Patricia Smith**, Director of Counseling Center

**Dr. Bharat Soni**, Vice President for Research and Economic Development

**Mr. Charles Wilkerson**, Director of International Education

**Mr. Mark Wilson**, Director of Athletics

## Graduate Faculty Roster

\* Associate Member

### A

**ABLAMOWICZ, Halina, Ph.D.**, Professor of English  
Southern Illinois University

**ABLAMOWICZ, Rafal, Ph.D.**, Professor of Mathematics  
Southern Illinois University

**AIRHART, Douglas L., Ph.D.**, Professor of Plant and Soil  
Science  
University of Georgia

**AKENSON, James E., Ph.D.**, Professor of Elementary Educa-  
tion  
University of Wisconsin

**ALLCOTT, Dan**, Professor, Music

**ALLEN, Michael R., Ph.D.**, Associate Professor of Mathematics  
University of Georgia

**ALOUANI, Ali T., Ph.D.**, Professor of Electrical Engineering  
University of Tennessee

**ANDERSON, Adam L., Ph.D.**, Assistant Professor of Electrical  
& Computer Engineering  
University of California San Diego

**ANDERSON, Melinda, Ph.D.**, Director of Human Ecology  
Tennessee Technological University

**ANITSAL, Ismet, Ph.D.**, Professor of Economics, Finance &  
Marketing  
University of Tennessee

**ANITSAL, M. Meral, M.B.A.**, Associate Professor of Econom-  
ics, Finance & Marketing  
University of West Georgia

**ANTHONY, Holly Garrett, Ph.D.**, Associate Professor of Cur-  
riculum and Instruction  
University of Georgia

**ARCE, Pedro E., Ph.D.**, Professor of Chemical Engineering  
Purdue University

**ARMSTRONG, Curtis P., Ph.D.**, Assistant Professor of Deci-  
sion Sciences  
Florida State University

**AUSTEN, Jeffrey R., Ph.D.**, Associate Professor of Electrical  
Engineering  
University of Illinois

**AYIK, Sakir, Ph.D.**, Professor of Physics  
Yale University

### B

**BACHMAN, Gary R., Dr.**, Professor, Agriculture

**BADOE, Daniel A., Ph.D.**, Professor of Civil Engineering  
University of Toronto

**BAGLEY, C. Pat, Ph.D.**, Professor, College of Agricultural and  
Human Sciences  
Virginia Polytechnic Institute and State University

**BAILEY, Carolyn Sue, Ph.D.**, Professor of Human Ecology  
University of Wisconsin

**BAKER, Anthony D., Ph.D.**, Professor of English  
University of Louisville

**BAKER, Jane, Ph.D.**, Associate Professor of Curriculum and  
Instruction  
Tennessee Technological University

**BAKER, Julia, Ph.D.**, Assistant Professor of Foreign Languages  
University of Cincinnati

**BAKER, Julie C., Ph.D.**, Assistant Dean & Associate Professor  
in Curriculum & Instruction  
Tennessee Technological University

**BALLAL, S. K., Ph.D.** Professor of Biology  
University of Tennessee

**BARBER, Tye, Ph.D.**, Chemistry

**BARGER, Bonita B., Ed.D.**, Associate Professor of Decision  
Sciences and Management  
Vanderbilt University

**BARGER, T. Wayne, Ph.D.**, Professor Biology

**BARNARD, Debbie, Ph.D.**, Associate Professor of Foreign  
Languages  
Vanderbilt University

**BARNES, Rita, Ph.D.**, Professor, English

**BEACH, Jason, Ph.D.**, Assistant Professor, Curriculum and  
Instruction

**BECK, David L., Ph.D.**, Assistant Professor of Biology  
University of Virginia

**BELKACEMI, Rabie, Ph.D.**, Assistant Professor of Electrical  
& Computer Engineering  
West Virginia University

**BELL, J. Lebron, Ed.D.**, Professor of Physical Education  
University of Tennessee

**BELLENFANT, Terry N., Ph.D.**, (Adjunct Member)

**BERK, Sharon G., Ph.D.**, Professor of Biology  
University of Maryland

**BEST, Michael J., Ph.D.**, Professor Agriculture

**BEVELHIMER, Mark, Ph.D.**, Instructor, Biology

**BIERNACKI, Joseph J., D.E.**, Professor of Chemical Engineer-  
ing  
Cleveland State University

**BILYEU, William M., Ph.D.**, Instructor, Curriculum and Instruc-  
tion

**BIRDWELL, Michael E., Ph.D.**, Professor of History  
University of Tennessee Technological University

**BOLES, Jeffrey Oakley, Ph.D.**, Professor of Chemistry  
University of South Carolina

**BOLES, Tammy H., Ph.D.**, Assistant Professor, Environmental  
Studies

**BOSHART, Mark, Ph.D.**,\* Instructor of Computer Science  
University of Florida

**BOUNDS, Paulina J., Ph.D.**, Assistant Professor, English

**BRANSON, Janice L., Ph.D.**,\* Professor of Agriculture  
University of Tennessee

**BRASHEARS, Kathy, Ph.D.**, Professor of Curriculum and  
Instruction  
University of Kentucky

**BROWN, Christopher A., Ph.D.**, Associate Professor of  
Biology

University of Texas, Arlington

**BURDUCK, Michael L., Ph.D.**, Professor of English  
University of Mississippi

### C

**CALENDAR, Amy Lou Locke, Ed.S.**,\*

**CALENDER, Andrew, Ph.D.**, Assistant Professor of Chemis-  
try

University of Michigan, Ann Arbor

**CANFIELD, Stephen L., Ph.D.**, Professor of Mechanical  
Engineering

Virginia Polytechnic Institute and State University

**CARRICK, Jesse, Ph.D.**, Assistant Professor of Chemistry  
University of Alabama

**CARROLL, William R., Ph.D.**, Assistant Professor, Chemistry

**CARNAL, Charles L., Ph.D., P.E.**, Professor of Electrical Engi-  
neering University of Tennessee

**CARVER, Brian D., Ph.D.**, Assistant Professor of Biology  
University of Memphis

**CASHMAN, Derek, J., Ph.D.**,\* Instructor, Chemistry

**CATHEY, Robert Michael, Ph.D.**, Assistant Professor, Exercise Science and Physical Education Wellness

**CHAMBERS, Amy, Ph.D.**, Associate Professor of Mathematics  
University of Colorado-Boulder

**CHITIYO, George, Ph.D.**, Assistant Professor of Curriculum and Instruction

Tennessee Technological University

**CHRISTIANSON, Kevin E., Ph.D.**, Professor of English  
University of Wisconsin

**CLICK, Stephen M., Ph.D., P.E.**, Assistant Professor of Civil and Environmental Engineering  
North Carolina State University

**COMBS, Daniel L., Ph.D.**, Professor of Biology  
University of Missouri--Columbia

**COMER, Melissa, Ed.D.**, Professor of Curriculum and Instruction

University of Tennessee

**CONNER, Nathan, Ph.D.**, Assistant Professor, Agriculture

**COOK, Stephen Bradford, Ph.D.**, Professor of Biology  
Southern Illinois University

**CORRELL, Kimberly,\*** Instructor, Curriculum and Instruction

**CRAWFORD, Douglas E., Ph.D.**, (Adjunct Member)

**CREEK, Melissa**, (Adjunct Member), College of Business

**CRETER, Mark H., M.F.A.\*\*,** Professor of Theatre/Speech  
University of North Carolina at Greensboro

**CROUCH, L. K., Ph.D., P.E.**, Professor of Civil Engineering  
University of Missouri, Rolla

**CROUSE, David J., Ph.D.**, Associate Professor of Chemistry  
University of Nebraska

**CUI, Jie, Ph.D.**, Professor of Mechanical Engineering  
University of Iowa

**CUNNINGHAM, Glenn T., Ph.D., P.E.**, Associate Professor of Mechanical Engineering  
Tennessee Technological University

**CUPP, Jann Darryl, Ph.D.**, Professor of Counseling and Psychology

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**CURRIE, Kenneth R., Ph.D., P.E.**, Professor of Industrial Engineering

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## D

**DAINTY, Helen T., Ph.D.**, Professor of Curriculum and Instruction

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**DANNER, Gregory, Ph.D.**, Professor of Music  
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**DARVENNES, Corinne M., Ph.D.**, Professor of Mechanical Engineering

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**DATTA, Tania, Ph.D.**, Assistant Professor, Water Center

**DECKER, Charles, D.M.A.**, Professor of Music  
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**DEITER, Kristen, Ph.D.**, Assistant Professor of English  
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**DIFURIO, Ferdinand, Ph.D.**, Associate Professor of Economics  
Clemson University

**DING, Yun, Ph.D.**, Associate Professor of English  
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**DOLLAR, Kent T., Ph.D.**, Associate Professor of History  
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## E

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**ELIZANDRO, David W., Ph.D., P.E.**, Professor of Industrial Engineering

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**ELKEELANY, Omar, Ph.D.**, Associate Professor of Electrical and Computer Engineering

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**ELSAWY, Ahmed H., Ph.D.**, Professor of Industrial Technology  
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**ENGELHARDT, Paula, Ph.D.**, Associate Professor of Physics  
North Carolina State University

## E

**FESLER, Robert Dan, D.B.A.**, Professor of Accounting  
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**FIDAN, Ismail, Ph.D.**, Professor of Industrial Technology  
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**FOSTER, Sherrie, Ed.D.**, Assistant Professor of Counseling and Psychology

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## G

**GALBREATH, SUSAN, Ph.D.**

**GAO, Wenzhong., Ph.D.**

**GEIST, Melissa, Ed.D.**, Dean, College of Interdisciplinary Studies

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**GHAFOOR, Sheikh, Ph.D.**, Associate Professor of Computer Science

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**GHAFOORI, Nader, Ph.D.**

**GHORASHI, Bahman, Ph.D.**, Provost, Academic Affairs

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**GROUNDLAND, Mark, Ph.D.**, Associate Professor of Spanish  
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**GUIMARAES, Tor, Ph.D.**, Professor of Decision Sciences  
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**GUNDERSON, John H., Ph.D.**, Associate Professor of Biology  
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**GUNTER, Michael M., Ph.D.**, Professor of Political Science  
Kent State University

## H

**HAN, Samuel S. M., Ph.D.**, Professor of Mechanical Engineering

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**HANNAH, Kimberly J., Ph.D.**, Associate Professor of Nursing  
Walden University

**HARRISON, Michael, Ph.D.**, Professor of Geology  
University of Illinois

**HART, Evan, Ph.D.**, Professor of Geography  
University of Tennessee

**HARWOOD, John J., Ph.D.**, Professor of Chemistry  
University of Missouri

**HASAN, Syed Rafay, Ph.D.**, Assistant Professor of Electrical & Computer Engineering  
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**HAUSER, Joshua, D.M.A.**, Professor of Music  
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**HAYNES, Ada, Ph.D.**, Professor of Sociology & Philosophy  
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**HAYS, Colleen B., Ph.D.**, Associate Professor of Foreign Language  
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**HAYSLETTE, Steven E., Ph.D.**, Professor of Biology  
Auburn University

**HENDERSON, Robert Craig, Ph.D., P.E.**, Professor of Civil Engineering  
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**HENRY, CANDI, J.D.**, Adjunct Professor, School of Professional Studies  
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**HERMANN, Joseph W., M.M.E.**, Professor of Music  
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**HETZEL, Andrew J., Ph.D.**, Associate Professor of Mathematics  
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**HINTON, Paula K., Ph.D.\*** Associate Professor of History  
Miami University

**HOWARD, Martha, Ph.D.**, Assistant Professor of Curriculum & Instruction  
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**HOY, Darrell E. P., Ph.D.**, Professor of Mechanical Engineering  
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**HUDDLESTON, David H., Ph.D., P.E.**, Professor of Civil and Environmental Engineering  
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**HUGUENARD, Brian R., Ph.D.**, Associate Professor of Decision Sciences  
Carnegie Mellon University

**HUME, David, Ed.D.**, Associate Professor of Computer Science  
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**HUO, X. Sharon, Ph.D., P.E.**, Associate Provost  
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**I**

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**J**

**JARED, Barbara, M.S.N.**, Assistant Professor of Nursing  
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**JIANG, Xiaohua, Ph.D.**, Assistant Professor of Chemistry  
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**JOHNSON, Glen E., Ph.D.**, Professor of Mechanical Engineering  
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**K**

**KALYANAPU, Alfred, Ph.D.**, Assistant Professor of Civil & Environmental Engineering  
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**KASH, Graham S., Ph.D.**, Professor of English  
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**KENNEDY, Frederick, D.M.A.**, Professor of Music  
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**KHARIF, Wali R., Ph.D.**, Professor of History  
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**KILLMAN, Christy, D.A.**, Associate Professor of Health and Physical Education  
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**KLINE, Eugene A., Ph.D.**, Professor of Chemistry  
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**KNOX, Larry William, Ph.D.**, Professor of Geology  
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**KOLODZIEJ, Nancy, Ed.D.**, Professor of Curriculum and Instruction  
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**KOSA, Martha J., Ph.D.**, Associate Professor of Computer Science  
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**KOZUB, Raymond L., Ph.D.**, Professor of Physics  
Michigan State University

**L**

**LAIRD, Shirley D., Ph.D.**, Professor of English  
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**LAMPLEY, TRACY, Ed.D.**, Adjunct Professor, School of Professional Studies  
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**LANINGHAM, Susan D., Ph.D.**, Associate Professor of History  
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**LARIMORE, David Lee, Ph.D.**, Professor of Curriculum and Instruction  
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**LAURILA, Marketta A., Ph.D.**, Professor of Foreign Languages  
University of Wisconsin-Madison

**LEBORNE, Richard C., Ph.D.**, Professor of Mathematics  
University of California

**LEIMER, H. Wayne, Ph.D.**, Professor of Geology  
University of Missouri

**LI, Peter, Ph.D.**, Professor of Earth Sciences  
University of Iowa

**LISIC, Edward, Ph.D.**, Professor of Chemistry  
Virginia Polytechnic Institute and State University

**LIU, Y. Jane, Ph.D.**, Professor of Civil and Environmental Engineering  
University of Hawaii

**LIU, Yung-Way, Ph.D.**, Professor of Mathematics  
University of Delaware

**LOUTZENHEISER, Roy C., Ph.D., P.E.**, Associate Dean of Civil Engineering  
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**LUKE, Chad, Ph.D.**, Assistant Professor of Counseling and Psychology  
University of Tennessee, Knoxville

**M**

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**MAHAJAN, Satish M., Ph.D.**, Professor of Electrical Engineering

University of South Carolina

**MALONE, Laura Yvonne, Ph.D.**, Assistant Professor of Counseling and Psychology  
University of Tennessee

**MANNLE, Henry W., Ph.D.**, Professor of Criminology  
Florida State University

**MARQUIS, Jeffrey A., Ph.D.**, Associate Professor of Mechanical Engineering  
University of Kentucky

**MARTIN, Oneida L., Ed.D.** Associate Professor of Instructional Leadership  
University of Tennessee

**MATSON, Jack E., Ph.D.**, Associate Professor of Decision Sciences and Management  
University of Alabama

**MATSON, Jessica O., Ph.D., P.E.**, Professor of Industrial and Manufacturing Engineering  
Georgia Institute of Technology

**MATTINGLY, Hayden T., Ph.D.**, Professor of Biology  
University of Missouri

**MCCORMICK, Chris, M.M.\*** Professor of Music  
University of Rochester

**MCQUAIL, Josephine A., Ph.D.**, Professor of English  
University of Virginia

**MILLER, Christine, Ph.D.**, Professor of Business Management  
University of Houston

**MILLS, Allan D., Ph.D.**, Chair, Department of Mathematics  
Louisiana State University

**MOHR, Benjamin J., Ph.D.**, Associate Professor of Civil and Environmental Engineering  
Georgia Institute of Technology

**MORRIS, R. Winston, M.M.**, Professor of Music  
Indiana University

**MURDOCK, Justin N., Ph.D.**, Assistant Professor of Biology  
Kansas State University

## N

**NARIMETLA, Satya, Ph.D.**, Instructor of Mathematics  
Tennessee Technological University

**NATARAJAN, Ramachandran, Ph.D.**, Professor of Decision Sciences  
University of Kansas

**NORDEN, Jeffrey, Ph.D.**, Professor of Mathematics  
State University of New York--Binghamton

**NORRIS, Gwendolyn Lachelle, Ph.D.**, Professor of Sociology  
University of Tennessee

**NORTHRUP, Scott Hayes, Ph.D.**, Professor of Chemistry  
University of Colorado

**NULL, Linda J., Ph.D.**, Professor of English  
University of Tennessee

## O

**O'CONNOR, Brian M., Ph.D.**, Associate Professor of Mathematics  
University of Illinois

**OJO, Joseph O., Ph.D.**, Professor of Electrical and Computer Engineering  
University of Wisconsin, Madison

**O'ROURKE, Michael, M.A.**, Professor of English  
University of Iowa

**OTUONYE, Francis, Ph.D.**, Associate Vice President for Research and Professor of Civil and Environmental Engineering  
Ohio State University

**OWENS, Carl W., Ed.D.**, Professor of Curriculum and Instruction  
Tennessee State University

## P

**PARDUE, Sally J., Ph.D.**, Director STEM Operating  
Tennessee Technological University

**PASHLEY, Mary, Ph.D.**, Professor of Finance  
University of Tennessee, Knoxville

**PEDDIESON, John, Jr., Ph.D.**, Professor of Mechanical Engineering  
Virginia Polytechnic Institute and State University

**PELTON, Ted, Ph.D.**, Professor of English  
SUNY at Buffalo

**PHARR, Julie M., D.B.A.**, Professor of Marketing  
Mississippi State University

**PHILLIPS, Mike, Ph.D.**, Associate Professor of Physical Education  
Middle Tennessee State University, Murfreesboro

**PICKERING, Kristin, Ph.D.**, Professor of English  
University of South Carolina

**PINEDA, Rodley C., Ph.D.**, Associate Professor of Decision Sciences  
Texas Tech University

**PLANT, Jeff, Ph.D.**, Professor of Human Ecology  
Southern Illinois University

**PROPES, C. Elizabeth, Ph.D.**, Assistant Professor of History  
University of Mississippi

## Q

**QIU, Robert, Ph.D.**, Professor of Electrical and Computer Engineering  
Polytechnic University

## R

**RADMAN, Ghadir, Ph.D., P.E.**, Professor of Electrical and Computer Engineering  
Tennessee Technological University

**RAJAN, Periasamy K., Ph.D.**, Director, Center of Energy Systems Research and Professor of Electrical and Computer Engineering  
Indian Institute of Technology

**RAMEY, Kelly, Ed.S.**, Instructor  
Tennessee Technological University

**RAMIREZ, Guillermo, Ph.D.**, Associate Professor of Civil Engineering  
Colorado State University

**RAND, Richard S., Jr., Ph.D.**, Associate Professor of Accounting  
University of South Carolina

**RAYMONDO, James, Ph.D.**, Professor of Sociology  
University of Tennessee

**REAGAN, Patrick D., Ph.D.**, Professor of History  
Ohio State University

**REDDING, J. Michael, Ph.D.**, Professor of Biology  
Oregon State University

**RENCIS, Joseph, Ph.D., P.E., F.ASME, F.ASEE** Dean of Engineering, Clay N. Hixson Chair for Engineering Leadership, Professor of Mechanical Engineering  
Case Western Reserve University

**RICE-YORK, Cynthia, Ph.D.**, Assistant Professor of Chemical Engineering  
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**ROBERTS, Jeffery J., Ph.D.**, Associate Professor of History  
Ohio State University

**ROBERTS, Thomas H., Ph.D.**, Professor of Biology  
Mississippi State University

**ROBINSON, Stephen J., Ph.D.** Professor of Physics  
Sussex University

**ROGERS, Michael, Ph.D.**, Associate Professor of Computer Science  
University of Kentucky  
**RUSSELL, Bedelia, M.S.N.**, Dean, School of Nursing  
Vanderbilt University  
**RYAN, Edmond P., Ph.D., P.E.**, Associate Professor of Civil Engineering  
University of New Mexico

**S**

**SANDERS, J. Robert, Ph.D.** Assistant Professor of Chemical Engineering  
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**SCHLOSSER, Jennifer A.**, Ph.D., Assistant Professor, Sociology and Political Science  
**SAYA, Tom, M.F.A.** Professor of English  
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**SCOTT, Stephen L., Ph.D.** Boeing Professor of Computing  
Kent State University  
**SEAY, Robert A., Ph.D.**, Associate Professor, Accounting  
**SEMMES, Paul B., Ph.D.**, Dean, College of Arts and Sciences  
Georgia Institute of Technology  
**SETLIFF, Deborah K., Ph.D.**, Professor of Curriculum and Instruction  
Louisiana State University  
**SHANK, Jennifer, S., Ph.D.**, Interim Dean, College of Education and Professor of Music  
**SHIBAKOV, Alexander, Ph.D.**, Professor of Mathematics  
Auburn University  
**SHRINER, John F., Jr., Ph.D.**, Professor of Physics  
Duke University  
**SIRAJ, Ambareen, Ph.D.**, Associate Professor of Computer Science  
Mississippi State University  
**SMITH, David D., Ph.D.**, Professor of Mathematics  
University of Georgia  
**SMITH, James R., Ph.D., P.E.** Professor of Industrial Engineering  
Virginia Polytechnic Institute and State University  
**SMITH, Matthew, Ed.D.**, Dean, College of Education  
Vanderbilt University  
**STANGER, Gretta G., Ph.D.**, Associate Professor of Sociology  
University of Tennessee  
**STEARMAN, G. Kim, Ph.D.**, Professor of Plant and Soil Science  
University of Tennessee  
**STEIN, Barry S., Ph.D.**, Chair, Counseling and Psychology and Professor of Educational Psychology  
Vanderbilt University  
**STENSON, M. Scott**, Instructor English  
**STEPHENS, Mark A., Ph.D.**, Senior Associate Provost for Academic Affairs  
University of Tennessee  
**STEPP, Julie, Ph.D.**, Assistant Professor of Curriculum and Instruction  
Tennessee Technological University  
**STEWART, James M., Ph.D.**, Professor of English  
Ohio University  
**STRETZ, Holly A., Ph.D.**, Associate Professor of Chemical Engineering  
University of Texas at Austin  
**SULLIVAN, Judith A., Ph.D.**, Associate Professor of Music Education, Coordinator of Music Education  
University of Kentucky  
**SUNDARAM, R. M., Ph.D., P.E.**, Professor of Industrial Engineering

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**SUTERS, Leslie, Ph.D.**, Professor of Curriculum and Instruction  
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**SWAFFORD, Melinda, Ph.D.**, Assistant Professor of Human Ecology  
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**SWARTLING, Daniel J., Ph.D.**, Associate Professor of Chemistry  
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**T**

**TALBERT, Douglas A., Ph.D.**, Chair, Department of Computer Science  
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**TAYLOR, F. Leann, Ed.S.**, Instructor, Curriculum and Instruction  
**TERNEUS, Sandra K., Ph.D.**, Professor of Counseling and Psychology  
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**TIMMERMAN, Thomas A., Ph.D.**, Professor of Decision Sciences  
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**TING, Kwun-Lon, Ph.D.**, Professor of Mechanical Engineering  
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**TRENT, Kristen Pennycuff, Ph.D.**, Associate Professor of Curriculum and Instruction  
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**V**

**VANDERPOOL, Lucia, Ed.D.**, Adjunct Professor, School of Professional Studies  
Union University  
**VEERAPEN, Padmini, Ph.D.**  
**VENTURA, Carol Ventura, Ph.D.**, Professor of Art  
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**W**

**WEATHERS, Lenly J., Ph.D., P.E.**, Associate Professor of Civil Engineering  
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**WEBB, George E., Ph.D.**, Professor of History  
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**WEBB, Terry, Ph.D.**, Instructor, Curriculum and Instruction  
**WELLS, F. Stuart III, D.B.A.**, Professor of Decision Sciences  
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**WENDT, Jeremy, Ph.D.**, Associate Professor of Curriculum and Instruction  
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**WENDT, Stephanie, Ed.D.**, Assistant Professor, Department of Teacher Education  
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**WIANT, Kenneth J., Ph.D.**, Dean, College of Business and Professor of Finance  
**WILCOX, Zachary C., Ph.D.**, Associate Professor of Counseling and Psychology  
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**WILLIAMS, Brian, J.**, Associate Professor, English  
**WILSON, Brenda, Ph.D.**, Associate Professor of Journalism  
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**WILSON, Dale A., Ph.D., P.E.**, Professor of Mechanical Engineering  
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## Y

**YARNOLD, Matthew, Ph.D.**

**YOUNG, Kevin, Ph.D.**

## Z

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**ZAGUMNY, Matthew J., Ph.D.** Professor of Psychology  
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**ZAMER, Craig, D., Ph.D.**, Associate Professor, Music

**ZHANG, Hong, Ph.D.**, Professor of Chemistry

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**ZHANG, Ying, Ph.D.**, Professor of Mechanical Engineering

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**ZHU, Jiahong, Ph.D.**, Professor of Mechanical Engineering

University of Tennessee

### \*Associate Membership

## Emerita/Emeritus Graduate Faculty

**Alfred, Suellen**, Professor of Secondary Education and Foundations, Emerita. Ed.D., The University of Tennessee, 1991 (1990-2012).

**Anderson, Joseph N.**, Professor of Electrical and Computer Engineering, Emeritus. Ph.D., Tennessee Technological University, 1976 (1979-2005).

**Armistead, Jack M.**, Provost and Vice President for Academic Affairs; Professor of English, Emeritus. Ph.D., Duke University, 1973 (1995-2011).

**Ayers, Mary Nesbitt**, Professor of Curriculum and Instruction, Emerita. Ed.D., University of Georgia, 1968 (1972-2004).

**Bailey, Sue**, Director of Human Ecology, Professor of Human Ecology, Emerita. Ph.D., University of Wisconsin, 1980 (1986-2011).

**Banks, Thurston E.**, Associate Professor of Chemistry, Emeritus. Ph.D., University of Delaware, 1968 (1972-2009).

**Barker, Marvin W.**, Provost and Vice President for Academic Affairs; Professor of Chemistry, Emeritus. Ph.D., Duke University, 1963 (1990-2007).

**Bell, Robert R.**, President, Professor Business Management, Emeritus. Ph.D., University of Florida, 1972 (1976-2012).

**Bonner, William H.**, Professor of Management, Emeritus. Ph.D., Ohio State University, 1961 (1962- 1999).

**Bonner, W. Paul**, Professor of Civil Engineering, Emeritus. Ph.D., University of Florida, 1967 (1972- 2000).

**Briggs, Barbara H.**, Assistant Professor of Mathematics, Emerita. M.S., Auburn University, 1964 (1968-1997).

**Briggs, Robert C., III**, Associate Dean, College of Arts and Sciences; Professor of Mathematics, Emeritus. Ph.D., University of Houston, 1968 (1968-2001).

**Brinker, William J.**, Professor of History, Emeritus. Ph.D., Indiana University, 1973 (1971-2003).

**Brown, James Seay, P.E.**, Dean, College of Engineering, Emeritus. M.S., University of Illinois, 1950 (1941-1979).

**Bulow, Frank J.**, Professor of Biology, Emeritus. Ph.D. Iowa State University, 1969 (1969-2000).

**Burnham, John M.**, Professor of Management, Emeritus. Ph.D., University of Texas, 1970 (1976- 1999).

**Burns, G. Frank**, Professor of English, Emeritus. Ph.D., Vanderbilt University, 1973 (1974-1987).

**Bustamante, Rafael B., P.E.**, Professor of Civil Engineering, Emeritus. Ph.D., Oklahoma State University 1968 (1967-1994).

**Byler, Ben L.**, Professor of Agricultural Education, Emeritus. Ed.D., University of Illinois, 1972 (1985- 2009).

**Campana, Phillip J.**, Professor of German. Ph.D., Brown University, 1970 (1970-2008).

**Cannella, Albert A., P.E.**, Professor of Civil Engineering, Emeritus. M.S., Clemson University, 1967 (1961-1986).

**Carlson, Rodney L.**, Professor of Decision Science, Emeritus. Ph.D., Louisiana State University, 1976 (1979-2006).

**Cho, Whewon**, Professor of Economics, Emeritus. Ph.D., Vanderbilt University, 1971 (1963-2004).

**Chowdhuri, Pritindra, P.E.**, Professor of Electrical and Computer Engineering (Electric Power Center), Emeritus. D.Eng., Rensselaer Polytechnic Institute, 1966 (1986-2005).

**Click, Larry S., P.E.**, Associate Professor of Agriculture, Emeritus. M.S., Pennsylvania State University, 1964 (1971-2004).

**Cook, Don Richard**, Professor of Accounting, Emeritus. Ph.D., University of Alabama, 1970 (1956-1994).

**Crowell, Orville L.**, Professor of Educational Psychology, Emeritus. Ph.D., University of Arkansas, 1970 (1971-1999).

**Culp, Frederick L.**, Professor of Physics, Emeritus. Ph.D., Vanderbilt University, 1966 (1959-1986).

**Cunningham, Cathy**, Professor of Human Ecology, Emerita. Ph.D., The University of Tennessee, 1976 (1974-2012).

**Deese, Helen R.**, Professor of English, Emerita. Ph.D., George Peabody College for Teachers, 1973 (1976- 1998).

**Deivanayagam, Subramaniam, P.E.**, Associate Dean for Graduate Studies and Research, College of Engineering; Professor of Industrial Engineering, Emeritus. Ph.D., Texas Tech University, 1973 (1986-2012).

- Demas, Nicholas G.**, Professor of Electrical & Computer Engineering, Emeritus. Ph.D., University of Wisconsin, 1971 (1977-1996).
- Dickinson, W. Calvin**, Professor of History, Emeritus. Ph.D., University of North Carolina, 1967 (1971-2000).
- Diemer, Richard D.**, Professor of Sociology, Emeritus. Ph.D., Purdue University, 1966 (1961-1989).
- Dixon, Edmond D.**, Professor of Mathematics, Emeritus. Ph.D., Auburn University, 1965 (1965-1997).
- Dooley, Elmo S.**, Professor of Biology, Emeritus. Ph.D., The University of Tennessee, 1957 (1957-1987).
- Elkins, Donald M.**, Dean, College of Agriculture and Human Ecology; Professor of Plant and Soil Science, Emeritus. Ph.D., Auburn University, 1967 (1995-2005).
- Elliott, Francis E.**, Assistant Professor of Music, Emeritus. M.M., University of Colorado, 1957 (1971-2002).
- Ensor, Dale D.**, Professor of Chemistry, Emeritus. Ph.D., Florida State University, 1977 (1978-2012).
- Evans, Eston E.**, Professor of German and ESL, Emeritus. Ph.D., University of Texas, 1975 (1977-2004).
- Fernandez, Gilbert G.**, Professor of History, Emeritus. Ph.D., Florida State University, 1974 (1968-2004).
- Ferreira, Linda**, Professor of Music, Emerita. M.A., North Dakota State University, 1990 (1990-2003).
- Flanders, John N.**, Professor of Educational Psychology, Emeritus. Ed.D., Florida State University, 1965 (1967-1993).
- Fletcher, Richard K.**, Professor of Curriculum and Instruction, Emeritus. Ed.D., University of Virginia, 1971 (1971-2000).
- Folio, Mary Rhonda**, Professor of Curriculum and Instruction, Emerita. Ed.D., George Peabody College of Vanderbilt University, 1975 (1975-2010).
- Franklin, Darlene A.**, Assistant Professor of Nursing, Emerita. M.S.N., Vanderbilt University, 1981 (1990-2007).
- Furtsch, Thomas A.**, Professor of Chemistry, Emeritus. Ph.D., University of Texas-Austin, 1969 (1971-2009).
- Giesbrecht-Bettolli, Linda W.**, Associate Professor of Educational Psychology, Emerita. Ph.D., Florida State University, 1979 (1976-1980, 1981-2011).
- Gilbert, J. Don**, Associate Professor of Electrical & Computer Engineering, Emeritus. Ph.D., Vanderbilt University, 1980 (1982-1998).
- Gilbreath, Sidney G., III, P.E.**, Professor of Industrial Engineering, Emeritus. Ph.D., Georgia Institute of Technology, 1967 (1968-1978, 1980-1994).
- Goodman, William P.**, Professor of Business Law, Emeritus. J.D., The University of Tennessee, 1949 (1967-1986).
- Gordon, John A., P.E.**, Professor of Civil Engineering, Emeritus. Ph.D., Purdue University, 1970 (1974-2000).
- Goss, Susan H.**, Professor of Biology, Emerita. Ph.D., Montana State University, 1984 (1987-2011).
- Griggs, Edwin I., P.E.**, Professor of Mechanical Engineering, Emeritus. Ph.D., Purdue University, 1970 (1962-1964, 1969-2004).
- Haggard, Roger L.**, Associate Professor of Electrical & Computer Engineering, Emeritus. Ph.D., Georgia Institute of Technology, 1991 (1989-2012).
- Harrison, Nathanael A.**, Associate Professor of Biology, Emeritus. M.S., University of Kentucky, 1950 (1951-1987).
- Harvey, Michael J.**, Professor of Biology, Emeritus. Ph.D., University of Kentucky, 1967 (1985-2000).
- Hearn, Dan K.**, Associate Professor of Music, Emeritus. M.M., North Texas State University, 1968 (1967-2001).
- Hearn, Edell M.**, Dean of the College of Education and Professor of Curriculum and Instruction, Emeritus. Ed.D., The University of Tennessee, 1959 (1961-1997).
- Helton, Walter L.**, Professor of Geology, Emeritus. Ph.D., The University of Tennessee, 1967 (1966-1998).
- Hickman, Charles E., P.E.**, Dean of the College of Engineering and Professor of Electrical Engineering, Emeritus. Ph.D., The University of Tennessee, 1966 (1988-1999).
- Higdon, Danny W.**, Associate Professor of Curriculum and Instruction, Emeritus. Ed.D., University of Houston, 1972 (1973-1999).
- Holland, William D.**, Professor of Chemical Engineering, Emeritus. Ph.D., Georgia Institute of Technology, 1966 (1966-1999).
- Hood, Connie**, Professor of English, Emerita. Ph.D., The University of Tennessee, 1983 (1983-2006).
- Hood, Walter K.**, Professor of English, Emeritus. Ph.D., University of North Carolina, 1968 (1972-2002).
- Houghton, J. Richard**, Professor of Mechanical Engineering, Emeritus. Ph.D., Vanderbilt University, 1976 (1977-1999).
- Hunter, Gordon E.**, Professor of Biology, Emeritus. Ph.D., Washington University, 1963 (1967-1995).
- Hutchison, Earl R., Sr.**, Professor of English, Emeritus. Ph.D., University of Wisconsin, 1966 (1980-2009).
- Jackson, Elouise**, Professor of Special Education, Emerita. Ph.D., University of Illinois, 1978 (1985-2011).
- Jager, Robert E.**, Professor of Music, Emeritus. M.M., University of Michigan, 1968 (1971-2001).
- Jared, Wanda L.**, Instructor of English, Emerita. M.A., Tennessee Technological University, 1977 (1984-2006).
- Johnston, Bower L., Jr.**, Professor of Health and Physical Education, Emeritus. Ed.D., Florida State University, 1969 (1969-2001).
- Jonakin, Seisel N.**, Professor of Economics, Emeritus. Ph.D., The University of Tennessee, 1992 (1994-2012).
- Jones, Robert F.**, Professor of French and ESL, Emeritus. Ph.D., University of Southern California, 1973 (1973-1997).
- Jones, William J.**, Assistant Professor of Mathematics, Emeritus. M.S., University of Kentucky, 1957 (1965-1995).
- Jordan, O. Ray**, Associate Professor of Biology, Emeritus. M.S., University of Arkansas, 1962 (1965-2009).
- Jordan, Patricia**, Professor of Health and Physical Education, Emerita. D.A., Middle Tennessee State University, 1997 (1997-2011).
- Kemp, Homer D.**, Professor of English, Emeritus. Ph.D., The University of Tennessee, 1972 (1971-2012).
- Kerr, Clayton P.**, Professor of Chemical Engineering, Emeritus. Ph.D., Louisiana State University, 1968 (1968-2002).
- Khleif, S. B.**, Professor of Mathematics, Emeritus. Ph.D., Auburn University, 1973 (1966-2002).
- Kick, Russell C., Jr.**, Professor of Decision Sciences, Emeritus. Ph.D., University of Alabama, 1975 (1983-2000).
- King, C. Cooper, Jr.**, Professor of Agronomy, Emeritus. Ph.D., North Carolina State University, 1968 (1986-1997).
- Kintz, Kenneth E.**, Associate Professor of French and ESL, Emeritus. Ph.D., Georgetown University, 1973 (1973-2004).
- Koczwara, Christine**, Professor of Art, Emerita. M.A., The William Paterson College of New Jersey, 1972 (1972-2009).
- Kumar, Krishna**, Professor of Physics, Emeritus. Ph.D., Carnegie Institute of Technology, 1964 (1980-1999).
- LaBar, Arthur T.**, Professor of Music, Emeritus. M.M., Indiana University, 1969 (1979-2012).

- Lamberth, Edwin E.**, Professor of Agricultural Education, Emeritus. Ed.D., University of Kentucky, 1963 (1979-1997).
- Lerner, Joseph**, Dean of the College of Arts and Sciences and Professor of Chemistry, Emeritus. Ph.D., Rutgers University, 1967 (1984-1999).
- Lessman, Roger E.**, Professor of Computer Science, Emeritus. Ph.D., University of Missouri-Rolla, 1975 (1966-1999).
- Long, Leland L.**, Professor of Computer Science, Emeritus. Ph.D., University of Missouri, 1972 (1971- 1997).
- Mazeris, Reginald M.**, Professor of Mathematics, Emeritus. Ph.D., Auburn University, 1969 (1963- 1999).
- McRae, William M.**, Professor of English, Emeritus. Ph.D., Purdue University, 1977 (1982-2012).
- McGee, Gloria**, Professor of Curriculum and Instruction, Emerita. Ed.D., Vanderbilt University, 1982 (1977- 2005).
- McGee, John C.**, Professor of Chemical Engineering, Emeritus. Ph.D., North Carolina State University, 1966 (1965-1999).
- McGee, Leo**, Associate Vice President for Academic Affairs; Professor of Instructional Leadership, Emeritus. Ph.D., Ohio State University, 1972 (1977- 2007).
- McHenry, Claude**, Assistant Professor of Mathematics, Emeritus. Ph.D., Texas A&M University, 1974 (1978- 2008).
- Miller, J.J.**, Professor of Health & Physical Education, Emeritus. Ed.D., George Peabody College for Teachers, 1956 (1972-1992).
- Mills, Hugh H., III**, Professor of Geology, Emeritus. Ph.D., University of Washington, Seattle, 1975 (1977-2011).
- Mitchum, Jere L.**, Associate Professor of English, Emeritus. Ph.D., Michigan State University, 1973 (1967-1997).
- Mookherjee, Harsha N.**, Professor of Sociology, Emeritus. Ph.D., Mississippi State University, 1971 (1970-2008).
- Morgan, Eric L.**, Professor of Biology, Emeritus. Ph.D., Virginia Polytechnic Institute and State University, 1973 (1972-2011).
- Mullins, Charlene Groce**, Associate Professor of Human Ecology, Emerita. M.S., The University of Tennessee, 1953 (1953-2008).
- Munukutla, Sastry**, Director of Electric Power Center; Professor of Mechanical Engineering, Emeritus. Ph.D., University of Iowa, 1981 (1986-2012).
- Narrie, David B.**, Professor of Agribusiness, Emeritus. Ph.D., Virginia Polytechnic Institute and State University, 1973 (1973-2005).
- Natarajan, Sundaram**, Professor of Electrical & Computer Engineering, Emeritus. Ph.D., Concordia University, Montreal, 1979 (1986-2008).
- Neapolitan, Jerome L.**, Professor of Sociology, Emeritus. Ph.D., University of Illinois at Chicago Circle, 1977 (1977-2012).
- Neufeldt, Harvey G.**, Professor of Curriculum and Instruction, Emeritus. Ph.D., Michigan State University, 1971 (1970-2000).
- Patil, S. A.**, Professor of Mathematics, Emeritus. Ph.D., Colorado State University, 1966 (1966-2000).
- Peach, Larry E.**, Professor of Instructional Leadership, Emeritus. Ed.D., The University of Tennessee, 1978 (1978-2011).
- Phelps, Margaret S.**, Director of Rural Education; Professor of Curriculum and Instruction, Emerita. Ed.D., The University of Tennessee, 1975 (1975- 2009).
- Powell, Homer M.**, Professor of Electrical & Computer Engineering, Emeritus. Ph.D., Vanderbilt University, 1966 (1982-1996).
- Prescott, Wallace S., P.E.**, Provost and Vice President for Academic Affairs and Professor Of Civil Engineering, Emeritus. Ph.D., The University of Illinois, 1962 (1946-1983; 1985-1987).
- Purdy, Kenneth R.**, Professor of Mechanical Engineering, Emeritus. Ph.D., Georgia Institute of Technology, 1963 (1968-1976, 1986-1999).
- Quattlebaum, Rebecca**, Professor of Psychology and Dean of Graduate Studies and Extended Education, Emerita. Ph.D., The University of Alabama, 1969 (1969-2001).
- Ramsey, Donald C.**, Professor of Computer Science, Emeritus. Ph.D., The University of Tennessee, 1970 (1971-2000).
- Raper, Horace W.**, Professor of History, Emeritus. Ph.D., University of North Carolina, 1951 (1956- 1985).
- Richey, David Dean**, Professor of Early Childhood Special Education, Emeritus. Ph.D., The University of North Carolina, 1975 (1974-2007).
- Riemer, Jeffrey W.**, Professor of Sociology, Emeritus. Ph.D., University of New Hampshire, 1975 (1985- 2005).
- Roe, Betty D.**, Professor of Education, Emerita. Ed.D., The University of Tennessee, 1969 (1970-2003).
- Rohr, Michael E.**, Professor of Educational Psychology, Emeritus. Ed.D., The University of Tennessee, 1969 (1969-2007).
- Ross, Elinor Parry**, Professor of Reading, Emerita. Ed.D., The University of Tennessee, 1972 (1971- 2002).
- Sahai, Vireshwar**, Professor of Mechanical Engineering, Emeritus. Ph.D., Virginia Polytechnic Institute and State University, 1966 (1966-1997).
- Saint-Leon, Claire**, Professor of French, Emerita. Ph.D., University of California at Los Angeles, 1966 (1970- 1993).
- Savage, Richard P., Sr.**, Professor of Mathematics, Emeritus. Ed.D., Oklahoma State University, 1968 (1962-1992).
- Scardina, Joseph T.**, Professor of Mechanical Engineering, Emeritus. Ph.D., Vanderbilt University, 1971 (1970-1999).
- Schrader, William C., III**, Professor of History, Emeritus. Ph.D., Catholic University of America, 1972 (1966- 2002).
- Sekar, Arun**, Professor of Electrical & Computer Engineering, Emeritus. Ph.D., Indian Institute of Technology, Madras, 1973 (1986-2010).
- Selden, Annie**, Professor of Mathematics, Emerita. Ph.D., Clarkson University, 1974 (1985-2003).
- Sharpe, Joseph D.**, Professor of Curriculum and Instruction, Emeritus. Ed.D., The University of Mississippi, 1970 (1968-2001).
- Shettlesworth, Juanita**, Assistant Professor of Spanish, Emerita. M.A., Vanderbilt University, 1966 (1968- 2003).
- Sissom, Leighton E., P.E.**, Dean of the College of Engineering, Emeritus. Ph.D., Georgia Institute of Technology, 1965 (1958-1962; 1965-1989).
- Slotkin, Alan R.**, Professor of English, Emeritus. Ph.D., University of South Carolina, 1970 (1970-2002).
- Smith, Dallas G., Jr.**, Professor of Civil Engineering, Emeritus. Ph.D., Virginia Polytechnic Institute and State University, 1969 (1970-1999).
- Smith, Flavious J.**, Professor of Health and Physical Education, Emeritus. Ed.D., George Peabody College for Teachers, 1962 (1962-1996).
- Smith, Harry T.**, Professor of Secondary Education and Foundations, Emeritus. Ed.D., Michigan State University, 1974 (1975-2002).
- Smoak, Robert A.**, Professor of Mechanical Engineering, Emeritus. D.Sc., University of Virginia, 1966 (1984-2003).
- Stapor, Frank W., Jr.**, Professor of Earth Sciences, Emeritus. Ph.D., Florida State University, 1973 (1985-2010).
- Stearman, Gail W.**, Assistant Professor of Nursing, Emerita.

- M.S.N., The University of Tennessee, 1986 (1990-2008).
- Stedman, Stephen J.**, Professor of English, Emeritus. Ph.D., University of Tennessee, 1982 (1987-2010).
- Stephenson, Paul G.**, Professor of Political Science, Emeritus. Ph.D., Emory University, 1965 (1965- 1998).
- Stewart, O. C.**, Dean of the Division of Extended Services, Emeritus. Ed.D., The University of Tennessee, 1965 (1966-1989).
- Stubblefield, Hugh H.**, Assistant Professor of English, Emeritus. A.M., The University of Missouri, 1969 (1962-1999).
- Swim, William B.**, P.E., Professor of Mechanical Engineering, Emeritus. Ph.D., Georgia Institute of Technology, 1966 (1973-1997).
- Swisher, George M.**, P.E., Professor of Mechanical Engineering and Dean of Engineering, Emeritus. Ph.D., Ohio State University, 1969 (1973-1999).
- Swong, Khyson**, Associate Professor of Mathematics, Emeritus. Ph.D., University of Michigan, 1963 (1966- 1989).
- Talbert, E. Gene**, Professor of Curriculum and Instruction, Emeritus. Ed.D., University of Oklahoma, 1968 (1980-2010).
- Thomas, Andrew C.**, Associate Professor of Counseling and Psychology, Emeritus. Ed.D., University of Georgia, 1973 (1973-2004).
- Thomas, John D.**, Associate Professor of Educational Psychology, Emeritus. Ph.D., The University of Alabama, 1973 (1968-1995).
- Tolbert, R. Noel, P.E.**, Professor of Civil Engineering, Emeritus. Ph.D., Vanderbilt University, 1975 (1979- 2007).
- Tolleson, Sherwell**, Professor of Educational Psychology, Emeritus. Ph.D., University of Alabama, 1964 (1964-1999).
- Torrey, Rubye P.**, Assistant Vice President for Research and Professor of Chemistry, Emerita. Ph.D., Syracuse University, 1968 (1988-2006).
- Turvaille, Lester Jackson, P.E.**, Professor of Industrial Engineering, Emeritus. Ph.D., Georgia Institute of Technology, 1967 (1976-1980, 1982- 1997).
- Ventrice, Carl A.**, Professor of Electrical & Computer Engineering, Emeritus. Ph.D., Pennsylvania State University, 1962 (1964-2011).
- Weidner, Heidemarie Z.**, Professor of English, Emerita. Ph.D., University of Louisville, 1991 (1993-2011).
- Viera, Carroll M.**, Professor of English, Emerita. Ph.D., Florida State University, 1972 (1974-2007).
- Viera, David J.**, Professor of ESL and Spanish, Emeritus. Ph.D., Catholic University of America, 1972 (1973-1975, 1977-2008).
- Volpe, Angelo A.**, President; Professor of Chemistry, Emeritus. Ph.D., University of Maryland, 1966 (1987-2000).
- Warren, John W.**, Professor of English, Emeritus. Ph.D., The University of Tennessee, 1961 (1962- 1988).
- Weinrauch, J. Donald**, Professor of Marketing. Ph.D., University of Arkansas, 1973 (1977-2009).
- Wells, John C.**, Professor of Physics. Emeritus. Ph.D., John Hopkins University, 1968 (1970-2003).
- Wells, Martha J.M.**, Professor of Chemistry. Emerita. Ph.D., Auburn University, 1981 (1989-2010).
- Whiteaker, Larry H.**, Professor of History, Emeritus. Ph.D., Princeton University, 1977 (1973-2009).
- Wilhelm, Albert E.**, Professor of English, Emeritus. Ph.D., University of North Carolina, 1971 (1971- 2001).
- Williams, Steven D.**, Professor of Political Science, Emeritus. Ph.D., University of Kentucky, 1972 (1970-2005).
- Winfree, Sam K.**, Professor of Animal Science, Emeritus. Ph.D., The University of Tennessee, 1973 (1980-2008).
- Yarbrough, David**, Professor of Chemical Engineering, Emeritus. Ph.D., Georgia Institute of Technology, 1966 (1968-2002).

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