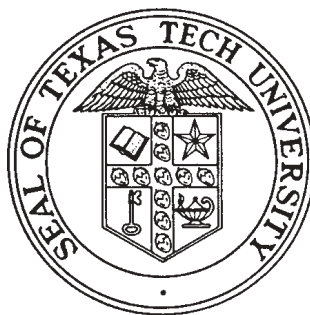


BULLETIN OF  
**TEXAS TECH**  
UNIVERSITY  
GRADUATE CATALOG  
2002-2003



BULLETIN OF  
**Texas Tech University**  
Vol. LXXIX (USPS 075-460) No. 1  
**Graduate Catalog 2002-2003**

March 2002



The *Graduate Catalog* provides the procedures and policies in effect at the time of printing. Although the information is subject to change, the published program requirements for students who enter Texas Tech University during the 2002-2003 school year must be satisfied by the student for the successful completion of any program.

This catalog should be retained permanently since future program revisions will generally not apply to students already enrolled. Furthermore, the course descriptions provided herein may be valuable to potential employers reviewing a student's completed course work.

While every attempt is made to ensure accuracy in its reporting of programs, policies, fees, and other statements within this publication, the university reserves the right to make changes at any time without notice.

This issue is the official catalog of graduate programs in both Texas Tech University and Texas Tech University Health Sciences Center.

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## **President's Welcome**

A comprehensive research university, Texas Tech offers masters' degrees in more than 115 program areas and doctoral degrees in 58 areas. Programs of study include the sciences, social sciences, humanities, business administration, engineering, agriculture, architecture, law, visual and performing arts, education, and human sciences. Each semester, graduate students from all 50 states and more than 90 countries are drawn to Texas Tech by its personalized, high-quality graduate education.

Texas Tech's graduate faculty includes many nationally and internationally prominent scholars in whose offices and laboratories cutting edge research is changing the way we understand the world and the way we live our lives.

Our location in a small but progressive city offers definite advantages to the graduate student looking for a low cost of living combined with many recreational and cultural opportunities. Our campus offers excellent teaching and learning facilities and a 2.1 million-volume library that holds membership in the prestigious Association of Research Libraries.

Whatever your personal ambitions, Texas Tech offers a graduate education environment in which you can define your goals, hone your skills, and find answers to the questions that matter most to you.

I hope you will consider becoming a part of the Texas Tech family. I can promise you an educational experience on our campus as challenging and rewarding as any you will discover.

David J. Schmidly, Ph.D.  
President

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B.A., Cornell, 1976; M.D., Cincinnati, 1980.

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B.S., Louisiana Tech, 1966; M.S., Florida State,  
1968; Ph.D., 1972.

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1991.  
B.A., Texas A&M, 1969; M.Stat., 1972.

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B.B.A., Stephen F. Austin State, 1981; M.Ed., 1989.

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B.A., Abilene Christian, 1966; J.D., Texas Tech,  
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B.A., Oklahoma State, 1963.

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B.A., Texas Christian, 1978; M.A., Midwestern  
State, 1984.

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B.S., Texas Tech, 1966; M.S., 1968; Ph.D. Illinois  
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Sciences, 1969.  
B.S., New Mexico State, 1963; M.S., 1966; Ph.D.,  
Indiana, 1969.

SENIOR EXECUTIVE ASSISTANT AND CHIEF OF  
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B.A., Knox, 1958; M.A., Washington State, 1970;  
Ed.D., 1974.

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State, 1974; Ph.D., Texas Tech, 1981.

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B.A., Knox, 1965.

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Engineering, 1970.  
B.A., Wichita State, 1962; M.S., 1966; Ph.D.,  
Oklahoma, 1970.

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TECHNOLOGY GARY L. WIGGINS, 1989.  
B.S., Texas Tech, 1971; M.S., 1973; Ph.D., 1978.

# University Calendar

## 2002-2003

### Summer 2002

#### Intersession at Junction

*May 9-23, Thursday-Thursday*  
Classes held at Junction Center campus for Intersession.

#### First Term

*May 27, Monday*  
Noon, residence halls open for occupancy.

*May 28, Tuesday*  
Registration for new students. Last day to register without penalty. First meal, breakfast, served in residence halls.

*May 29, Wednesday*  
Classes begin.

*May 29-30, Wednesday-Thursday*  
Student-initiated drop-add on the Web.

*June 3, Monday*  
Last day to drop a course and receive a refund.

*June 5, Wednesday*  
Last day for graduate degree candidates to file statement of intention to graduate with the Graduate School.

*June 13, Thursday*  
Last day to declare pass-fail intentions. Last day to drop a course and receive an automatic W.

*June 14, Friday*  
Last day for degree candidates and faculty to order invitations and academic regalia at the Bookstore.

*June 25, Tuesday*  
Last day to drop a course, transfer between colleges, or withdraw from the University.

*June 27, Thursday*  
Last day of classes.

*June 28-29, Friday-Saturday*  
Final examinations for the first term.

*June 29, Saturday*  
First summer term ends.

*June 30, Sunday*  
Students without room reservations for the second term must vacate residence hall rooms by 10 a.m.

*July 2, Tuesday*  
9 a.m., final grade rolls due in the Registrar's Office. Last day for graduate degree candidates to pay binding fee at Student Business Services.

*July 3, Wednesday*  
Last day for graduate degree candidates to remove grades of I, PR, or CR and to submit final comprehensive examination and defense reports.

#### Second Term

*July 8, Monday*  
10 a.m., residence halls open to new occupants. Registration for new students. Last day to register without penalty.

*July 9, Tuesday*  
Classes begin. Last day for graduate degree candidates to submit to the Graduate School the official version of theses and dissertations.

*July 9-10, Tuesday-Wednesday*  
Student-initiated drop-add on the Web.

*July 12, Friday*  
Last day to drop a course and receive a refund.

*July 24, Wednesday*  
Last day to declare pass-fail intentions. Last day to drop a course and receive an automatic W.

*August 5, Monday*  
Last day to drop a course, transfer between colleges, or withdraw from the University.

*August 7, Wednesday*  
Last day of classes. Last day for graduate degree candidates to submit to the Graduate School the final (corrected) copies of theses and dissertations.

*August 8-9, Thursday-Friday*  
Final examinations for the second term.

*August 9, Friday*  
Last meal served in residence halls Thursday evening. Second summer term ends.

*August 10, Saturday*  
Commencement. 10 a.m., residence halls close.

*August 12, Monday*  
9 a.m., final grade rolls due in the Registrar's Office.

### Fall 2002

*August 18, Sunday*  
10 a.m., residence halls open for occupancy.

*August 19, Monday*  
Faculty on duty.

*August 21-23, Wednesday-Friday*  
Registration for new students.

*August 22, Thursday*  
First meal, breakfast, served in residence halls.

*August 23, Friday*  
Last day to register without penalty.

*August 26, Monday*  
Classes begin.

*August 26-29, Monday-Thursday*  
Student-initiated drop-add on the Web.

*September 2, Monday*  
Labor Day. University holiday.

*September 6, Friday*  
Last day for graduate degree candidates to file statement of intention to graduate with the Graduate School.

*September 11, Wednesday*  
Last day to drop a course and receive a refund.

*September 23, Monday*  
Last day to withdraw from the University and receive a partial refund.

*October 2, Wednesday*  
Last day for graduate degree candidates to pay binding fee at Student Business Services.

*October 7, Monday*  
Last day to declare pass-fail intentions. Last day to drop a course and receive an automatic W.

*October 21, Monday*  
5 p.m., midsemester grade rolls due in the Registrar's Office. Last day for degree candidates and faculty to order invitations and academic regalia at the Bookstore.

*November 4-19, Monday-Tuesday*  
Advance registration (currently enrolled students) for spring semester.

*November 6, Wednesday*  
Last day for graduate degree candidates to submit to the Graduate School final defense reports.

*November 11, Monday*  
Last day for graduate degree candidates to remove grades of I, PR, or CR and for master's candidates to submit final comprehensive examination reports. Last day for graduate degree candidates to submit to the Graduate School the official version of theses and dissertations.

*November 20, Wednesday*

Open registration begins.

*November 27-December 1, Wednesday-Sunday*

Thanksgiving holiday.

*December 2, Monday*

Classes resume.

*November 25-December 4, Monday-Wednesday*

Period of no examinations except for make-up exams or scheduled lab exams.

*November 26, Tuesday*

Last day to drop a course, transfer between colleges, or withdraw from the University. Last day for undergraduate degree candidates to remove grades of I and PR and to complete final examinations in correspondence courses.

*December 4, Wednesday*

Last day of classes.

*December 5, Thursday*

Individual study day.

*December 6-11, Friday-Wednesday*

Final examinations for the fall semester.

*December 11, Wednesday*

Last day for graduate degree candidates to submit to the Graduate School the final (corrected) copies of theses and dissertations. Fall semester ends.

*December 12, Thursday*

Last meal, breakfast, served in residence halls. 10 a.m., residence halls close. Noon, grade rolls for graduating students due in the Registrar's Office.

*December 14, Saturday*

Commencement. Degree candidates may occupy rooms until noon.

*December 16, Monday*

Noon, final grade rolls due in the Registrar's Office.

## **Spring 2003**

*January 12, Sunday*

10 a.m., residence halls open for occupancy.

*January 13, Monday*

Faculty on duty.

*January 13-14, Monday-Tuesday*

Registration for new students.

*January 14, Tuesday*

Last day to register without penalty. First meal, breakfast, served in residence halls.

*January 15, Wednesday*

Classes begin.

*January 15-21, Wednesday-Monday*

Student-initiated drop-add on the Web.

*January 20, Monday*

Martin Luther King Jr. day. University holiday.

*January 31, Friday*

Last day to drop a course and receive a refund. Last day for graduate degree candidates to file statement of intention to graduate with the Graduate School.

*February 12, Wednesday*

Last day to withdraw from the University and receive a partial refund.

*February 24, Monday*

Last day for graduate degree candidates to pay binding fee at Student Business Services.

*February 26, Wednesday*

Last day to declare pass-fail intentions. Last day to drop a course and receive an automatic W.

*March 12, Wednesday*

5 p.m., midsemester grade rolls due in the Registrar's Office. Last day for degree candidates and faculty to order invitations and academic regalia at the Bookstore.

*March 15, Saturday*

Noon, classes dismissed for spring vacation.

*March 24, Monday*

Classes resume.

*April 3-18, Thursday-Friday*

Advance registration (currently enrolled students) for summer and fall.

*April 9, Wednesday*

Last day for graduate degree candidates to submit to the Graduate School final defense reports.

*April 14, Monday*

Last day for graduate degree candidates to remove grades of I, PR, or CR and for master's candidates to submit final comprehensive examination reports. Last day for graduate degree candidates to submit to the Graduate School the official version of theses and dissertations.

*April 21, Monday*

Day of no classes.

*April 22, Tuesday*

Open registration begins.

*April 29-May 5, Tuesday-Monday*

Period of no examinations except for make-up exams or scheduled lab exams.

*May 2, Friday*

Last day to drop a course, transfer between colleges, or withdraw from the University. Last day for undergraduate degree candidates to remove grades of I and PR and to complete final examinations in correspondence courses.

*May 5, Monday*

Last day of classes.

*May 6-7, Tuesday-Wednesday*

Individual study days.

*May 8-14, Thursday-Wednesday*

Final examinations for the spring semester.

*May 14, Wednesday*

Last day for graduate degree candidates to submit to the Graduate School the final (corrected) copies of theses and dissertations. Spring semester ends.

*May 15, Thursday*

Last meal, breakfast, served in residence halls. 10 a.m., residence halls close. Degree candidates may occupy rooms until Saturday, May 17. Noon, grade rolls for graduating students due in the Registrar's Office.

*May 17, Saturday*

Commencement.

*May 19, Monday*

Noon, final grade rolls due in the Registrar's Office.

## Mission

Committed to teaching and the advancement of knowledge, Texas Tech University, a comprehensive public research university, provides the highest standards of excellence in higher education, fosters intellectual and personal development, and stimulates meaningful research and service to humankind.

## The University

Texas Tech University is a state-supported, coeducational institution with a total student population of more than 25,000 located in the West Texas city of Lubbock. The Graduate School of Texas Tech, with a current enrollment of some 4,200 graduate and professional students, operates as an integral component of the university. In addition to the Graduate School, the university consists of the instructional colleges of Agricultural Sciences and Natural Resources, Architecture, Arts and Sciences, Business Administration, Education, Engineering, Human Sciences, and Visual and Performing Arts, the School of Law, and a number of special departments and divisions. Texas Tech University is fully accredited by the Southern Association of Colleges and Schools; its various programs are accredited by their associations. The Texas Tech Health Sciences Center functions as a separate institution that includes the School of Medicine, the School of Nursing, and the School of Allied Health.

Texas Tech's students can stroll across its 1,839-acre campus featuring expansive lawns and impressive landscaping together with unique Spanish Renaissance style red-tile-roofed buildings. This beautiful, spacious campus—one of the largest in the nation—is well-equipped not only for research and study, but also for varied cultural and recreational activities.

Besides the main campus, the university operates a number of other facilities, including the Research Center—East Campus (Lubbock), research facilities at Reese Center, agricultural field laboratories at New Deal, and satellite medical facilities at Amarillo, El Paso, and Midland-Odessa. Also outside the Lubbock campus is the Texas Tech University Center in the Texas Panhandle, an agricultural facility and research farm spanning 16,000 acres.

Texas Tech's popular summer programs in art for graduate students as well as photography classes are only part of the unique outdoor experiences and expanding extended learning opportunities offered at the 400-acre Texas Hill Country Junction campus.

The university's main Library, a member of the Association of Research Libraries, includes several exceptional collections and a total (when combined with constituent sublibraries housed in various colleges and programs on campus) of more than one million volumes and more than two million bibliographic items. The library has strong collections in the humanities, the biological sciences, and physical sciences and serves as one of two regional de-

positories for U.S. government documents in Texas. An extra bonus for students involved in research is the Computer Assisted Search Services, a nationwide service that aids students in finding information on virtually any topic.

The Southwest Collection, in combination with the Texas Tech University Museum and the National Ranching Heritage Center, offers unusual opportunities to those interested in area studies, regional history, and economic development. Current in-depth collecting focuses on gathering materials on Hispanics in the Southwest. Among other special research resources housed in the library's newly completed special collections building is the Archive of the Vietnam War, whose significance is reflected in the fact that more dissertations on that war are currently being written at Texas Tech than at any other university in the country.

In alliance with the Texas Tech Museum, excavations at the Lubbock Lake Landmark historical site yield information on thousands of years of human habitation as well as on now-extinct animals. This location is a rich lode for researchers in disciplines ranging from archaeology and anthropology to biology, history, and area studies. An archaeological research facility on the site continues to yield important discoveries.

The International Cultural Center houses the various area studies programs and transcultural initiatives, as well as providing expanded space for international and intercultural conferences. This state-of-the-art facility attests to Texas Tech's rapidly growing international involvement.

The Advanced Technology Learning Center provides a variety of support services to students and faculty researchers, from microcomputers to computer documentation, statistical and other software support, individualized on-line computer bibliographic searches, and VAX technical support. An on-line computer catalog, with ties to a wealth of databases, multiplies the research potential while simplifying the leg work required of the student researcher.

Another important new state-of-the-art facility is the recently established Teaching, Learning, and Technology Center, conveniently located in the University Library. Faculty multimedia labs and workshops, technology in instruction roundtables, and classroom videotaping enhance the learning experience and provide instructional assistance (available also to graduate assistants).

The newly initiated Institute of Environmental and Human Health integrates the efforts of Texas Tech University, the School of Law, and the Health Sciences Center in a joint venture to assess toxic chemical impacts on human environments. Attracting graduate students at both the master's and doctoral level, IEHH includes faculty from biological sciences, medicine, epidemiology, biostatistics, engineering, chemistry, computer science, law, mathematics, pharmacology, physiology, and range, wildlife, and fisheries management.

Opportunities for a fulfilling campus life after hours include an expansive Student Recreation and Aquatic Center that contains an Olympic-size indoor-outdoor swimming pool; handball-racquetball courts; squash



courts; multipurpose rooms for martial arts, wrestling, tumbling, fencing, indoor archery, golf, and dance; a gymnasium for basketball, tennis, volleyball, or badminton; weight areas, saunas, and a lounge.

Other resources that enhance campus life at Texas Tech are two radio stations—KTXT-FM and classical KOHM (FM)—and KTXT-TV, a noncommercial television station. The University Daily—the student newspaper—is available to every student, staff, and faculty member on campus free of charge.

## Academic Diversity

Established in 1923, Texas Tech is one of the youngest major research universities in the country. Consistent dedication to quality and research has earned numerous graduate programs national and international respect. From toxic waste research to archaeology, from land-use programs to nationally known laser fingerprint detection studies, the Texas Tech Graduate School offers unlimited opportunity for the aspiring scholar.

The Graduate School is remarkable for its diversity, offering more than 115 different master's programs and some 58 doctoral programs, outnumbering those available at most other multipurpose universities. The Graduate School at Texas Tech has conferred 24,997 master's

degrees since its first master's degrees were awarded in 1929 and 4,141 doctorates since granting the first Ph.D. degree in 1952. The number of doctorates awarded during the last five years averaged more than 160, placing Texas Tech in close degree-granting competition with many of the nation's other major research universities. Last year, 817 master's degrees and 123 doctoral degrees were conferred.

The Graduate School strives to maintain flexibility through a combination of options from the traditional degree programs to progressive interdisciplinary and multidisciplinary choices. The Graduate School values the student's interests, personal research aims, and career goals. In keeping with that spirit, many outstanding facilities for interdisciplinary research are located at Texas Tech, including fifty specialized research centers and institutes. Some interdisciplinary programs are housed within specific colleges or a cluster of departments, while others are headquartered in the Graduate School itself. All of these programs are defined by the topic rather than by traditional disciplinary boundaries. Interdisciplinary subjects include comparative literature, ethnic studies, fine arts, linguistics, museum science, neuroscience, plant physiology, public administration, sports health, women's studies, and many more, in addition to approved student-designed options.

## Fields of Study

In addition to this list of degrees, many departments offer specializations or concentrations in various fields. Graduate degrees are offered in the following areas.

### Agriculture

Agricultural and Applied Economics .....	M.S., Ph.D.
Agricultural Education .....	M.S., Ed.D.
Agriculture .....	M.Agr.
Agronomy .....	Ph.D.
Animal Science .....	M.S., Ph.D.
Crop Science .....	M.S.
Entomology .....	M.S.
Fisheries Science .....	M.S., Ph.D.
Food Technology .....	M.S.
Horticulture .....	M.S.
Landscape Architecture .....	M.L.A.
Range Science .....	M.S., Ph.D.
Soil Science .....	M.S.
Wildlife Science .....	M.S., Ph.D.

### Architecture

Architecture .....	M.Arch., M.S.
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### Business

Accounting .....	M.S.Acct.
Business Administration .....	M.S., Ph.D.
General Business .....	M.B.A.

**Education**

Bilingual Education .....	M.Ed.
Counselor Education .....	M.Ed.
Curriculum and Instruction .....	M.Ed., Ed.D.
Educational Leadership .....	M.Ed., Ed.D.
Educational Psychology .....	M.Ed., Ed.D.
Elementary Education .....	M.Ed.
Higher Education .....	M.Ed., Ed.D., Ph.D.
Instructional Technology .....	M.Ed., Ed.D.
Language Literacy Education .....	M.Ed.
Secondary Education .....	M.Ed.
Special Education .....	M.Ed., Ed.D.
Supervision .....	M.Ed.

**Engineering**

Chemical Engineering .....	M.S.Ch.E., Ph.D.
Civil Engineering .....	M.S.C.E., Ph.D.
Computer Science .....	M.S., Ph.D.
Electrical Engineering .....	M.S.E.E., Ph.D.
Engineering .....	M.Engr.
Environmental Engineering .....	M.Env.E.
Environmental Technology Management .....	M.S.E.T.M.
Industrial Engineering .....	M.S.I.E., Ph.D.
Manufacturing Systems and Engineering .....	M.S.M.S.E.
Mechanical Engineering .....	M.S.M.E., Ph.D.
Petroleum Engineering .....	M.S.P.E., Ph.D.
Software Engineering .....	M.S.
Systems and Engineering Management .....	M.S.S.E.M.

**Fine Arts**

Art .....	M.F.A.
Art Education .....	M.A.E.
Fine Arts (Art, Music, Theatre Arts) .....	Ph.D.
Musical Arts (Composition, Conducting, Performance, Piano Pedagogy) .....	D.M.A.
Music Education .....	M.M.Ed.
Music History and Literature .....	M.M.
(Music) Performance .....	M.M.
Music Theory .....	M.M.
Theatre Arts .....	M.A., M.F.A.

**Human Sciences**

Environmental Design .....	M.S.
Environmental Design and Consumer Economics .....	Ph.D.
Family and Consumer Sciences Education .....	M.S., Ph.D.
Family Financial Planning .....	M.S.
Food and Nutrition .....	M.S., Ph.D.
Human Development and Family Studies .....	M.S., Ph.D.
Marriage and Family Therapy .....	M.S., Ph.D.
Restaurant, Hotel, and Institutional Management .....	M.S.

**Humanities**

Applied Linguistics .....	M.A.
Classics .....	M.A.
English .....	M.A., Ph.D.

German .....	M.A.
Philosophy .....	M.A.
Romance Languages (French or Spanish) .....	M.A.
Spanish .....	Ph.D.
Technical Communication .....	M.A.
Technical Communication and Rhetoric .....	Ph.D.

### **Interdisciplinary Programs**

Biotechnology .....	M.S.
Heritage Management .....	M.S.
Interdisciplinary Studies .....	M.A., M.S.
Land Use Planning, Management, and Design .....	Ph.D.
Multidisciplinary Science .....	M.S.
Museum Science .....	M.A.

### **Pure Sciences**

Applied Physics .....	M.S., Ph.D.
Atmospheric Science .....	M.S.
Biology .....	M.S., Ph.D.
Chemistry .....	M.S., Ph.D.
Environmental Toxicology .....	M.S., Ph.D.
Geoscience .....	M.S., Ph.D.
Mathematics .....	M.A., M.S., Ph.D.
Microbiology .....	M.S.
Physics .....	M.S., Ph.D.
Statistics .....	M.S.
Zoology .....	M.S., Ph.D.

### **Social Sciences**

Anthropology .....	M.A.
Clinical Psychology .....	Ph.D.
Communication Studies .....	M.A.
Counseling Psychology .....	M.A., Ph.D.
Economics .....	M.A., Ph.D.
Exercise and Sport Sciences .....	M.S.
General Experimental Psychology .....	M.A., Ph.D.
History .....	M.A., Ph.D.
Mass Communications .....	M.A.
Political Science .....	M.A., Ph.D.
Psychology .....	M.A., Ph.D.
Public Administration .....	M.P.A.
Sociology .....	M.A.
Sports Health .....	M.S.

### **Joint Programs**

Accounting–Law .....	M.S.Acct.–J.D.
Agricultural and Applied Economics–Law .....	M.S.–J.D.
Architecture–Business Administration .....	B.Arch.–M.B.A., M.Arch.–M.B.A.
Biotechnology–Law .....	M.S.–J.D.
Business Administration–Law .....	M.B.A.–J.D.
Business Administration–Medicine .....	M.B.A.–M.D.
Business Administration–Nursing .....	M.B.A.–M.S.N.
Business Administration–Foreign Languages .....	M.B.A.–B.A., M.B.A.–M.A.

Environmental Toxicology–Law .....	M.S.–J.D.
Family Financial Planning–Law .....	M.S.–J.D.
Physiology–Health, Physical Education, and Recreation .....	Ph.D.
Public Administration–Economics .....	M.P.A.–M.A.
Public Administration–Law .....	M.P.A.–J.D.

### Health Sciences

Anatomy .....	M.S., Ph.D.
Athletic Training .....	M.A.T.
Audiology .....	Ph.D.
Communication Disorders .....	M.S.C.D.
Health Services Research .....	M.S.H.S.R.
Medical Biochemistry .....	M.S., Ph.D.
Medical Microbiology .....	M.S., Ph.D.
Medicine .....	M.D.
Nursing .....	M.S.N., Ph.D.
Occupational Therapy .....	M.O.T.
Pharmaceutical Sciences .....	M.S., Ph.D.
Pharmacology .....	M.S., Ph.D.
Pharmacy .....	Pharm.D.
Physical Therapy .....	M.P.T.
Physician Assistant .....	M.S.
Physiology .....	M.S., Ph.D.
Vocational Rehabilitation .....	M.V.R.





## Research Opportunities

With the full range of graduate programs presently in place, Texas Tech offers advanced study not only in the complete spectrum of basic disciplines, but also in many unique areas. Every department has its own particular strengths with each college possessing special resources, centers of investigation, and research opportunities. For example, Texas Tech's renowned College of Engineering is deeply involved in research and provides exciting opportunities in a variety of areas, through both traditional programs and more specialized initiatives such as the Wind Engineering Research Center, the Center for Hazardous and Toxic Waste Studies, and the Water Resources Center. The college also supports the Center for Research in Industrial Automation and Robotics, the Institute for Ergonomics Research, and the Institute for Disaster Research—all of which have attracted national interest.

The multidisciplinary High-Performance Computing Center (HPCC) located at Reese Center uses a state-of-the-art SGI/CRAY system and related virtual reality lab. The HPCC facilitates research within departments as well as multidisciplinary research across the university. It also provides classes in the use of high-performance platforms, in techniques and theory of parallelization of code. These courses can be specialized to meet the needs of individual departments, centers, or research teams.

The Natural Science Research Laboratory, an archive of representative recent fauna of the American Southwest and other areas, functions as a natural history library for studies of biodiversity, biogeography, ecology, evolution, genetics, molecular biology, parasitology, systematics, and virology. The collections, extensively used for investigations worldwide, include specimens of 72,000 mammals; 4,500 birds; more than 15,000 reptiles, amphibians, and fish; 250,000 insects; and 75,000 cryogenically preserved tissue samples, providing hands-on training for graduate students in biology and museum sciences.

The Plant Stress and Water Conservation research program in the College of Agricultural Sciences and Natural Resources investigates plant growth and development under conditions of thermal and water stress to aid in creating new crop varieties and management systems which minimize the impact of climatic extremes. Students can explore other specializations through the Thornton Agricultural Finance Institute and the Wildlife and Fisheries Management Institute, among numerous additional options.

The Health Sciences Center has developed major research strengths in reproductive biology, neuroscience, hematology and immunology, the mysteries of sleep, and Alzheimer's disease. Texas Tech's innovative Sports Health program combines the resources of personnel from the Health Sciences Center and the Department of Health, Physical Education, and Recreation, as well as related sciences.

An internal VAX-11/750 system, microcomputer labs, and a remote-access center linked to the university's central computing facilities permit students to train with state-of-the-art resources located in the College of Business Administration. Research facilities include the Center for Professional Development, the Institute for Banking and Financial Studies, the Institute for Studies in Organizational Automation, and the Small Business Institute.

The nationally top-ranked College of Human Sciences boasts a spacious and attractive learning environment together with many special research programs and centers. Community support services are offered through the Institute for Child and Family Studies, the Child Development Research Center, and the Marriage and Family Development Center, which in turn enhance ongoing research. Other centers within the College of Human Sciences include the Institute for Nutritional Services, the Curriculum Center for Family and Consumer Sciences, the Texas Wine Marketing Research Institute, the Leather Research Institute, the Risk-Taking Institute, and the Center for the Study of Addiction.

The Center for Applied Systems Analysis, the Psychology Clinic, and the innovative Center for Forensic Studies—which has attracted state and regional media attention for its work in criminology—figure among a broad spectrum of prominent research endeavors within the College of Arts and Sciences. The Institute for Studies in Pragmatism is one of two national focal points for investigations of the thought of American philosopher Charles S. Peirce.

Special study and research opportunities in Arts and Sciences include the Center for Public Service and the Institute for Communications Research. Many such programs have their own specialized libraries or collections and nearly all are linked to the professional achievements and scholarly contributions of a distinguished faculty.

The Biotechnology and Genomics Center, established to encourage and support multidisciplinary research in biochemistry, cell biology, genetics, molecular biology, and related areas, offers a training program for Ph.D. students interested in interdisciplinary research in plant stress, including research teams in areas of cotton improvement and drug design. The institute's sophisticated core instrument facility provides services such as DNA sequencing.

ICASALS, Texas Tech's International Center for Arid and Semiarid Land Studies, established over a quarter century ago, encourages study of arid and semiarid environments and the human problems peculiar to such areas. As a part of its special goal, ICASALS hosts numerous international visitors to the Texas Tech campus. The center operates an international data exchange and coordinates research in a variety of regional and global land-use programs.

Other centers of international scope at Texas Tech include the Latin American and Iberian Studies program and the College of Architecture's Institute for Urban Studies International. The Vietnam Archives have made Texas

Tech a major center for studies of that country, with Texas Tech having become a focus for doctoral dissertations and Vietnam studies.

Various unique research opportunities are independent of specific programs. Examples include the Archive of Turkish Oral Narrative, the one-of-a-kind collection of Modernist periodicals in the library of the Instituto de Estudios Hispánicos, and the nationally known Comparative Literature Symposium, now with nearly four decades in existence.

Reflecting many of the university's research strengths, Texas Tech University Press publications appeal to both academic tastes and those of the general reader, and range from cutting-edge scholarship to award-winning popular books.

The Graduate School is justifiably proud of the many outstanding teachers, honored scholars, and internationally known experts who are currently part of the graduate faculty at Texas Tech. Graduate students in every college have the opportunity to work with a distinguished group of professors, to interact with present and future leaders of their respective disciplines, and most importantly, to enjoy the rapport that comes from mutual enthusiasm for learning, research, and shared interests. Comments from present and former students indicate their deep appreciation for faculty whose doors are always open and who are easily accessible for consultation and assistance despite research and editorial involvements, activities in professional organizations, and the daily demands of an expanding curriculum. The quality of graduate faculty-student interaction is enhanced by a small class size that allows a professor to devote personal attention to each student. Standards for graduate students have been raised in recent years, and many programs have admissions requirements that exceed the university-wide standard. At the same time, the Graduate School has expanded admissions criteria to include numerous factors besides test scores and grades, allowing consideration of a broad range of indicators of full individual potential.

## Finances

Texas Tech offers graduate study opportunities that are far more affordable than those at other institutions. Not only is the State of Texas known nationwide for its low tuition rates (as recognized by the *Chronicle of Higher Education*), but Texas Tech is outstanding among the state's universities for its reasonable costs. Texas Tech is able to help most of its graduate students with some form of financial assistance, and with the below-average cost of living in Lubbock, graduate education at Texas Tech is an exceptional investment value.

A number of fellowships are available for graduate work at Texas Tech, often directly through the departments, especially for doctoral work. Many departments also support graduate students through teaching assistantships and research assistantships, which must be re-

quested from the department concerned. Some departments offer tuition scholarships as well, and by departmental nomination, Chancellor's Fellowships are available to qualified students to enhance assistantship stipends. Applications must be completed and the student must first be accepted by the Graduate School before departments can act on requests for fellowships and assistantships and make Chancellor's Fellowship nominations. Other fellowships and financial assistance available through the Graduate School include the Cash Family Endowed Fellowships, the James Douglas and Mary Hazlewood Memorial Fellowships, the Helen DeVitt Jones Graduate Fellowships, the Arthur J. Waterman Scholarships, the Health and Social Service Fellowships, the Ronald E. McNair Post-Baccalaureate Achievement Program, Mr. and Mrs. Carl H. Gelin Emergency Loan Fund, and the Junction Summer Scholarship Program. Competitive Graduate Dean's Summer Research Awards are also available to assist students completing theses and dissertations. Further details can be found at <[www.ttu.edu/gradschool](http://www.ttu.edu/gradschool)>.

Details on other work opportunities on campus and additional economic assistance are available by request in the *Scholarships and Financial Aid* publication through the Student Financial Aid Office, Box 45011, Lubbock, TX 79409.

## Location

Lubbock, a city of nearly 200,000, was named by *Money* magazine some years ago as one of the top places to live in the United States. Among Lubbock's many cultural and recreational opportunities are more than sixty public parks for those interested in sailing, sailboarding, tennis, softball, golf, and soccer. Cultural events include regular performances of the Lubbock Symphony and Civic Ballet during a full season of programming, while dramatic groups from the city, the Texas Tech theatre arts program, and occasional Broadway companies present a broad selection of theatrical fare. Other special events—including lectures, films, symposia, and performances by visiting artists—are part of each semester's calendar.

Situated at an elevation of 3,250 feet, Lubbock offers a dry, invigorating climate boasting more than 3,550 hours of sunshine annually, low summer humidity, and moderate winters, making it comfortable in all seasons. Lubbock is located 320 miles west of Dallas and an equal distance southeast of Albuquerque, New Mexico. The city is served by a modern, international airport, as well as an interstate highway. Part of the city's uniqueness stems from geographical location, while part is derived from Lubbock's multicultural flavor.

Lubbock's relatively low cost of living permits many options in housing, apartments, and other lodging. Compared to the national average, rent is considerably less expensive, as are food and entertainment. Lubbock's many clubs and restaurants offer dining for all tastes at reasonable prices, as well as varied entertainment op-

tions. The below-average costs of tuition and fees at Texas Tech, combined with the low living expenses, facilitate a higher quality of life for graduate students than is feasible at most other universities.

Lubbock has become a regional medical center, partly because of the Health Sciences Center. Several major hospitals, numerous clinics, specialized medical groups, dentists, and other health care professionals have established themselves here, providing excellent health care. Clean air and good climate are added health bonuses for residents.

Nearby lakes permit water skiing and fishing, and the mountain ranges of eastern New Mexico are within easy driving distance of Lubbock, offering hiking and camping during the spring, summer, and fall, and snow sports in winter.

Excellent relationships between the city and the university facilitate student-community integration and offer many opportunities for off-campus internships, practica, and field work.





# General Information

## The Graduate Catalog

This catalog is an official bulletin of Texas Tech University containing policies, regulations, procedures, and fees in effect as the publication went to press. The university reserves the right to make changes at any time to reflect current board policies, administrative regulations and procedures, amendments by state law, and fee changes.

Students are urged to study the contents of this catalog carefully, for they are responsible for observing the regulations contained herein.

Other official bulletins published by the university include *Undergraduate Catalog*, *Law School Catalog*, *Scholarships and Financial Aid*, *Extended Studies Catalog*, and *Faculty Handbook*.

The *Student Affairs Handbook* includes the institution's policies and regulations relating to student conduct.

Courses to be offered during any semester or summer term are announced prior to the registration period for that semester or term in the form of class schedules.

Visit our Web site at <[www.ttu.edu/catalogs](http://www.ttu.edu/catalogs)> where the current *Undergraduate*, *Graduate*, and *Law* catalogs are maintained together with other official university documents.

## Equal Opportunity Policy

The university brings together, in common pursuit of its educational goals, persons of many backgrounds and experiences. The university is committed to the principle that in no aspect of its programs shall there be differences in the treatment of persons because of race, creed, national origin, age, sex, or disability and that equal opportunity and access to facilities shall be available to all.

Nondiscrimination is observed in the admission, housing, and education of students and in policies governing discipline, extracurricular life, and activities.

The university is an equal opportunity employer and no applicant or employee will be discriminated against because of race, color, religion, sex, age, national origin, lifestyle, or disability concerning employment or during the course of employment in the institution.

Any student complaints pursuant to a discrimination concern should be referred to the Office of Campus Life, 250 West Hall, 806-742-2192.

## AccessTECH (Students with Disabilities)

Students with disabilities at Texas Tech University will find numerous programs designated to coordinate academic accommodations and promote access to all phases of university life. Such programming is coordinated through AccessTECH: *An Academic Accommodation and Disability Support Program*, with the assistance of an advisory committee of disabled and nondisabled faculty, staff, and students.

AccessTECH personnel oversee and coordinate programs to ensure accessibility to students with disabilities on an individual basis. The university strives to provide equal access to a college education as well as support to students with disabilities in their experience in the university community. ADA compliance officers located in the Office of the Provost and the Student Counseling Center also work with students with disabilities to coordinate accessible facilities.

Prospective and current students interested in receiving more information regarding programs for students with disabilities should contact AccessTECH, 214 West Hall, 806-742-2405.

State offices of the Texas Commission for the Blind (806-742-2253) are also located on the campus.

## Texas Commission for the Blind

The Texas Commission for the Blind has several vocational rehabilitation programs of educational assistance for blind and visually impaired students at Texas Tech, in those instances in which the disability constitutes a substantial handicap to employment. For detailed information concerning these programs, contact the TCB counselor, 3rd floor, TTU Library, 806-742-2253.

## Facilities and Services

**Office of Campus Life.** The Office of Campus Life at Texas Tech, one of the most diverse in its programs and services on campus, provides students with a wide array of opportunities for a better educational experience. The office recognizes Tech's diverse student populations and appreciates the different backgrounds and interests of these populations. This office, along with other academic and administrative departments and the Lubbock community, helps create an environment conducive to creative learning.

The Office of Campus Life is located in 250 West Hall, 742-2192.

**Student Health Services.** Student Health Services is a primary care clinic staffed with experienced physicians, nurse practitioners, health educators, and support staff who provide care for minor illnesses and injuries, with a focus on prevention.

Students enrolled for 4 or more semester hours pay a medical services fee that entitles them to necessary visits to Student Health Services and access to other medical services, when appointments are available. A valid Texas Tech ID is required to access the clinic services. A student who is unsure about a medical issue or problem can call 743-2860 and speak to the nursing staff privately and confidentially. If a student is sick and all appointments are taken for the day, an urgent care nurse will advise on care until the student can be seen. Care is provided at Student Health Services in Thompson Hall, and physicians do not make residence hall or house calls. As over 150 appointments are available daily for care, stu-



dents have a wide variety of choices for appointment times and conflicts with class schedules are very few. Students are not given excuses for missed classes due to a visit to the clinic. Students with a major illness may consult their physician at Student Health and may request an excuse for excessive class absences due to that illness.

Services offered at Student Health include Primary Health Care Clinic, Men's Health Clinic, blood pressure and cholesterol checks, contraceptive counseling and information, pharmacy, anonymous HIV testing and counseling, Women's Health Clinic, immunizations, care for sprains and strains, prescription medications, and educational information on more than 100 health issues. Offered by referral by a Student Health physician are the Dermatology Clinic, Orthopedic Clinic, and x-ray and laboratory services.

Pharmacy services are conveniently located in the same building. The pharmacy can fill most health care providers' prescriptions, including those written by a family health care provider, and it offers many over-the-counter medications at reduced prices for students. Pharmacy purchases may be charged to major credit cards and Tech Express.

Student Health's Nurse Clinic provides MMR (measles, mumps, and rubella), influenza, tetanus, TB testing, and hepatitis B immunizations at a nominal charge. The university requires that all students born after December 31, 1957, provide proof of two MMR immunizations in their lifetime. The first immunization must have been received on or after the first birthday. The two immunizations must have been received at least 30 days apart. Students must meet this requirement by providing documentation of or receiving the immunization by the 5th week of the first semester of enrollment. Failure to comply with this policy will result in a hold being placed on the student's records. Mail documentation to Student Health Services, Medical Records, 3601 4th Street, MS 7208, Lubbock, Texas 79430 or fax to (806) 743-2122. *Include your social security or student ID number on all documentation.* There is a \$5 charge for the MMR immunization. Although it is not a requirement, the Center for Disease Control recommends an annual TB test and the Hepatitis B immunization. These services are available for \$8 and \$35, respectively.

The 77th Texas Legislature passed a law requiring that all public institutions of higher education in Texas provide all new students information about bacterial meningitis. We are extending the requirement and are notifying ALL Texas Tech students of this information. Please go to this Web site <[www.techsis.admin.ttu.edu/health.htm](http://www.techsis.admin.ttu.edu/health.htm)> and review the information on bacterial meningitis. Once you have read and confirmed that you have received this information, your student record will be updated. If you have any questions or would like to receive the vaccination for meningitis, please contact Student Health Services at (806) 743-2860.

If seeking emergency, after-hour, or weekend care, please check with local hospitals' emergency rooms or

other medical facility of your choice. Student Health Services has arranged for a discounted rate for Texas Tech students at University Medical Center's Emergency Center. Hospital care and outside referrals are not covered by the medical services fee and are the responsibility of the patient.

Student Health Services is not a substitute for major medical insurance. Students should have their own insurance policies or see that they are covered by their parents' insurance. Students who do not have insurance or who are not covered by a family policy may purchase student injury and sickness insurance through a plan offered by the TTU Student Association. Applications may be obtained from Student Health or from the Student Association, Room 230 University Center.

In accordance with state law, a student's medical information is kept completely confidential and cannot be released to anyone without the student's written permission unless otherwise authorized by law. Brochures detailing Student Health Services are available in several locations on campus. Students may contact Student Health at 743-2860 with any questions or concerns. Student Health Services is located in Thompson Hall at Drive of Champions and Flint Avenue on the north end of the campus. Services are available by appointment by calling 743-2848. Appointment hours are 8-5:30, Monday-Friday. Summer and interim hours may vary.

**Residence Halls Facilities and Services.** The Texas Tech residence hall system includes a variety of living options and provides convenient and affordable housing for approximately 6,000 students. Special interest housing, including Honors, Intensive Study, and upperclass-graduate areas, provides students with the opportunity to live with others of similar interests. The Carpenter/Wells Complex arranged in three-bedroom townhouses or four-bedroom flats offers private bedrooms in an apartment setting. Gaston Hall Apartments and Doak Hall offer upperclass and graduate students separate living communities to meet the needs of mature students. Honors housing is available in Gordon Hall (suites) and Coleman Hall. All residence halls are nonsmoking living environments. Additionally, all residents of a hall will select a visitation policy from four approved choices. Visitation options range from "24/7" to restricted hours.

Ethernet computer connections and a private telephone line are available for each resident. Other services include basic cable television service, local telephone service, coin-operated laundry and vending machines, and desk services.

An experienced and trained staff of Residence Life Coordinators and Resident Assistants manages the residence halls. Each hall office provides assistance to residents with concerns, including maintenance requests, room and roommate assignments, and resource information.

The interests of students living on campus are promoted through the Residence Halls Association and indi-

vidual hall governments. Each hall government sponsors social, cultural, educational, and recreational activities.

Dining services for on-campus residents provides a wide variety of choices. Residents may dine in any of the conveniently located dining halls, the Market at Stangel/Murdough, or Sam's Place mini-markets using the meal plan. Regular and theme (Mexican, Italian, Asian, etc.) menus are offered in the five all-you-care-to-eat dining halls. The Market at Stangel/Murdough and Sam's Place mini-markets offer a variety of dine-in or take-out choices where items are individually priced. The Market and Sam's Place offer late-night and extended serving hours. Meal service is not provided during the Thanksgiving, semester, or spring vacation periods while classes are not in session.

Meal plans provide residents with a predetermined amount of Dining Dollars per semester. As purchases are made at all-you-care-to-eat halls or at cash dining operations, the account balance will be reduced for the cost or value of the meal.

Graduate students who live off campus may purchase a meal plan and eat in the conveniently located dining halls or the Market at Stangel/Murdough or Sam's Place mini-markets. The Masked Rider Plan provides a set number of meals and is accepted in the all-you-care-to-eat dining halls. The Red Raider Plan provides a predetermined amount of Dining Dollars to make purchases at discounted rates in cash operations including Sam's Place and the Market at Stangel/Murdough.

**Residence Hall Reservations.** Residence halls, like all other services and facilities of Texas Tech, are available to all students regardless of race, creed, national origin, age, sex, or disability. Applications for housing are accepted up to one year in advance of enrollment in the university. Students may apply for housing before being admitted to the university.

To receive a higher priority for room assignment, all students are encouraged to submit the Residence Hall Application specifying their preferred hall choices as early as possible. The date the application is received determines the priority for room assignment. Space in the university residence halls is reserved on a first-come, first-served basis. All students who apply for accommodations in the residence halls and are accepted sign a Residence Hall Contract for the full academic year. A limited number of one-semester contracts are available to upperclass and graduate students upon request. A contract will be mailed to new students after the application and required fees have been received.

Room and roommate assignments for new students are made in June after continuing students in the residence halls have completed reassignments for the following year. Roommate requests are granted when space is available, if the request is mutual and if both applications are received at or about the same time. Graduate students may request a single (private) room if preferred. All specific requests will be considered when space is available.

**Room and Board Rates.** Rates for room and board are based on a per-person charge and are established by the university Board of Regents in February of each year. For reference purposes, the rates for the 2001-2002 academic year are listed below. Rates are for a double room and the Diamond Declining Dining Dollars Meal Plan (excluding state and local taxes):

Non-air-conditioned halls:	
Bledsoe, *Doak, *Gaston, Sneed	\$4,701
Air-conditioned halls:	
Chitwood, Clement, Coleman, *Gaston, Gates, Horn, Hulen, Knapp, Murdough, Stangel, Wall, Weymouth	\$5,337
Air-conditioned suites:	
Gordon	\$5,532
**Carpenter/Wells Complex	
3-bedroom townhouse	\$6,150
4-bedroom flat	\$5,926
*Doak and Gaston residents add \$35 for continuous housing between fall and spring semesters.	
**Rates are for a single room and the Diamond Declining Dining Dollars Meal Plan.	

Single room charges (except Carpenter/Wells) range from \$790 to \$860 per academic year.

For assistance or to obtain a residence hall application, contact the Department of Housing and Dining Services, Box 41141, Lubbock, TX 79409-1141, 806-742-2661, or <[www.hous.ttu.edu](http://www.hous.ttu.edu)>.

**Career Center.** Graduate students are strongly encouraged to use the many services available through the university's centralized Career Center. Each year, hundreds of organizations visit the campus for on-campus interviews, list positions requiring graduate degrees with the center, or review resumes of potential candidates for employment. All graduate students are urged to register with the center, which can be done via our Web site <[www.careercenter.ttu.edu](http://www.careercenter.ttu.edu)>. Career counseling, campus interviewing opportunities, career fairs, a career library, and the establishment of a credentials file are among the services that students can find helpful. The Career Center is currently located in 335 West Hall but will be relocating to the Wiggins Complex during the 2002-03 school year. The telephone number is (806) 742-2210.

**Library.** Texas Tech University Libraries comprise a number of libraries, including the University Library, Architecture Library, the Southwest Collection/Special Collections Library, and the International Cultural Center Library. The library's Web site <[www.lib.ttu.edu](http://www.lib.ttu.edu)> provides information about the libraries' services and extensive holdings, including a collection of over 2.1 million books, nearly 2 million units of microforms, and over 21,400 current serial titles.

Research collections include unique resources such as the Southwest Collection, the Archive of Turkish Oral Narrative, and the Institute for Studies in Pragmaticism.

Other archive holdings are the Vietnam Archive and the CNN World News Report Archive. In addition, the University Library is a Patent and Trademark depository and one of two regional depositories for U.S. government documents in Texas. The size, range, and uniqueness of some of these collections place Texas Tech among the ranks of the leading research libraries in North America.

The University Library has recently undergone extensive renovation to create a pleasant environment conducive to study and research. A range of library services is provided for graduate students including the following:

**Library instruction.** In addition to answering questions at the Reference Desk, subject librarians assigned to academic departments provide a one-on-one consultation service to help students locate relevant material for their research.

**Individual study carrels.** These can be reserved for one semester and are renewable at the beginning of each semester.

**Generous borrowing privileges.** Graduate students may check books out for an entire semester, subject to recall by another patron. Reciprocal borrowing privileges grant students borrowing rights at any public or private four-year college or university in Texas. Books and other resources not available in Texas Tech libraries can be obtained through interlibrary loan at no charge.

**Access to electronic databases.** We provide on-campus and off-campus access to a number of full-text electronic databases and electronic journals covering a range of subjects in the arts and humanities, social sciences, science and technology, engineering, and law.

**Museum.** The Museum of Texas Tech University is an American Association of Museums accredited general museum consisting of the main Museum building, the Moody Planetarium, the Lubbock Lake Landmark, and the Natural Science Research Laboratory.

The Museum mounts temporary and permanent exhibits in the social and natural sciences and the visual arts. The Lubbock Lake Landmark contains a complete cultural sequence from Clovis (12,000 years ago) through historic times. The Moody Planetarium offers public and specially designed school programs. The Natural Science Research Laboratory affords research opportunities in botany, entomology, herpetology, ichthyology, mammalogy, ornithology, and vertebrate paleontology.

A Master of Arts degree in Museum Science and a Master of Science degree in Heritage Management are offered as academic components of the Museum.

The graduate program in Museum Science emphasizes thorough preparation in the broad spectrum of museum theory and practice and leads to a Master of Arts degree. Graduates from the program have a comprehensive background in museum studies. In addition, students may elect to become specialists in a number of subdisciplines including collection management and care; exhibitions and interpretation; museology; museum management; and curatorship in anthropology, art, ethnology, history, and the natural sciences.

The graduate program in Heritage Management emphasizes extensive investigation in the field of heritage management. Graduates from the program are prepared to enhance local, regional, and national sociological and scientific values; encourage preservation and stewardship of cultural and natural heritage; advocate public service; and direct educational programming designed to derive maximum advantage from innovative technology without the loss of cultural identity and biodiversity. The program is configured to allow individual students to emphasize areas of special interests such as heritage administration, conservation, interpretation, education, and use (ecotourism). The program offers both theoretical and practical course work designed to prepare graduates to be leaders in the heritage management field.

Curators—most of whom hold joint appointments in university academic departments—are involved in research. The results of their research periodically appear in the *Special Publications* and *Occasional Papers* series produced by the Museum.

The Museum of Texas Tech University Association contributes significant amounts of monetary and volunteer support to the Museum. In addition, the association publishes *The Museum Digest* and the *Museum Journal*. The Museum publishes a quarterly newsletter, *MuseNews*.

The Museum is open Tuesday through Saturday, 10 a.m. to 5 p.m. (Thursday evening until 8:30 p.m.), Sunday, 1 p.m. to 5 p.m., and is closed Monday. The Museum is closed on state authorized holidays. Planetarium shows are at 3:30 p.m. Tuesday-Friday, 7:30 p.m. Thursday, and 2 and 3:30 p.m. Saturday and Sunday.

**Computing Services.** The Information Technology Division <[www.infotech.ttu.edu](http://www.infotech.ttu.edu)> provides a wide range of computing resources, services, and support for students, faculty, and staff. Some of the key services are student labs, free shortcourses, Web hosting, personal Web pages, e-mail, aliases, dial-up (RAS) access, Help Desk, desktop support, teleconference room, and server hosting, administration, and consulting. The most recent addition to these services is the student portal "RaiderLink" available at <[www.raiderlink.ttu.edu](http://www.raiderlink.ttu.edu)>. Most online services will be accessible via the use of an eRaider account provided by the IT Division.

**Technology Support** <[www.itts.ttu.edu](http://www.itts.ttu.edu)> provides quality user services and operates the Advanced Technology Learning Center (ATLC) in the west basement of the Texas Tech Library. The 25,000-square-foot ATLC facility provides leading-edge computing technology to the university community. The Technology Support staff provides such services as free shortcourses, Web hosting, consulting, documentation, and computing labs at the ATLC and several remote locations.

**IT Help Desk** <<http://helpdesk.ttu.edu>> is an excellent service that provides students, faculty, and staff with a friendly "front line" to meet their technology support needs. It is the primary point of contact for the IT Division for those needing assistance regarding a technology



issue. The Help Desk is structured to escalate questions, problems, and concerns from the user community to the proper IT staff member and track the incident until it is resolved. Their 742-HELP phone number is easy to remember.

**Telecommunications** <www.net.ttu.edu> provides Texas Tech with a data and video network, TTUnet, and wide-area Internet and Internet2 connections. Telecommunications directly supports education, research, and public service by planning and administering the development, acquisition, repair, maintenance, and delivery of network services.

**Technology Operations and Systems Management (TOSM)** <www.tosm.ttu.edu> staff are available to answer these questions: Do you have questions about server administration, management or support? Are you confident the data on your server is being backed up properly? Do you have questions about distributed mainframe print? TOSM also hosts the IBM 9672-R26 mainframe system supporting administrative, instructional, and research activities and offers such services as general-purpose computation, optical scanning, and large-scale laser printing.

**High Performance Computing Center (HPPC)** <www.hpcc.ttu.edu> houses an SGI/Cray Origin 2000 supercomputer, which contains 56 R12000 processors with 56GB of common memory in a single-image system. It has .8TB RAID storage with 8.8TB of robotic tape storage. These engines can drive a 3 Megapixel display, which provides an immersive experience. A 32-node Beowulf cluster based on IA32 architecture is currently being installed. Faculty and researchers are welcome to take advantage of these services.

**Communication Services** <www.its.ttu.edu> assists in the following areas. Need a new telephone (office or cellular), additional telephone line, or voice mail? Is your telephone not working? Do you need a telephone number for someone on campus? Contact Communication Services at 742-2000.

**Institutional Research and Information Management** <www.irs.ttu.edu> provides precise statistical and management information of all units of the university, regulators, and others. Information provided includes statistics on students, faculty, semester credit hours, and course evaluations.

**Information Systems** <www.itis.ttu.edu/ismain.htm> develops and supports legacy, intranet, and online systems that facilitate the business of the university and Texas Tech Health Sciences Center. Among these are systems for student information, human resources, payroll, accounting, budget, housing, and communication services.

**Southwest Collection.** The Southwest Collection/Special Collections Library research collections include Rare Books, the university archives, the Archive of Turkish Oral Narrative, and the Southwest Collection. The Southwest Collection is the regional repository for historical information pertaining to West Texas and the Southwest. It has collected and makes available for re-

search more than 1,700 collections of personal papers, and over 4,000 hours of oral history interviews, noncurrent business and institutional records, as well as a noncirculating library of Texana, Western Americana, maps, periodicals, photographs, newspapers, taped interviews, films, videotapes, and microfilm. It houses one of the nation's most important collections on the Literature of Place, the James Sowell Collection in Literature, Community, and the Natural World.

All materials may be used by both the university community and the general public for research or reference. The Southwest Collection is located in the Southwest Collection/Special Collections Library Building north of the University Library. Service is provided 9 a.m. to 5 p.m., Monday, Wednesday, and Friday; 9 a.m. to 7 p.m., Tuesday and Thursday; and 10 a.m. to 5 p.m., Saturday. Inquiries and donations are welcomed. Tours are available.

**Research Centers and Institutes.** In addition to extensive research activity on the part of its individual faculty, the university sponsors institutes and centers that conduct both basic and applied research and provide various services to the public. A list of these follows:

#### *Interdisciplinary*

Center for Applied Acoustics Research and Development  
Center for Applied Petrophysical Studies  
Center for Biotechnology and Genomics  
Center for Child and Adolescent Development and Resiliency  
Center for Health Care Strategy  
Center for High Performance Computing  
Center for Systems Solutions  
Fire Ecology Center  
Institute for the Development and Enrichment of Advanced Learners (IDEAL)  
International Center for Arid and Semiarid Land Studies  
International Center for Space Science  
Northwest Texas International Trade Center  
Northwest Texas Small Business Development Center  
Software Engineering Research, Training, and Education Center  
Teaching, Learning, and Technology Center  
The Institute of Environmental and Human Health

#### *Agricultural Sciences and Natural Resources*

Center for Excellence in Cryobiology  
Center for Agricultural Technology Transfer  
Center for Feed and Industry Research and Education  
Cotton Economics Research Institute  
Institute for Research in Plant Stress  
International Center for Food Industry Excellence  
International Textile Center  
Pork Industry Institute for Research and Education  
Thornton Agricultural Finance Institute  
Wildlife and Fisheries Management Institute



*Architecture*

Architecture Research Center

*Arts and Sciences*

Center for Applied Systems Analysis

Center for Forensic Studies

Center for Historic Preservation and Technology

Center for Integration of Science Education and Research

Center for Petroleum Mathematics

Center for Public Service

Center for the Interaction of the Arts and Sciences

Center for the Study of the Vietnam Conflict

Center of Sports Health and Human Performance

Cooperative Institute for Convective Meteorology Studies

Institute for Communications Research

Institute for the Mathematics of the Life Sciences

Institute for Studies in Pragmatism

Leather Research Institute

Southwest Center for German Studies

*Business Administration*

Center for Entrepreneurial and Family Business

Center for Professional Development

Institute for Banking and Financial Studies

Institute for Internet Buyer Behavior

Institute for Leadership Research

Texas Center for Innovative Organizations

*Education*

Virginia Murray Sowell Center for Research and Education in Visual Impairment

*Engineering*

Center for Applied Research in Industrial Automation and Robotics

Center for Energy Research

Center for Multidisciplinary Research in Transportation

Center for Partnerships in Science and Technology

Institute for Design and Advanced Technology

Institute for Disaster Research

Institute for Ergonomics Research

MRI Petrophysical Applications Center

Murdough Center for Engineering Professionalism

Nano Tech Center

Pulsed Power and Power Electronics

Rural Airborne Particulate Matter Research Center

Water Resources Center

Wind Engineering Research Center

*Human Sciences*

Center for Financial Responsibility

Center for the Study of Addiction

Child Development Research Center

The Curriculum Center for Family and Consumer Sciences

Institute for Child and Family Studies

Texas Wine Marketing Research Institute

**Office of International Affairs.** The Office of International Affairs (OIA) is composed of a division of immigration services and student advisement; an Overseas Resource Center for study abroad, international sponsored student recruitment and alumni development; the International Center for Arid and Semiarid Land Studies (ICASALS); the Division of Public Education for K–12 students; the International Cultural Center; and several support units. OIA facilitates programs that bring an international dimension to the university's roles in teaching, research, and public service. OIA works with and assists the various units of the university, coordinating international activities at Texas Tech.

The immigration division provides information, counseling, and advisement to international students and scholars on all noncurricular issues including immigration regulations, financial issues, personal concerns, and general American academic questions. The office also coordinates cross-cultural programming and other extracurricular activities with campus- and community-based organizations to facilitate development of cross-cultural understanding. OIA offers customized services to sponsoring agencies and students. Services to sponsoring agencies include monitoring of placement, customized billing procedures, timely reports, special program design, and maintenance of communications. Special counseling and advising, orientation, and administrative services are provided to sponsored students. An administrative fee of at least \$250 per semester and \$125 per summer term enrolled is charged for sponsored international students. See also the Overseas Resource Center section in this catalog for information on Texas Tech opportunities for study abroad. The public education division, funded through the university with the support of an external organization, provides an outreach program of an international dimension for K–12 students. ICASALS provides special research and sustainable development projects for faculty, staff, and students. See the ICASALS entry for additional information. The International Cultural Center houses all units of the Office of International Affairs; a library featuring specialized publications, videotapes, and CD-ROMs; the CNN World Report Television Archive; and the area studies programs of the university. It offers attractive facilities for all types of meetings, conferences, and special events and represents Texas Tech's commitment to internationalization.

**Overseas Opportunities Resource Center.** A period of time spent studying abroad is of more importance today than ever before. Students in almost any field will be more competitive in the globalized job market if they have studied abroad. For example, pre-med students will be more competitive when applying to a medical school if they have studied abroad. The reason for this is that study abroad offers a kind of education that can be obtained in no other way than through the experience of living in another culture for in this situation one is afforded the opportunity to view one's own culture through the eyes of another culture. This opportunity broadens

one's perception of the world and enables one to gain skills in working cooperatively with people from other cultures. The experience obviously offers the opportunity to improve facility in other languages, to study problems and approaches to problems that are specific to other areas, and to gain a new understanding of oneself and one's own culture.

Many of the foreign language areas and other departments offer their own programs in the summer. Additionally, the Overseas Resources Center, a unit of the Office of International Affairs, coordinates reciprocal student exchanges with institutions in Eastern and Western Europe, Scandinavia, Turkey, and Central and South America. This type of exchange allows qualified Texas Tech students to trade places with students from other countries for a year or semester and to receive credit and grades for their academic work. The cost of these exchanges is usually much less than that of many other education abroad programs, and participants remain eligible for financial aid and scholarships through Texas Tech University.

There are also affiliated study abroad programs in which Texas Tech students pay tuition to another institution or program with which the university has an affiliation agreement. Through the center, participants in these programs remain registered in a non-tuition-bearing registration while they are away so that they are not required to reapply for admission upon return to the United States. They also remain eligible for financial aid and scholarships through Texas Tech. Transfer credit is earned for academic work completed on these programs. We can literally send students almost anywhere in the world on these programs—to Eastern and Western Europe, Asia, Africa, South America, and Australia.

In addition to coordinating programs, the center maintains a reference library of catalogs and announcements of overseas educational, work abroad, internships, and volunteer programs. These programs include those offered by Texas Tech departments as well as those sponsored by other institutions. The staff of the center helps students clarify their objectives for overseas opportunities and assists them in identifying educationally sound programs. The staff assist students throughout the application process including an all-day orientation program to prepare students for their international experience, and, upon their return, the awarding of credit for academic work completed while abroad. Students wishing to study abroad are advised to begin planning at least one year in advance of their departure.

**Archive of Turkish Oral Narrative.** The archive is a research facility devoted to the study of Turkish folktales and related narrative forms: folk history, legends, folk minstrelsy, and myths. Its extensive holdings—in Turkish on magnetic tape, in English in bound typescript volumes—and its support services for researchers are unique. Books, articles, papers, and recorded programs produced from archive materials flow from scholars in this country and abroad.

Located on the third floor of the Texas Tech University Library, the archive makes available a conference room, audio-visual equipment, and comfortable work space for the use of students, faculty, and the general public. It is open Monday through Friday from 8 a.m. to 3 p.m., and at other times by special arrangement. Queries for information and requests for materials may be written or telephoned to the curator.

**Academic Common Market Program.** Texas Tech participates with 12 other southern states in the Academic Common Market, a reciprocal agreement for sharing uncommon curricula. Students from these states who are admitted into approved out-of-state programs qualify for resident tuition. Two steps are necessary to qualify: (1) applicants must be accepted into a program for which an interstate agreement has been arranged and (2) applicants must submit proof of legal residency in a member state to the university where he or she has been accepted (such documentation is provided by the ACM coordinator in the student's home state; a list of state coordinators is available from the Southern Regional Education Board, 1340 Spring Street, N.W., Atlanta, Georgia 30309).

Graduate programs at Texas Tech University and the member states from which qualified students may gain resident tuition are:

- Master of Architecture (Alabama, Kentucky)
- Master of Science, Doctor of Philosophy—Range Science (Arkansas, Louisiana)
- Doctor of Philosophy—Fine Arts (Arkansas, Louisiana, Tennessee, Virginia)
- Doctor of Philosophy—Home Economics Education (Kentucky)
- Doctor of Philosophy—Land-Use Planning, Management, and Design (Alabama, Arkansas, Kentucky, Louisiana, Virginia)
- Doctor of Philosophy—Marriage and Family Therapy (Kentucky)
- Doctor of Philosophy—Technical Communication and Rhetoric (Tennessee)

Further information about the ACM program in Texas may be obtained from the Program Development Division of Senior Colleges and Universities, Texas Higher Education Coordinating Board, Box 12788, Capitol Station, Texas 78711.

#### **Financial Assistance.**

- University Assistantships* (Available in most departments)
  - Teaching Assistantships
  - Research Assistantships
- Federal Traineeships and Research Assistantships*
  - Center for Public Service (Public Service Fellowships)
- Special Fellowships*
  - Available in a number of departments
- University Counseling Center Positions*
  - Counseling Assistantships
  - Reading Instructorships

**Residence Hall Positions**

Head Residentships  
Resident Assistantships

**Other Assistance**

Texas Public Education Grant awards  
Stafford, Perkins, and other loans

Inquiries concerning assistantships, traineeships, and fellowships (which frequently are subject to annual renewal by granting agencies) should be addressed to the chairperson of the department concerned. For information about residence hall positions, contact the university Housing Office. Information on other financial assistance is available from the Director of Student Financial Aid and from the Graduate School.

**Military Service Programs.** Although they do not offer graduate courses or degrees, Texas Tech's departments of Aerospace Studies (Air Force ROTC) and Military Science (Army ROTC) offer commissioning programs for which graduate students may qualify if their graduate studies will extend for three to four full semesters, not including summer school. Students who have successfully completed the Army ROTC Basic Course or who qualify through enlisted service may enter directly into the Advanced Program. Others may qualify by attending a five-week Army ROTC summer camp. There are no prerequisites for taking the Air Force ROTC upper division classes. Financial assistance is available for all qualified students in either program. For further information, inquire directly to the appropriate department.

## Tuition and Fee Payment

Texas Tech University reserves the right, without notice in this or any other publication, to change, amend, add to, or otherwise alter any or all fees, dues, rates, or other charges set forth herein by action of the Board of Regents of Texas Tech University, Texas State Legislature, or other authority as the case may be.

Texas Tech University reserves the right to deny credit for course work completed in a semester or term and/or registration in a future semester or term for unpaid balances. This also includes the release of official academic transcripts.

The university accepts no responsibility for billings or refund checks sent to incorrect addresses or difficulties caused by the postal service or other delivery services.

*It is the student's responsibility to ensure that payment is in the possession of Student Business Services by the university-established due dates announced each semester.*

**Fee Payment.** Student registration is not complete and enrollment is not official until payment is made on tuition and fees. Tuition and fees may be paid using one of the following options:

*Option 1:* Payment of the total amount due;

*Option 2:* Emergency enrollment loan or payment option plan.

**Failure to make payment by the due date will result in the cancellation of the registration. Failure to make payments under the installment payment plan may result in the addition of late charges. A student who fails to make full payment of tuition and fees including any incidental fees by the due date may be prohibited from registering for classes until full payment is made. A student who is not 100% paid by the date indicated by Texas Tech prior to the end of a semester or term may be denied credit for course work completed that semester or term. Failure to be paid to the percentage required by state law by the date and time established by Texas Tech may result in a cancellation of enrollment. Any student registering or reregistering after the census day will be charged appropriate late fees in addition to tuition and other fees.**

**Emergency Enrollment Loan.** Students may request an Emergency Enrollment Loan (EEL) for 100% payment of tuition and fees. The loan must be repaid over a period not to exceed 90 days from the date of the loan. Students may obtain the EEL form at Student Business Services in 163 Drane Hall, Financial Aid in 301 West Hall, or the Registrar in 100 West Hall. EEL forms are also available at <<http://techsis.admin.ttu.edu/student>>. The student may print the form and deliver it in person to Student Business Services, Financial Aid, or the Registrar for immediate application to their tuition and fee account.

**Payment Option Plan Agreement.** Texas State Law (Texas Education Code, Section 54.007(a) allows students to pay tuition and fees in three installments over the course of the semester. Students selecting this option are required to sign a Payment Option Plan Agreement (POPA) form with the university. POPA forms are available at Student Business Services in 163 Drane Hall, Financial Aid in 301 West Hall, or the Registrar in 100 West Hall. POPA forms are also available at <<http://techsis.admin.ttu.edu/student>>. POPA forms must be turned in prior to the first class day. The first installment of 50% of all tuition and fees must accompany the POPA form. The second and third installments must be made in increments of one-half of the remaining balance for each installment.

Students who have elected the payment option plan and subsequently add or change courses must maintain a 50% or greater payment status on the 12th class day. Please check your account information via the Web to ensure compliance with the terms of the agreement.

Billings will be mailed to the student's permanent legal address in the Student Registration System unless the student has established a Special Billing Address. *Please keep addresses current.*

**Students should refer to the Schedule of Classes published each semester for more detailed and updated registration and payment procedures.**



**Payment.** Payment may be made in cash (in person at Student Business Services, 163 Drane Hall), personal check, cashier's check, money order, Visa, MasterCard, American Express, or Discover Card. Checks should be made payable to Texas Tech University. All payments made other than cash are subject to final acceptance for payment.

**Mailing Payments.** Cash should not be sent through the mail and Texas Tech University accepts no responsibility for cash sent thorough the mail. Payments should be sent to Texas Tech University, Student Business Services, Box 41099, Lubbock, Texas 79409. Payments should be mailed far enough in advance so as to reach Student Business Services by the due date.

**Telephone Credit Card Payments.** Credit card payments may be made by calling 806-742-3272. Please call between the hours of 8:30 a.m. and 4 p.m., Monday through Friday.

**Fax Credit Card Payments.** Credit card payments may be made by faxing payment to 806-742-0445. Please fax credit card payments between the hours of 8:30 a.m. and 4 p.m., Monday through Friday. Texas Tech University assumes no responsibility or liability for credit card payments faxed other than these hours.

**Web Credit Card Payments.** Payment can be made on the Web at this address: <<http://techsis.admin.ttu.edu/student>>.

**Financial Aid Refunds.** Financial aid refunds may be disbursed as permitted by federal regulations. Students may choose either to have their refund checks mailed to them or to have their funds automatically deposited into their checking or savings account.

**Automatic Deposit.** Students may have their refund deposited directly into their checking or savings account at the bank of their choice. The Financial Aid Refund Direct Deposit Authorization form may be obtained from Student Business Services, 163 Drane Hall. Forms are also located at this address: <<http://techsis.admin.ttu.edu/student>>.

Address selection criteria in the Student Information System permit a student to establish the address to which their refund check will be sent. A refund address may be established via the Web at this address: <<http://techsis.admin.ttu.edu/student>>.

The following will be the selection criteria for address printing on the check:

First selection:	Refund Address
Second selection:	Permanent Legal Address
Third selection:	Local Address

The following will be the selection criteria for address printing on the check 3 calendar days prior to the first class day:

First selection:	Refund Address
Second selection:	Local Address
Third selection:	Permanent Legal Address

IT IS THE STUDENT'S RESPONSIBILITY TO MAINTAIN A CURRENT ADDRESS IN THE STUDENT INFORMATION SYSTEM.

**Refund Check Replacement Policy.** The time period for reissuing a refund check will be 10 business days from the date of the check. This will allow sufficient time for the postal system to forward the check in cases of changed addresses.

**Account Information.** Tuition and fee information can be obtained via the Web at <<http://techsis.admin.ttu.edu/student>>. The student's six-digit PIN number will be required to view this information.

**Late Payment Charge.** \$25 per due date charged the first working day following the university established due date. Postmarks will not be a consideration for assessment of this charge.

**Late Registration Fee.** \$25 charged to registrations after classes have begun. Includes reregistration and reenrollment in the event of cancellation.

**Returned Check Charge.** \$25 assessed for each check returned from the bank unpaid. A returned check for initial payment of tuition and fees may result in cancellation of enrollment. Responsibility rests with the student regardless of the maker of the check.

**Post Census Day Matriculation Fee.** \$100 charged for a registration or reregistration and reenrollment after the 12th class day for initial payment. The amount of the reinstatement fee is subject to change by Board action without prior notice.

**Tuition Fees.** Doctoral students registering for the fall 1998 semester or later with 130 or more doctoral hours (150 in the areas of clinical psychology and counseling psychology) will pay out-of-state tuition (full cost of education). These fees may not be waived by virtue of employment or scholarship.

**Graduate Program Tuition.** Students enrolling in graduate level courses will be charged a per credit hour charge in addition to the current tuition. Rates will be set by the college offering the course.

Charges in addition to regular tuition are as follows:

Agricultural Sciences & Natural Resources .....	\$38
Architecture .....	\$37
Arts and Sciences:	
Biology .....	\$26
Theatre & Dance, Public Administration ...	\$25
All other Arts and Sciences .....	\$23
Business Administration .....	\$38
Education .....	\$38
Engineering .....	\$38



Human Sciences .....	\$38
Law .....	\$80
Other Graduate Programs .....	\$25

**Tuition for Texas Residents Other Than the School of Law.** For legal resident students of the state of Texas, tuition is \$88 per semester credit hour (\$44 state, \$44 institutional).

**Tuition for Nonresident Graduate Students Living in a State Adjacent to Texas Who Are Legal Residents of New Mexico, Oklahoma, Arkansas, and Louisiana.** Tuition is \$295 per semester credit hour.

**Tuition for Nonresidents of the School of Law.** Tuition is \$371 per semester credit hour.

**Tuition for Nonresident Graduate Students Who Are Legal Residents of New Mexico, Oklahoma, Arkansas, and Louisiana, Residing in a County Adjacent to Texas.** Tuition is \$88 per semester credit hour.

**Tuition for Texas Residents of the School of Law.** Tuition is \$284 per semester credit hour.

**Tuition for Nonresidents Other Than the School of Law.** Tuition is \$295 per semester credit hour.

**General Fees.** The following fees are in effect during the fall 2001 semester. They are subject to change by the university Board of Regents and/or the Texas Legislature and will not necessarily be the same for the fall 2002 semester.

All fees are mandatory and are authorized by state statute or Texas Tech University Board of Regents authority.

**Application Fee.** \$40.

**University Center Fee.** \$88 charged for enrollment of 3 semester credit hours or more.

**Information Technology Fee.** \$7 per semester credit hour.

**Laboratory Fee.** Not less than \$2 per semester credit hour with a maximum charge of \$30 for each applicable course.

**Library Fee.** \$4 per semester credit hour.

**Medical Services Fee.** \$55 fall and spring semester; \$25 summer term.

**Diploma Fee.** The cost of a diploma will be funded by Texas Tech University.

**Student Services Fee.** \$9.65 per semester credit hour. Supports services including Learning Center, KTX-TFM, *University Daily*, Law School Student Government, Student Organization Advisement, Student Association, Spirit Activities, Health Sciences Center, Student Gov-

ernment, University Counseling Center, Attorney for Students, Career Center, Texas Tech Band, Campus Organizations, Texas Tech Choral Organizations, Texas Tech Symphony Orchestra, Campus Transportation System, Cultural Events, University Theatre, Intercollegiate Athletics, and Recreational Services (intramurals, facilities, aquatic center, sports clubs).

**Diploma Replacement Fee.** \$16 for printing and mailing a replacement diploma.

**Diploma Insertion Fee.** \$2 (reapplication for graduation).

**Identification Card Maintenance Fee.** \$4.50 charged each term or semester.

**Identification Card Replacement Fee.** \$12.

**Identification Card Revalidation Fee.** \$5.

**Graduate Fees.** The cost of research items, questionnaires, charts, maps, slides, microfilm, photostats, postage, etc., required by a graduate student for completion of a thesis or research project as part of the graduate program will be the responsibility of the student.

**International Education Fee.** \$1 charged each term or semester.

**International Student Fee.** \$30 charged to each nonimmigrant international student each enrollment.

**Course Fee.** \$3 minimum per course with a maximum charge of \$45 per course.

**Recreation Center Fee.** \$55 for fall and spring semester; \$27.50 for summer term.

#### Other Fees.

**Music Fees for Private Instruction.** An additional fee is charged at the time of registration for individual instruction in voice, piano, strings, and wind instruments for enrollment in the following courses in applied music: MUAP 1001, 1002, 2001, 2002, 3001, 3002, 4001, 4002, 5001 (1 semester credit hour—\$15) (2 or more semester credit hours—\$30).

**Auditing Fee.** Students enrolled for fewer than 12 semester credit hours in a semester (6 hours in summer) must pay a \$10 fee for the privilege of auditing a course. Written permission from the dean of the college in which the course is being taught and from the course instructor is required. No charge is assessed for enrollment of 12 or more semester credit hours. (Senior citizens 65 years of age and older are exempt from payment of this fee regardless of the number of semester credit hours.)

**Parking Fee.** A fee is required for all vehicles parked on campus. A schedule of these fees may be obtained from Traffic and Parking.

**Fee for Binding Theses and Dissertations.** The charge for binding theses and dissertations is \$12 per copy, plus applicable tax; \$7.50 for architectural theses. For the three required (official) copies, there is a \$45 total charge. This includes a \$4 handling fee to cover preparation and shipping to the commercial binder. The total charge for dissertations is \$95, which includes \$55 for microfilming.

**Distance Learning/Electronic Instruction Fee.** \$10 per semester credit hour.

**Refund of Tuition and Fees.**

**Refund Policy.** All refunds, other than financial aid checks, will be mailed no later than the 35th class day in a fall or spring semester or the 20th class day of a summer term.

**Change in Class Schedule.** Any refund as a result of class change will be processed and mailed no later than the 35th class day of a fall or spring semester or the 20th class day of a summer term. The class change refund amount will be in accordance with the following:

Summer Terms	
1st class day through 4th class day .....	100%
After the 4th class day .....	None

**Students who drop their class enrollment to zero credit hours for a summer term should refer to the withdrawal schedule below.**

**Withdrawal.** Students withdrawing at their request or those who have been withdrawn due to university action may be eligible to receive a refund of paid tuition and fees. The student will be required to pay tuition and fees according to the following schedule:

Before the 1st class day .....	None
1st, 2nd, or 3rd class day .....	20%
4th, 5th, or 6th class day .....	50%
7th class day or later .....	100%

Fall or Spring Semester	
1st class day through 12th class day .....	100%
After the 12th class day .....	None

**Students who drop their class enrollment to zero credit hours for a fall or spring semester should refer to the withdrawal schedule below.**

**Withdrawal.** Students withdrawing at their request or those who have been withdrawn due to university action may be eligible to receive a refund of paid tuition and fees. The student will be required to pay tuition and fees according to the following schedule:

Before the 1st class day .....	None
1st five class days .....	20%
2nd five class days .....	30%
3rd five class days .....	50%
4th five class days .....	75%
21st class day and after .....	100%

Any refund due to a student will be after calculation of the amount of tuition and fees due at the time of withdrawal. If the student has paid less than the amount due at the time of withdrawal, the student will be required to pay the percentage due.

**Federal Refund Formula.** Effective with the fall 2000 semester the new federal refund formula requires federal student aid to be refunded at a prorata basis if a complete withdrawal from the institution occurs before 60% of the semester has been completed.

**Exemptions and Waivers.** All exemptions or waivers have been authorized by statute in the Education Code or through Texas Tech University Board of Regents action.

Texas Tech University reserves the right to apply exemptions and waivers after the census day (12th class day of a fall or spring semester or the 4th class day of a summer term). Also, Texas Tech University reserves the right to audit any exemption or waiver prior to application to a student's tuition and fee account.

Refunds will be mailed according to the refund schedule printed in this publication.

**Academic Common Market.** Exempts nonresident tuition over and above Texas resident tuition rate. Certification by Academic Common Market Coordinator is required.

**Blind Students.** Exempts a student from payment of all tuition and fees excluding charges for room and board. Certification by the Texas Rehabilitation Commission or the Texas Commission for the Blind is required.

**Biomedical Research Program: Scholarship Student.** Exempts nonresident tuition. Documentation is required through the Office of International Affairs.

**Children of Disabled Firemen.** Exempts a student from payment of tuition and required fees. Certification by Texas Higher Education Coordinating Board is required.

**Children of Disabled Peace Officers.** Exempts a student from payment of tuition and required fees. Certification by Texas Higher Education Coordinating Board is required.

**Children of Prisoners of War or Persons Missing in Action.** Exempts a student from payment of Texas resident tuition and required fees. Certification by Texas Higher Education Coordinating Board is required.

**Competitive Scholarship.** Exempts a student from payment of nonresident tuition over and above resident tuition. Student must be awarded a competitive scholarship of at least \$1,000 for the academic year or summer of their enrollment and be either a nonresident or citizen of a country other than the United States. Student must compete with other students including Texas residents and the award must be made through a duly recognized scholarship committee. Certification is sent to Student Business Services from the Financial Aid Office.

**Concurrent Enrollment.** Charges a student minimum tuition charges over and above per credit hour rate. Student must present certification of enrollment at institution of public higher education.

**Deaf Students.** Exempts a student from payment of all tuition and fees excluding charges for room and board. Certification by Texas Rehabilitation Commission or the Texas Commission for the Deaf and Hard of Hearing is required.

**Economic Development and Diversification Employees, Spouses, and Dependents.** Exempts a student from payment of nonresident tuition. A listing of eligible companies is provided by the Texas Higher Education Coordinating Board. Students must provide employment certification accordingly.

**Educational Aide Exemption.** Exempts a student from payment of all tuition and fees except charges for class and laboratory fees. Student must apply for this

exemption through the Financial Aid Office with certification provided by the Texas Higher Education Coordinating Board.

**Faculty Exemption (Teacher or Professor).** Exempts a student from payment of nonresident tuition. Certification by employing department is required.

**Faculty Dependent (Nonresident Dependent of Teacher or Professor).** Exempts a student from payment of nonresident tuition. Certification by employing department is required.

**Foster Care.** Exempts a student from payment of tuition and fees. Must be a Texas resident. Certification from Department of Protective and Regulatory Services is required.

**Good Neighbor (Students from other Nations of the Western Hemisphere).** Exempts a limited number of students from payment of 100% of tuition. Certification through the Office of International Affairs is required.

**Individual Studies.** Waives payment of Student Services Fee, University Center Fee, Rec Center Fee, and Medical Services Fee. Student must be enrolled only for those courses which because of the nature of the courses will not permit the student to avail themselves of these services. All courses in which the student is enrolled must meet this criteria and be certified by the Office of the Provost.

**Junction.** Waives Student Services Fee, University Center Fee, Rec Center Fee, Medical Services Fee, and ID Maintenance Fee for main campus. These are billed separately by the Junction Center.

**Mexico and Canada Exchange Program.** Exempts a student from payment of nonresident tuition. Certification by the Office of International Affairs is required.

**Military Personnel and Dependents.** Exempts a student from payment of nonresident tuition. Application must be made through Admissions and Records. Certification by Unit Commander or Unit Personnel Officer is required. A separate certification is required, in original form, with original signature, for each semester or term of enrollment.

**Off-Campus.** Waives Student Services Fee, University Center Fee, Rec Center Fee, Medical Services Fee, and ID Maintenance Fee. Student MUST be registered in ONLY those courses which, because of their nature, will not permit the student to avail themselves of these services. If student is enrolled in a course requiring attendance on campus this waiver does not apply. Certification by the Office of the Provost is required.

**Prisoner of War.** Exempts a student from payment of tuition and required fees. Student must have been classified as a prisoner of war by the U.S. Department of Defense on or after January 1, 1999.

**Senior Citizens (55 Years of Age and Older).** Exempts a student from payment of up to 6 semester or term credit hours of resident or nonresident tuition. Student must be 55 years of age or older by the first class

day. Notification should be given to Student Business Services at time of enrollment.

**Senior Citizens (65 Years of Age and Older).** Exempts a student from payment of up to 6 semester or term credit hours of resident tuition. Student must be 65 years of age or older by the first class day. Notification should be given to Student Business Services at time of enrollment.

**Special Field Trips.** Waives Student Services Fee, University Center Fee, Medical Services Fee, Rec Center Fee, and ID Maintenance Fee. Student MUST be registered in ONLY those courses which, because of their nature, will not permit the student to avail themselves of these services. Certification by the Office of the Provost is required.

**TANF Students.** Exempts a student from payment of tuition and fees for the first academic year of enrollment. Certification is required from the Department of Protective and Regulatory Services.

**Veterans and Dependents.** Exempts a student from payment of tuition and fees except Student Services Fee and Medical Services Fee and charges for class materials paid directly to the department as a reimbursement for materials used in a laboratory setting. Certification by the Registrar's Office is required.

**Veterans and Dependents (Partial Exemption).** Certification by the Registrar's Office is required. The amount exempted will be that amount calculated after the application of federal aid which the student must utilize first.

**Graduate Student Tuition/Fee Assistance Program: Teaching Assistant, Research Assistant, Graduate Assistant, Graduate Part-Time Instructor.** Exempts, by Board of Regents action, the student from the payment of Institutional Tuition, Student Services Fee, Information Technology Fee, Library Fee, University Center Fee, Recreation Center Fee, and Course Fees.

By Board of Regents mandate, appointment must be on or before the 12th class day of the fall or spring semester (4th class day of a summer term) as a benefits-eligible employee with employment of at least one-half time as a TA, RA, GA, or GPTI.

**Graduate Student Tuition/Fee Assistance Program: Nonresident State Tuition Exemption—Teaching Assistant, Research Assistant, Graduate Assistant, Graduate Part-Time Instructor.** Exempts a student from the payment of nonresident tuition over and above the state resident rate.

By Texas Education Code and Texas Tech Board of Regents mandate, appointment must be on or before the 12th class day of the fall or spring semester (4th class day of a summer term) in a position that meets the definition of the Texas Tech Pay Plan in work related to the student's degree program.

**Benefits-Eligible Medical Services Waiver.** Waives the student from payment of the Medical Services Fee. By Board of Regents mandate, appointment



must be on or before the 12th class day of the fall or spring semester (4th class day of a summer term) in a position eligible for State benefits as defined in the Texas Civil Statutes and the Teacher Retirement System of Texas.

**Teaching Assistant, Research Assistant, Graduate Assistant, Graduate Part-Time Instructor Dependents.** Exempts a student from payment of nonresident tuition over and above state resident rate. Certification from the employing department is required.





## Policies and Regulations

Graduate study is ideally characterized by intellectual curiosity and the desire to contribute to human knowledge. It is much more than a mere continuation of undergraduate work and should be contemplated only by those students who have demonstrated in their earlier studies exceptional intellectual ability and the capacity for independent thought and investigation.

For this reason, practically all graduate schools exercise some type of selectivity in their admission of students. Selective entrance requirements are partly for the maintenance of the high standards that must always characterize graduate study and partly for the benefit of students in helping them decide early whether they should pursue such work.

The Graduate School of Texas Tech University recognizes its obligation both to the standards mentioned above and to the citizens of Texas by requiring appropriate evidence of an applicant's intellectual ability and reserves the right to decline to accept any applicant whose admission would not be to his or her best interest or that of the university. Nevertheless, the Graduate School recognizes that standardized test scores and grade-point averages alone do not portray the complete individual or accurately reflect all relevant abilities. Numerous additional factors are considered in our quest to admit the best students possible.

### Admission to the Graduate School

A \$25 nonrefundable application fee is required of all U.S. citizens and permanent residents seeking admission to the Graduate School for the first time (see "Admission of International Students" on the following pages for the fees for non-U.S. citizens). Once this fee is paid, it is not required when reapplying. Full-time Texas Tech employees, their spouses, and dependents under age 25 are exempt from this fee, and an exemption form may be obtained in the Office of Graduate Admissions. All materials submitted become the property of TTU and are not returnable or refundable.

Five types of admission are granted:

- Admission to a master's or doctor's degree program
- Admission as a nondegree student enrolled in undergraduate courses only (PGRD)
- Admission as a temporary nondegree student (GTMP)
- Admission as a nondegree student seeking teacher certification (CERT, GHEC)
- Admission as a nondegree student seeking continuing professional development (CPED)

The requirements for each type are explained below.

Applicants desiring information concerning services for students with disabilities should contact the AccessTECH Office, 214 West Hall or Box 45008, Texas Tech University, Lubbock, TX 79409-5008, phone 806-742-2405.

**Procedure for Admission to a Master's or Doctor's Degree Program.** Admission to any graduate degree program is granted by the Dean of the Graduate School upon the recommendation of the department of proposed study. The applicant must have been in good standing in the school last attended.

To apply, one must submit to the Office of Graduate Admissions:

1. A formal application (preferably at least three months prior to date of intended enrollment). The forms may be obtained from the Office of Graduate Admissions, Texas Tech University, P.O. Box 41030, Lubbock, TX 79409-1030, phone 806-742-2787. Students may also apply at <[www.ttu.edu/gradschool](http://www.ttu.edu/gradschool)>, through the Texas common application <[www.applytexas.com](http://www.applytexas.com)>, or through Embark <[www.embark.com](http://www.embark.com)>. Please include your social security number when requesting an application.

2. Official transcript showing the awarding of a bachelor's degree. The bachelor's degree must be substantially equivalent to one from Texas Tech. A student who, because of current enrollment, cannot provide final transcripts at the time of application must submit transcripts of all completed study, as well as incomplete transcripts from the current institution. Consideration may then be given for tentative admission upon the condition that final transcripts are provided within the initial semester of enrollment at Texas Tech.

3. Official GRE (or GMAT in the case of the College of Business Administration and a few select programs) score report no more than five years old. This is a requirement for all applicants for degree programs regardless of educational background. Information about the GRE or GMAT may be obtained from the Educational Testing Service, P.O. Box 6000, Princeton, NJ 08541-6000, phone 609-771-7670, <[www.gre.org](http://www.gre.org)> (GRE), 609-771-7330, <[www.gmat.org](http://www.gmat.org)> (GMAT).

4. Official, in good standing transcripts from all higher education institutions attended.

Prospective students must also contact the department in which they are planning to study to obtain information regarding any special admission requirements, such as additional tests, applications, or letters of recommendation. You may do so by calling the main university switchboard number 806-742-2011, then asking for the department in which you are interested. You may also find the departmental applications at their Web sites <[www.ttu.edu/gradschool](http://www.ttu.edu/gradschool)>, then click on Academics.

Application files will not be evaluated until all of the above requirements have been met. Applicants will be notified by the Director of Graduate Admissions when their applications have been forwarded to the department for consideration and also when an admissions decision has been made. Some departments, operating with a limited number of spaces for students each year, make final decisions for the fall semester in early spring.

Three general categories of criteria are used to evaluate all applicants for admission and competitive scholarships:

**Academic Records:** All academic records may be considered—last 60 hours, total, major, post-baccalaureate, etc.

**Test Scores:** Scores on the General Test of the Graduate Record Examination (GRE) or, for programs in the College of Business Administration, the Graduate Management Admission Test (GMAT), should be no more than five years old. Each score is considered separately, with percentile scores viewed by broad major. No test score will be the sole criterion for making admission decisions.

**Individual Profile:** Profiles may include recommendations, research background, motivation, multilingual proficiency, undergraduate institution, presentations, portfolios, interviews, work experience, demonstrated commitment to a particular field of study, community involvement, and family and socioeconomic background.

U.S. or permanent resident applicants who, for whatever reason, cannot provide all documents required for admission to a degree program by the time of planned initial enrollment may request permission to register for graduate courses through temporary nondegree admission (GTMP).

Falsification of application information will void admission to Texas Tech University.

**Admission to a Second Graduate Degree Program.** Permission to work toward a second graduate degree of the same level is granted only upon approval by the relevant department and review by the Graduate Dean, and the applicant is subject to all requirements as a new student. While there is no guarantee that any work from the first degree may apply to the second, at least one full year (24 semester hours) must be taken specifically for the new degree program.

**Procedure for Admission as a Nondegree Student.** There are four categories of nondegree admission:

1. **PGRD** This category is for students who have earned an undergraduate degree and desire to take only undergraduate courses. In this status, a student may register indefinitely as a nondegree graduate student but may not be appointed to teaching assistantships or research assistantships. *Students in this category may not register for graduate courses.*

2. **GTMP** A student in this category is considered a temporary nondegree student and may enroll for only 12 hours before completing credentials in order to be admitted to a degree program. After this time, the student must be either admitted and enrolled in a degree program, accepted into the certification category (CERT, GHEC), or switch to all undergraduate course work (PGRD).

3. **CERT, GHEC** A student who desires to earn certification through the College of Education or the College of Human Sciences may apply for this type of nondegree status. Graduate courses may be taken, but if the student wishes to pursue a degree at a later time, only 12 graduate hours completed before admission to a degree program can be counted toward a degree. The student must

also apply through the College of Education or the College of Human Sciences, in addition to Graduate Admissions. For information on teacher certification, contact the Teacher Certification Office, College of Education, P.O. Box 41071, Lubbock, TX 79409-1071, phone 806-742-2377.

4. **CPED** This category is designed to meet the needs of professionals such as engineers, certified public accountants, architects, social workers, teachers, administrators, counselors, and other professions that require continuing professional educational development. In addition to applying to Graduate Admissions, students must request permission for this nondegree status from the graduate advisor of faculty administering the program in their department. The GRE will be waived as long as a GPA of 3.0 or greater is maintained as a nondegree student.

Any exceptions to the above must be approved in advance by the Graduate Dean.

Applicants seeking nondegree admission in any category must:

1. Submit a formal application as far in advance of intended enrollment as possible. The application is available through the Office of Graduate Admissions, Texas Tech University, P.O. Box 41030, Lubbock, TX 79409-1030, phone 806-742-2787, or through <[www.ttu.edu/gradschool](http://www.ttu.edu/gradschool)>.

2. Submit an official transcript showing the awarding of a bachelor's or higher degree. The degree must be substantially equivalent to one from Texas Tech. Transcripts for all other college level study must also be submitted. The applicant must have been in good standing in the school last attended.

3. Submit official, in good standing, transcripts that are sent directly from all higher education institutions attended.

The GRE is not required for this type of admission; however, nondegree students who wish to enroll in a graduate course in the College of Business Administration must submit scores on the GMAT and be potentially admissible to a degree program in business. Those students should also contact the Graduate Services Center, College of Business Administration, P.O. Box 42101, Lubbock, TX 79409-2101, phone 806-742-3184, as far in advance of intended registration as possible.

Students who are in nondegree status have no assurance that credits earned while in this status will apply toward degree requirements should admission to a degree program be granted later. Prospective students should be aware that some departments give preference for course enrollments to students in degree programs.

Falsification of application information will void admission to Texas Tech University.

**Readmission to Graduate School.** Students who have been accepted into a degree program and fail to register during a one-year period must contact the department and present evidence to the Office of Graduate Admissions of the department's desire for the student to

continue in the degree program. Students must then contact the Office of Graduate Admissions and update their file by completing and submitting a new application. Payment of the application fee is not required for readmission. The department may require that the application be resubmitted for reconsideration by their faculty.

If a student does not enroll in a spring or fall semester, a returning student form must be completed and submitted to the Office of Graduate Admissions in order to reactivate the file. This rule applies to both students in degree programs and students with nondegree status.

If a student in a graduate degree program has been awarded that degree and wishes to continue taking course work, the student must then request further admission as a nondegree student in one of the nondegree categories by contacting the Office of Graduate Admissions.

**Admission of International Students.** Over the years, Texas Tech University has been fortunate to attract numbers of highly qualified and talented international students. Recognizing the difficulties involved in students' movement from their home countries and home schools to a new environment and to new scholarly procedures and expectations, Graduate Admissions is committed to helping international students in this important transition. Its staff recommends that applicants pay special attention to the following information and requirements.

A \$50 nonrefundable application processing fee is required of all international applicants seeking admission to the Graduate School for the first time. This fee cannot be waived or deferred. Once this fee is paid, it is not required when reapplying. Applications will not be considered unless they are accompanied by an application fee in the form of an international money order, a cashier's check, a traveler's check, a U.S. postal money order, or a U.S. credit card.

Applications and other admission information may be obtained from the Graduate Admission Office, Box 41030, Texas Tech University, Lubbock, TX 79409-1030. The e-mail address is <gradschool@ttu.edu>. The Web address is <www.ttu.edu/gradschool>. Applications, fees, transcripts, and other credentials should be returned to the above mailing address. Applications can also be submitted through the Texas Common Application <www.applytexas.org> or through <www.embark.com>.

Applicants desiring information concerning services for students with disabilities should contact the AccessTECH Office, 214 West Hall or Box 45008, Texas Tech University, Lubbock, TX 79409-5008, phone 806-742-2405.

The deadlines for applications (for all applicants, including those in the U.S.) are

March 1 for the fall semester,  
September 1 for the spring semester,  
February 1 for the summer session.

The following procedures should be followed carefully in order for non-U.S. citizens to be admitted to a master's or doctoral degree program at Texas Tech University.

1. Submit the application fee and application. Please fill out the form carefully. The applicant's name must be the same as it appears on the passport.

2. Submit official Test of English as a Foreign Language (TOEFL) score. The score must be received directly from the Educational Testing Service. Photocopies are not accepted. The minimum score required is 550 on the paper and pencil test or 213 on the computer-based test. The TOEFL is not waived unless an applicant has a degree from a U.S. university. All test scores are received by Graduate Admissions, not the department. Our institution code is 6827.

3. Submit official Graduate Record Exam (GRE) general test scores or Graduate Management Admission Test (GMAT) scores. The GMAT is required for business administration majors. These scores must also be received directly from the Educational Testing Service. The GRE or GMAT requirement will not be waived.

4. Submit original or certified copies of *all* college and university records (marksheets, examination results, etc.). An official English translation is required. Certification of the translation must be made by an official government translator with the original signature and/or the university issuing the transcript or marksheets with original signature and seal. Uncertified photocopies without an original signature are not acceptable. Graduate Admissions will not accept a public notary certification. Graduate Admissions also requires a degree that is equivalent to a U.S. undergraduate degree. This requirement excludes must three-year degrees and degrees that are attained at a second-class level.

5. Submit the original or certified photocopies of the degree certificate, diploma, or official statement that the degree has been granted. The same rules apply for the certification of the diploma as for the transcripts and marksheets.

6. If the degree is not complete when the application is made, 6 semesters or 3 years of course work are required. After the degree is completed, a final transcript showing the degree awarded must be submitted.

7. A bank statement converted to U.S. currency should be included with the application. This statement should not be sent to the department. A statement of support from the sponsor must accompany the bank statement. Students should check with Graduate Admissions about the current amounts needed in the bank account. These amounts include tuition, books, living expenses, etc. Amounts will vary depending upon the financial assistance awarded by the department.

8. If a student is accepted by a department, Graduate Admissions will then determine if there is enough financial information to issue an I-20. If there is, the I-20 will be issued by Graduate Admissions and mailed to the student.

The application process takes time. After an application is received, it may take as long as two months for the processing and decision. Students should contact the prospective department for their individual requirements.



Department information is also available on the Texas Tech University Web site.

International students are not allowed to change majors upon arrival. They must remain in the program to which they are admitted for one year.

Send application fee, application, and all official documents to

Graduate Admissions  
Texas Tech University  
P.O. Box 41030  
Lubbock, TX 79409-1030

Students should be certain to give their full names on the envelope return address. Correspondence should include the full name and birth date. All entries into the records system are made by family name (last name), first name, middle name.

Applications will be judged upon the same general criteria as specified under the "Procedure for Admission to a Master's or Doctor's Degree Program" section of this catalog.

Requirements listed under continuation in the Graduate School, academic probation and suspension, enrollment, and general information apply also to international students.

Students who have been accepted into a degree program and fail to enroll must reapply. A new application form must be submitted, but the application processing fee is not required again. Current financial information is required.

If an international student has attended another U.S. university and wishes to transfer to Texas Tech, an official transcript from that university is required. The student must have maintained a grade point average of at least 3.0 at that university.

**The General Test of the Graduate Record Examination (GRE) and the Graduate Management Admission Test (GMAT).** The general test of the Graduate Record Examination (GRE) is an examination yielding three scores—verbal, quantitative, and analytical. The Graduate Management Admission Test (GMAT) is designed to help assess the qualifications of applicants for study in business and management and it consists of three sections—verbal, quantitative, and analytical writing.

The Graduate School requires that applicants submit a score only for the general test of the GRE; however, a few departments may also require a subject test score. That information may be obtained by contacting the department in which the student is interested.

Both tests are prepared and scored by the Educational Testing Service:

GRE—P.O. Box 6000, Princeton, NJ 08541-6000, phone 609-771-7670, fax 609-771-7906

GMAT—P.O. Box 6103, Princeton, NJ 08541-6103, phone 609-771-7330, fax 609-883-4349

The GRE and GMAT are administered on computer at various testing centers throughout the world several times each week. Information on the computer-based tests is available through the Office of Graduate Admissions at

Texas Tech or the Educational Testing Service, <www.gre.org>.

International students should note that the tests are entirely in English. There are no foreign language editions of the tests.

The information and registration bulletins and examination dates may be obtained from the Educational Testing Service, <www.gre.org>.

Each applicant is individually responsible for making arrangements to take the GRE or GMAT and for having the official score report sent to the Office of Graduate Admissions, Texas Tech University, P.O. Box 41030, Lubbock, TX 79409-1030. The institution code is 6827.

**Continuation in the Graduate School.** Every student enrolled in the Graduate School, whether working toward a degree or not, is required to maintain a high level of performance and to comply fully with policies of the institution. The Graduate School reserves the right to place on probation or to suspend any post-baccalaureate or graduate student who does not maintain satisfactory academic standing or who fails to conform to the regulations of the university.

Students who are admitted to the Graduate School or to a degree program on condition of maintaining a required GPA are automatically on admissions notice. Failure to fulfill the conditions stipulated at the time of admission will result in termination from the Graduate School.

**Academic Probation and Suspension.** If a student's graduate GPA for a particular semester falls below 3.0, the student will be placed on academic probation. (A 3.0 average is the minimum requirement of the Graduate School; individual academic areas may, and often do, impose a higher grade-point average for continuation in their academic programs.) A student must make a 3.0 GPA or better in the next semester in which he or she is enrolled. Failure to do so, or to maintain a 3.0 current GPA in each succeeding semester, will result in academic suspension from further enrollment as a graduate student or in graduate courses at Texas Tech University. Regulations governing scholastic probation are based on semester grade-point averages and will be applied regardless of overall grade-point average. Any student who has been suspended must appeal to the Graduate School if reinstatement is desired. Appeal of suspension may be made in writing to the Dean of the Graduate School. If the student's appeal is rejected by the Graduate Dean, the student may request a hearing before the Student Affairs Committee of the Graduate Council. This committee will render a decision as to whether or when the student may be readmitted to graduate study.

A student may be suspended for unprofessional conduct such as cheating or plagiarism. Any appeal of such action is subject to the provisions of the Code of Student Conduct. See the *Student Affairs Handbook* for further information.



## Enrollment

Students who have been granted admission to the Graduate School are expected to register for course work whether or not they contemplate degree work. Failure to register in the term for which admission is granted requires the student to reapply for admission. The details of registration are under the jurisdiction of the Registrar's office which furnishes to each enrollee complete instructions for all steps in the procedure. Students should follow carefully such instructions and those found below. Graduate students are permitted to register at any time beginning with the first day of advance registration. Advance registration usually begins in April for the summer and fall sessions and in November for the spring semester. The exact dates may be found in the printed *Schedule of Classes* which becomes available shortly before advance registration begins. On-line, Web-based registration is also available to all admitted students. Instructions for Web Registration and Add-Drop on the Web site can be found at <<http://techsis.admin.ttu.edu/student>>.

**Departmental Approval of Courses.** The student should have a schedule of courses approved by an official representative of the major department at the time of registration. It is the student's responsibility to see that the Registrar's printout corresponds exactly to the courses that he or she has registered for.

Enrollment of a graduate student in any course that carries graduate credit is automatically considered to be for graduate credit and affects relevant grade-point averages accordingly.

**Full-Time Study.** Normal full-time enrollment varies between 9 and 13 hours for doctoral students and between 9 and 16 hours for other graduate students in the regular semester. The minimum enrollment for full-time graduate status is 9 hours in the regular semester. Full-time enrollment in a summer term is from 3 to 6 hours. Students on fellowships, assistantships, or other appointments designed for the support of graduate study should enroll for 9 hours in each regular semester and at least 3 hours in a summer term.

If a student is devoting full time to research, using university facilities and faculty time, the schedule should reflect at least 9 hours enrollment (6 hours in each summer term).

Normally, the maximum allowable hours per semester is 13 for doctoral students and 16 for other graduate students, and 6 hours in a six-week summer term. The general rule is that a student may not earn more than one hour of credit for each week of the enrollment period. Any exceptions to this rule *must* have the prior approval of the Graduate Dean.

Registration in an individual study, research, or similar course implies an expected level of effort on the part of the student comparable to that associated with an organized class with the same credit value.

A doctoral student shall not be required to register for more than 9 credit hours during any long semester or 6 credit hours during a summer term and may not register for more than 13 and 6 hours, respectively, without the prior permission of the Dean of the Graduate School.

A doctoral student not on campus who is required to register solely for the purpose of satisfying a continuous enrollment requirement need not register for more than 1 credit hour during each term. However, a doctoral student not on campus who is involved in internship, research, or other type of academic study should register for credit hours in proportion to the teaching effort required of the program faculty.

**Leave of Absence.** Any student who fails to register during a one-year period, and who does not have an official leave of absence from study, is subject to review for readmission by the standards in effect at the time of reconsideration. Official leave of absence, granted by the Dean of the Graduate School upon departmental recommendation, may be requested in case of serious medical conditions and other exceptional reasons only. Normally, leaves of absence will not exceed one year. Leaves of absence do not extend the maximum time allowed for completion of the degree.

**Continuous Enrollment.** Students who have begun thesis or dissertation research must register for 6000 or 8000 courses in each regular semester and at least once each summer until all degree requirements have been completed, unless granted an official leave of absence from the program for medical or other exceptional reasons. Off-campus students may register for 1 hour of 6000 or 8000 with departmental approval until their final semester, at which time they must enroll for at least 3 hours. Students receiving financial assistance must register for the number of hours required by Financial Aid. Approval of a leave of absence will not extend the allowed time for completion of the degree.

**Registration for Thesis or Dissertation Hours.** Registration for master's thesis is required for at least 6 hours, for doctor's dissertation, at least 12 hours. A student must be enrolled in such courses every semester, once the project is begun, until finished. A student should enroll under the committee chairperson; however, in those instances where other professors on the committee are making substantial contribution to the student's research, it is permissible for the student to enroll proportionally under those professors. Students certified as off-campus may enroll for as little as 1 hour until their final semester, at which time 3 hours minimum are required.

Students may not enroll in thesis or dissertation courses before formal admission to a degree program by the Graduate Dean.

Enrollment for thesis or dissertation courses is permitted only during a regular registration period. Students away from the campus may, however, register for such

courses by mail, provided arrangements are made with the Registrar's office by telephone or electronically prior to the beginning of a registration period.

### **Registration When Using University Facilities.**

Students are required to register for appropriate courses in every semester or summer term in which they expect to receive assistance or use the facilities of the university, or when taking comprehensive examinations.

The number of hours for which a student must enroll in each semester depends on the level of involvement in research and the use of university facilities and faculty time. Students in residence who are devoting full time to research should enroll for 9 to 12 hours. Each student fulfilling the doctoral residence requirement will normally enroll for 24 hours within a 12-month period. The requirement may be fulfilled in several ways, such as 12 hours in each of two consecutive semesters; 9 hours in two consecutive semesters and 6 in the summer; or other approved patterns as authorized by the Graduate Dean. Residence consists of accumulation of 24 hours within the approved time. Also, please consult the statements relevant to residence under "General Information," "The Master's Degree," and "The Doctor's Degree." Students off campus who are devoting less time to thesis or dissertation research may enroll for fewer hours, depending on the level of activity and the judgment of the committee chair or the department. However, in the semester in which students expect to complete their work and hold the defense, enrollment should be well above the minimum, to cover the more intense reading and processing time involved.

**Registration in Session of Graduation.** There are three official graduation dates: December, May, and August. Every candidate for a graduate degree must be registered in the Graduate School in the session of graduation for at least 3 hours of 6000/8000, if all requirements are not met, or 1 hour of 7000 individual study for nonthesis, if all requirements are met. Failure to graduate at the expected time requires such additional registrations as may be necessary until graduation.

**Maximum Allowable Doctoral Hours.** Students not making timely progress toward completion of the doctoral degree are subject to termination by the Graduate Dean. The Texas Legislature has capped fundable graduate study at 99 doctoral hours and imposed sanctions upon universities permitting registration for excess hours. The maximum time allowed for completing the doctoral degree is eight years from the first doctoral semester, or four years from admission to candidacy, whichever comes first. Any exceptions or extensions must be approved in advance by the Graduate Dean.

**Maximum Allowable Graduate Hours.** Students in programs other than doctoral programs who are not making timely progress toward completion of their de-

gree are subject to termination by the Graduate Dean. Graduate students beyond the maximum allowable graduate hours as determined by the Texas Legislature may be required to pay out-of-state tuition, regardless of residence status. The maximum time allowed for completing masters' degrees is six years. Any exceptions or extensions must be approved in advance by the Graduate Dean.

**Changes in Schedule and Withdrawal.** A graduate student who wishes to add or drop a course must initiate such action with the graduate advisor for his or her program. A student who quits a course without official withdrawal is likely to receive an F in that course.

**Enrollment by Faculty and Staff.** Full-time members of the faculty and staff of Texas Tech University may enroll for courses by permission of the department chairperson concerned. In registering for graduate work, they become subject to the regulations of the Graduate School. However, no member of the faculty who has held rank higher than instructor at Texas Tech is eligible to pursue a graduate degree program at this institution unless prior approval of the Graduate Dean is given.

**Enrollment by Undergraduates.** An undergraduate student who is within 12 hours of graduation and who has at least a B average in the major subject may enroll for courses carrying graduate credit, subject to the approval and certification of an acceptable grade-point average by the dean of the instructional college and the approval of the Dean of the Graduate School. This approval must be obtained on special forms available in the Graduate School at the time of registration. No course taken without this approval may be counted for graduate credit. With the approval of the dean of the instructional college and the Dean of the Graduate School, students may take graduate courses for undergraduate credit. Students may not, however, receive both graduate and undergraduate credit for the same course, except for up to 6 hours for an approved joint undergraduate and graduate degree program.

An undergraduate who is permitted to enroll for graduate work as indicated above is required to take the Aptitude Test of the Graduate Record Examinations (or Graduate Management Admissions Test, for business applicants) in the first semester of enrollment in graduate courses, if not taken during the previous five years.

The maximum amount of work that may be scheduled by an undergraduate taking courses for graduate credit is 16 hours in a semester or 6 hours in a summer term, including graduate and undergraduate work. Undergraduates permitted to enroll for graduate work are expected to receive their bachelor's degrees within a year of their first enrollment for graduate credit.

An undergraduate may not receive credit for more than 12 semester hours of graduate work completed prior to admission to the Graduate School as an applicant for a graduate degree.

## General Information

The Graduate School, like other colleges and schools of Texas Tech, reserves the right to institute, after due notice and during the course of a student's work toward a degree, any new ruling which may be necessary for the good of the university and therefore, ultimately, of recipients of its degrees. Normally a student may graduate under the provisions of the catalog in effect the semester of admission into the degree program.

**Responsibility of Students.** Each graduate student is expected to become thoroughly familiar with both departmental and Graduate School regulations and with the requirements for degrees. Failure to follow the regulations and requirements almost inevitably results in complications for which the Graduate School cannot assume responsibility.

To facilitate communications, graduate students should promptly notify the Graduate Office of changes of address.

**Graduate Advisors.** The Dean of the Graduate School is the general advisor for all graduate students, but, insofar as the particular courses are concerned, students are counseled by the chairpersons of their major and minor departments or by other professors designated for such counseling. Advisement in matters pertaining to teachers' certificates is the responsibility of the Director of Teacher Certification in the College of Education.

**Extracurricular Activities.** Graduate students may participate in extracurricular activities within university policies. They are encouraged to participate in honor societies for which they may be qualified. Graduate students who are satisfactorily pursuing full-time programs of graduate work are eligible to serve as officers in organizations of this type.

**Prerequisites for a Graduate Major.** For a graduate major, an applicant must have completed, or must take, sufficient undergraduate work to ensure adequate background for successful graduate work in the proposed field. With approval of the department, the student may receive credit by examination for such leveling requirements. Any department may specify additional prerequisites if they are considered necessary and may require an applicant to pass an examination before being accepted.

**Residence.** Study leading to a graduate degree involves sustained residence as well as the successful completion of course work. Residence is credited for work done on the campus of Texas Tech University and for certain types of courses (theses, field courses, practica, extended learning, internships, individual study, or any other such course) when offered by Texas Tech faculty at a place and under circumstances specifically established by the university in advance of the offering of the course.

The minimum residence requirements for various graduate degrees will be found in the appropriate sections of this catalog.

**Transferred and Extension Work.** There is no automatic transfer of credit from another university toward a graduate degree at Texas Tech. In general, all such work is subject to review and approval by the student's department and by the Graduate Dean. No work completed with a grade of less than B will be considered.

Graduate credit is not granted for courses taken by extension at another university. Extension work completed through Texas Tech's Division of Extended Learning may be considered if the student had been officially admitted to the Graduate School prior to enrolling for the courses. (See section under "Degree Programs" for further details.) Graduate credit is **not** granted for courses taken by correspondence.

**Grades.** The grades used in the Graduate School are the same as those used in undergraduate work (A, B, C, D, and F), but graduate credit is allowed only for courses completed with grades of A, B, and C, although grades of D and F are used in computing grade point averages. Instructors may choose to add a plus or a minus to the grade. These will be entered on the transcript but will not be used in the calculation of the grade point average.

At departmental option, individually arranged courses, professional seminars, and certain other courses may be graded P (pass) or F (fail). However, no more than one-fourth of a student's program course work may be graded pass-fail.

No final grade assigned for a graduate-level course may be raised unless an error has been made. The substitution of another course for one completed with a low grade is not permitted.

Work completed at another graduate school with a grade less than B will not be accepted, nor will grades of Pass or Satisfactory be accepted. Grades on transferred work will not raise the grade average on courses completed at Texas Tech University.

**Symbols CR, NC, I, W, and WF.** The symbol CR (credit) or NC (no credit) normally is assigned for every enrollment for a master's thesis or doctor's dissertation until the completed document has been approved by the student's committee and accepted by the Dean of the Graduate School. At that time a grade of A or B will be entered for the final enrollment.

CR may be given by a professor when a student's work in other individual research courses is not finished but is satisfactorily in progress at the end of a semester. When the research is completed, a standard letter grade should be entered for the final semester. PR is not an appropriate grade for any graduate course.

The symbol I (incomplete) may be given by a professor when a student's work in a course has not been completed at the end of a semester and when the failure to



complete the work has been due to causes beyond the student's control. It is not used as a substitute for F. The instructor should file a form with the Graduate Office, at the time the I is given, specifying the reasons for the grade and the work remaining to be done. When an I stands for a year without action on the part of the student, it may become an F.

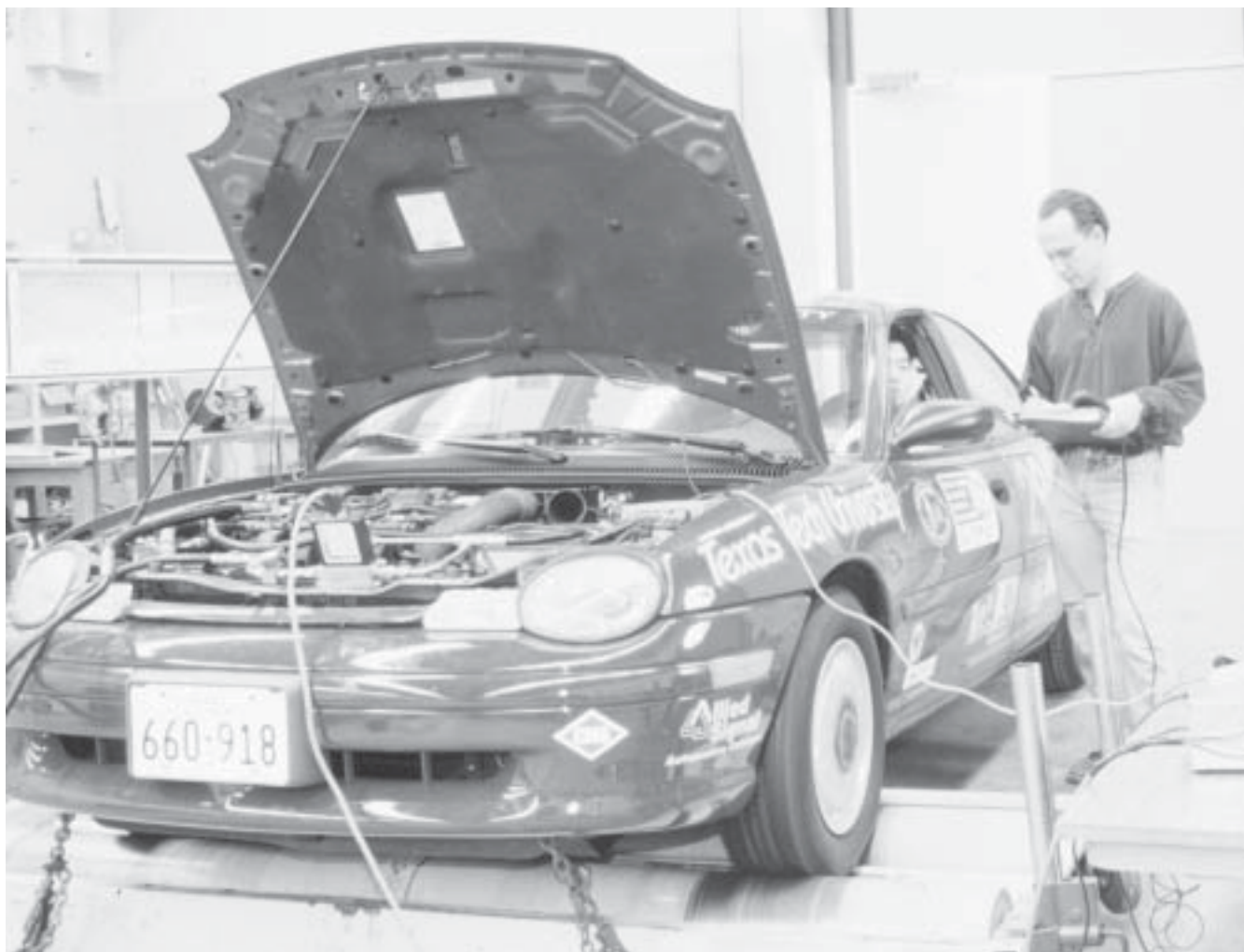
When a student officially withdraws from a course by the specified date early in the term, a grade of W will be assigned. A withdrawal after the specified date will result in a grade of W or WF, according to the assessment of the student's work in the course up to the time of the official withdrawal.

**Proficiency in English.** A student found deficient in English may be required to complete satisfactorily certain specified courses in English usage (without graduate credit) before being considered for admission to candidacy for a graduate degree.

**Statement of Intention to Graduate.** A student planning to graduate must file in the Graduate School's office a "Statement of Intention to Graduate" at the beginning of the semester of intended graduation. (A list of deadlines will be sent to all students who indicate a current-semester graduation date on their program forms.) No candidate's name will be placed on the "Tentative List of Graduates" for any graduation date unless this statement has been received at the Graduate Office by the specified deadline.

A candidate who fails to graduate at the expected time is required to file a new "Statement of Intention to Graduate" for any subsequent graduation.

**Teacher Certification.** Prospective students should understand that the material in this catalog applies only to requirements for graduate degrees and has no direct relation to certificates for public school teachers. The Graduate School gives no assurance that a program for a graduate degree and a program for a certificate will coincide. Students interested in certificates should confer with the Director of Teacher Certification at the outset of their work.





# Degree Programs

## The Master's Degree

The requirements set forth in this section are in addition to those listed under the heading of "Policies and Regulations."

**Prerequisites.** Admission to a master's degree program is dependent upon the applicant's undergraduate record, scores on the Aptitude Test of the Graduate Record Examinations (or Graduate Management Admissions Test, for business applicants), other relevant information, and recommendation of the proposed major department.

A substantial body of undergraduate work in the major subject and considerable breadth of background are essential for graduate study. Therefore, students whose undergraduate programs are considered deficient in breadth or depth may be required to complete additional preparatory work without degree credit. Such undergraduate "leveling" courses must be completed with a grade of C or better.

**Major Subject.** Every program for a master's degree not granted special exception must embody a major comprising at least 18 semester hours of graduate work (which may include a thesis) in a subject which has been approved for major work and for which the student has, or completes without degree credit, the necessary prerequisites for a graduate major as explained in an earlier section of this catalog.

**Minor.** Programs for a master's degree may include two or three courses outside the major area. Departments offering master's programs may permit students to take all of their work for the degree within the department. A minor may be completed in a single department or in several departments, but the courses comprising the minor are subject to the following limitations: (1) they must carry graduate credit; (2) they must be acceptable to the student's major department; and (3) each course must be approved for the student by the department offering it. This approval is indicated in the degree plan by the signature of the department chairperson (or graduate advisor) concerned. Its purpose is to make sure that a student does not enroll for a course for which he or she is not prepared.

**Basic Plans for the Master's Degree.** There are two basic plans for master's degree work: (1) a minimum of 24 hours of graduate course work plus 6 hours of thesis research; (2) a minimum of 36 hours of graduate course work without a thesis. (Some degrees have a greater minimum hour requirement. An example is the Master of Fine Arts degree program, which requires 60 hours of graduate course work including a thesis or an exhibition.) The option to offer thesis or nonthesis programs is a departmental decision.

Ordinarily, no more than 6 hours of individual study courses (aside from the thesis) will be permitted in the master's program.

**Filing the Official Degree Program.** During the first semester of enrollment, the student should submit to the Dean of the Graduate School a "Program for the Master's Degree" as prepared by an official representative of the proposed major department and of other departments as indicated under "Minor" in the preceding section. Delay in submission of a degree program may result in postponement of admission to candidacy and graduation. The forms for the "Program" are available at the Graduate Office.

When the student receives an approved copy of the "Program" from the Graduate Office, he or she is expected to follow it as the basis of all subsequent enrollments. Substitution of courses can be made only on the written recommendation of the department or departments concerned and the approval of the Graduate Dean.

Approval of a "Program for the Master's Degree" does not, however, constitute admission to candidacy for a master's degree. It merely signifies that the proposed program will be acceptable if the student satisfies all of the regulations of the Graduate School and all of the requirements connected with the degree program.

**Annual Review.** The Graduate School strongly encourages faculty of master's programs to conduct a formal review of their students' progress at least once a year. Any student not making satisfactory progress toward the degree may be placed on probation and given conditions to stay in the program. Continued unsatisfactory progress in any area of a student's work will be cause for dismissal.

**Minimum Residence.** Ordinarily, the minimum residence for any master's degree is a full academic year or its equivalent of graduate work carrying residence credit. Part-time enrollment is evaluated on a fractional basis.

**Transferred Work.** There is no automatic transfer of credit toward a master's degree, but, in general, work completed in residence at another accredited graduate school may, on the recommendation of the departments concerned, be accepted for as much as 6 semester hours toward a master's degree. Exceptions to this rule are granted in the case of the Master of Engineering degree and in certain other instances upon agreement between the college or department concerned and the Graduate School. Work completed at another graduate school with a grade less than B will not be accepted. Transfer credit will not alter a student's grade-point average at Texas Tech.

**Extension.** A maximum of 6 semester hours of extension work completed through the Division of Extended Learning of Texas Tech may be credited on the course work for a master's degree (or a maximum of 9 hours on a 36-hour program) if the student had been officially ad-

mitted to the Graduate School prior to enrolling for the extension work. Graduate credit is not granted for courses taken by extension at another university.

Not more than 9 semester hours (or 12 hours on a 36-hour program) of any combination of extension courses and courses completed elsewhere may ordinarily be credited toward a master's degree.

Graduate credit is **not** granted for courses taken by correspondence.

**Language Requirement.** Although it is not a school-wide requirement, many departments require a reading knowledge of one or more foreign languages. (For information on this requirement, where it exists, see the appropriate departmental section in this catalog.) The essential purpose is to assure that the student gains access to scholarly literature of his or her field in more than one language. Foreign students may use their native language (if it is not English) to meet this requirement if this essential purpose is served thereby and their major department approves. Foreign students must provide official documentation of acceptable grades in languages taken abroad or be tested as described below.

To qualify for Admission to Candidacy in a program which requires knowledge of a foreign language, the applicant must demonstrate proficiency in one of the following ways (as specified by the department) not more than seven years prior to the submission of an official program of study: (1) by passing, with a C- or better, the second course of the sophomore sequence of the required language; (2) by passing, with a B- or better, the second half of one of the special 6-hour programs for graduate students offered in French, German, and Spanish; (3) by passing a standardized examination in French, German, Spanish, or Latin given in the Department of Classical and Modern Languages and Literatures, or one of the examinations in French, German, or Spanish, furnished by the Educational Testing Service, which are administered by the university Testing Center. Arrangements for these examinations should be made in the applicable unit. The Department of Classical and Modern Languages and Literatures will administer the examinations in any other foreign language in which instruction is offered by the department. Arrangements for testing for other foreign languages will be approved by the Graduate Dean.

Students majoring or minoring in foreign languages in the Department of Classical and Modern Languages and Literatures are subject to higher performance levels in satisfying the master's requirement; students should consult the graduate advisor of the appropriate language for guidelines.

**Tool-Subject Requirement.** Some departments require a tool subject in lieu of, or in addition to, the language requirement. (For information on this requirement, where it exists, see appropriate departmental section of this catalog.) Where this provision is satisfied by formal course(s), a grade of B or better is required, either in a single course or in the last of a sequence of such courses.

**Grade Requirement for Graduation.** For the master's degree, the minimum requirement for graduation is an average of 3.0 in the major subject and an overall average of 3.0 on all courses, exclusive of the thesis, comprising the official program for the degree. Individual departments or colleges may have higher standards.

**Admission to Candidacy.** Every applicant for a master's degree is required to make formal application for admission to candidacy for the master's degree as soon as 9 to 12 semester hours of the work listed in the "Program for the Master's Degree," other than leveling courses, have been completed. This application is submitted to the Dean of the Graduate School on the form entitled "Program for the Master's Degree and Application for Admission to Candidacy."

Admission to candidacy will be granted at such time as all of the following requirements have been met.

(1) All conditions relating to admission to the program have been met.

(2) At least 9 semester hours of the graduate work required for the master's degree have been completed (exclusive of transfer and extension courses).

(3) All required leveling work has been completed with C or better grades.

(4) An average grade of 3.0 or better has been maintained in all courses comprising the official program exclusive of leveling work.

(5) Proficiency in a foreign language or tool subject required for the particular degree has been acceptably demonstrated.

(6) The general field of the thesis has been stated and approved.

(7) Work to date is acceptable to the departments concerned, as attested by their approval of the application for admission to candidacy.

(8) The entire program conforms with the general requirements of the Graduate School and with the requirements of the particular degree.

**Thesis.** The master's thesis is expected to represent independent work by the student, conducted under the supervision of the committee, and to be written clearly and concisely in good English (or whatever other language may be appropriate). As soon as the student's area for thesis research has been determined, an advisory committee will be appointed by the Graduate Dean upon the recommendation of the major department. The committee must consist of at least two members of the Graduate Faculty. All members of the committee must approve and sign the thesis. The student must earn a grade of B or better on thesis work to qualify for graduation.

A manual entitled *Instructions for Preparing and Submitting Theses and Dissertations* is available at CopyTech in West Hall or on E-Reserve at the Texas Tech University Library (see <[www.ttu.edu/gradschool](http://www.ttu.edu/gradschool)> and click on current students). All manuscripts must conform to the published policies. Three copies of the thesis

are required by the university. Additional copies may be required by the academic unit in which the student pursues the degree.

**Thesis Fee.** Early in the semester of graduation, the candidate will pay Student Business Services a thesis fee to cover the cost of binding and processing the official copies of the thesis. This fee is paid only once. A receipt for this fee should be brought to the Graduate School. Health Sciences Center students' fees are slightly higher because four copies of the thesis are required. Students may have additional copies bound at the prevailing rate if they wish.

**Time Limit.** With the exception of certain specially approved programs, work credited toward a master's degree must be completed within six years. Students whose graduate study here is interrupted by military service will be granted an extension of time for the period of their military duty, not exceeding five years.

**Final Comprehensive Evaluation.** The Graduate School strongly encourages each program to require of each master's student a final comprehensive evaluation in the semester of intended graduation, in a format most appropriate to the major field. At departmental discretion, the evaluation format may differ for thesis and nonthesis, or professional and predoctoral, students. The final evaluation should require a synthesis and application of knowledge acquired during the course of study and research leading to the master's degree; no student should expect the evaluation to be based solely on performance in the classroom.

A student is eligible to undergo evaluation only after having been admitted to candidacy by the Graduate Dean. As soon as possible after the evaluation, a written report of the outcome should be sent to the Graduate Dean. A student who does not receive a satisfactory evaluation may be assessed once again after an interval of four months or more. At the discretion of the program concerned, a student who receives a satisfactory evaluation but who does not graduate within 12 months may be required to repeat the assessment.

## The Doctor's Degree

The requirements set forth in this section are in addition to those listed under "Policies and Regulations."

**Admission to Doctoral Study.** Admission to doctoral study is restricted to applicants whose backgrounds show definite promise of success on this, the highest level of academic endeavor. Each doctoral department has its own requirements which applicants must satisfy for admission. It is essential that the student communicate with departmental advisors on this matter.

**Years of Study.** A minimum of three years of graduate study beyond the bachelor's degree is required for

the doctorate. Work completed for the master's degree may be considered as a part of this period if it forms a logical sequence in the entire program. Ordinarily, credit will not be given for work completed more than seven years prior to admission to the doctoral program at Texas Tech University. Exceptions to this policy will require written justification through the student's department and approval by the Graduate Dean.

Work completed in the doctoral program of another recognized graduate school will be considered on the recommendation of the departments concerned, but no assurance can be given that such work will reduce the course or residence requirements here. In no case can transferred credit reduce the minimum residence (see below).

Doctoral study cannot be calculated solely in terms of credit hours, but the program for the doctorate normally requires the completion of 60 or more semester hours of work beyond the bachelor's degree, exclusive of credit for the dissertation.

**Major and Minor.** The doctorate requires at least 60 semester hours of graduate work, exclusive of the dissertation. The Graduate School does not require a formal minor. However, the student may pursue a minor or one may be required by the student's advisory committee or by the program faculty in which the major is taken. If a minor is taken, it must include at least 15 graduate hours in a program outside the student's major. The minor will be declared in the student's Program for the Doctoral Degree (see section on Filing a Degree Plan). If a minor is taken, the major requires a minimum of 45 semester hours.

Courses listed for the major will be primarily in one academic program. However, courses from other academic programs may be included (other than courses for a minor, if one is declared) if they provide coherent support for the program courses in the major.

If a formal minor is declared, it must be represented on the student's doctoral committee (see section on Advisory Committee) and must be covered on the qualifying examination (see section on Qualifying Examination).

Programs at variance with this description may be approved in exceptional circumstances. Such proposed exceptions must be approved by the advisory committee and the program faculty before they are submitted to the Graduate School for consideration.

**Residence Requirement.** Regardless of the amount of graduate work that may have been completed elsewhere, every candidate for the doctorate is required to complete at least one year of graduate study beyond the master's degree (or beyond the first 30 hours if the student proceeds directly to the doctorate from a bachelor's degree). The aim of this requirement is to ensure that every doctoral candidate devotes a substantial period of time to the doctoral program.

The residence requirement is fulfilled by the completion of a full schedule (at least 12 semester hours) of graduate course work in each of two consecutive terms. Stu-

dents holding half-time graduate assistantships may satisfy the requirement by taking at least 9 hours of course work in each of the two long terms and 6 hours in the summer. Other patterns require approval of the Graduate Dean.

The plan for fulfilling the residence requirement must be indicated on the doctoral program form submitted to the Graduate School in the first year of doctoral study and must be approved in advance of the beginning of the residence year. (For any program variations in this requirement, see the college or department sections that follow.)

**Filing a Degree Plan.** Early in a student's doctoral studies a formal evaluation will be made of his or her background preparation in the major field. This evaluation may vary according to the academic unit involved; in some cases it may consist of a formal written or oral exam, in others, a review meeting with a committee or graduate advisor, in still another, the successful passing of a key course or courses. On the basis of this evaluation, whatever form it takes, the student's course of study will be projected and submitted to the Graduate School on the appropriate form. This evaluation will occur during the student's first year of doctoral study and the "Program for the Doctoral Degree" will be submitted to the Graduate School before the second year of work is begun. Revisions of the plan are permitted as needed.

**Annual Review.** The Graduate School strongly encourages faculty in each doctoral program to conduct a formal review of their students' progress at least once each year. From the third year onward, such review is required. Any student not making satisfactory progress may be placed on probation and given conditions to meet in order to stay in the program. Continued unsatisfactory progress in any area of a student's work will be cause for dismissal.

### **Languages and Tool Subjects.**

**Doctor of Philosophy.** Each department offering a doctoral program determines its language requirements, subject to the approval of the Graduate Council. Language requirements, if any, are described in the sections of this catalog devoted to instructional departments. In order to qualify for admission to candidacy in those programs which have a language requirement, applicants must demonstrate their competence in one of the following ways:

1. Students may fulfill the reading knowledge requirement by passing, with a C- or better, the second course of the sophomore sequence of the required language. Those seeking to present a high level of competency will pass with a B- or better any literature course at the third-year level or beyond.

2. Students may satisfy the standard competency level by enrolling in one of the special 6-hour programs for graduate students offered in French, German, and Spanish by the Department of Classical and Modern Languages

and Literatures. The second half of such a program must be passed with a grade of B- or better.

3. The third method of fulfilling the language proficiency requirement is by passing a standardized examination in French, German, Spanish, or Latin given in the Department of Classical and Modern Languages and Literatures, or one of the examinations in French, German, or Spanish, furnished by the Educational Testing Service, which are administered by the university Testing Center. Arrangements for these examinations should be made in the applicable unit. The Department of Classical and Modern Languages and Literatures will administer the examinations in any other foreign language in which instruction is offered by the department. Arrangements for testing for other foreign languages will be approved by the Graduate Dean.

Students majoring or minoring in foreign languages in the Department of Classical and Modern Languages and Literatures are subject to higher performance levels in satisfying the doctoral requirement; students should consult the graduate advisor of the appropriate language for guidelines.

Some departments require a tool subject in lieu of, or in addition to, the language requirement. (For information on this requirement, where it exists, see appropriate departmental section of this catalog.) Where this provision is satisfied by formal courses, a grade of B or better is required, either in a single course or in the last of a sequence of such courses passed not more than seven years prior to the student's approval for doctoral work.

**Doctor of Education.** In order to qualify for admission to candidacy, applicants for the Ed.D. degree are required to show competency in educational research methods and educational statistics, and also a foreign language if their research requires such competency.

**Advisory Committee.** As soon as an applicant's program has been determined, an advisory committee of at least three members of the graduate faculty (including the minor area, if a minor is declared) will be appointed by the Graduate Dean on the recommendation of the advisor concerned. This committee will meet as often as necessary with the applicant and will direct his or her work at all stages. Either the chair or the co-chair of a student's committee must be a regular member of the department or program faculty from which the student will receive the doctorate.

**Qualifying Examination.** The Qualifying Examination for Admission to Candidacy for the doctor's degree is one of the major features of the doctoral program and will be administered in both the major and minor areas of study (if a formal minor has been declared). The examination requires a synthesis and application of knowledge acquired during the course of study for the doctoral degree; consequently, satisfactory performance in course work does not necessarily guarantee successful performance on the Qualifying Examination. A student is eligible to stand for this examination after receiving approval



of the doctoral degree plan from the Dean of the Graduate School and completing all language and tool requirements and most of the course work prescribed by the approved plan. Students must take this examination within one calendar year of completing all requirements listed on the degree plan. Failure to do so will be cause for dismissal from the program.

The Qualifying Examination normally is prepared and administered by the candidate's advisory committee and any other professors the committee or the Graduate Dean may consider necessary. In some instances the examination may be administered by the department or college concerned. The major portion of the examination is ordinarily of a written type, of at least six hours' duration. It usually includes also an oral examination under the supervision of the committee and any other professors who may be invited to participate.

**Procedure When the Examination Is Satisfactory.** If the Qualifying Examination is considered satisfactory and the requirements in languages (including English) and/or tool subjects have been met, the chairperson of the advisory committee will send to the Graduate Dean, for consideration by the Graduate Council, a formal written recommendation that the applicant be admitted to candidacy for the doctor's degree. (The letter should also state the date of the examinations and whether or not the student passed both the major and minor portions if an official minor is involved.) This recommendation should be forwarded as soon as possible after all the above requirements have been met.

**Procedure When the Examination Is Not Satisfactory.** If the Qualifying Examination is not satisfactory, the chairperson of the advisory committee will so notify the Graduate Dean, in writing. An applicant who does not pass the Qualifying Examination may be permitted to repeat it once, after a lapse of at least four months, and not more than twelve months from the date of the unsatisfactory examination. Failure to pass the Qualifying Examination within the specified time will result in dismissal from the program irrespective of performance in other aspects of doctoral study.

**Admission to Candidacy.** Authority for admitting an applicant to candidacy for a doctor's degree is vested in the Graduate Council. Upon receipt of a recommendation from the advisory committee, the Graduate Dean will submit it to the Graduate Council for approval.

By written communication, the Graduate Dean will transmit the results of the council's action to the applicant, to the chairperson of the advisory committee, and to the chairperson of the department concerned.

A student must be admitted to candidacy for the doctorate at least four months prior to the proposed graduation date.

**Dissertation.** Except for the Doctor of Musical Arts, a dissertation is required of every candidate for a doctoral degree. This requirement is separate and apart from other requirements in doctoral programs; consequently,

successful performance in other areas does not necessarily guarantee the acceptance of a dissertation. The dissertation work must earn a grade of at least B in order to qualify the student for graduation. The Graduate School strongly recommends that each student be required to present and defend a dissertation proposal before his or her committee early in the course of the research.

The subject of the dissertation must be approved by the advisory committee and the Graduate Dean at least four months before the candidate's proposed date of graduation. The dissertation must demonstrate a mastery of the techniques of research, a thorough understanding of the subject matter and its background, and a high degree of skill in organizing and presenting the materials. The dissertation should embody a significant contribution of new information to a subject or a substantial reevaluation of existing knowledge, presented in a scholarly style. The work on the dissertation is constantly under the supervision of the advisory committee and any other professors the committee or the Graduate Dean may consider necessary.

A manual entitled *Instructions for Preparing and Submitting Theses and Dissertations* is available at CopyTech in West Hall or on E-Reserve at the Texas Tech University Library (see <[www.ttu.edu/gradschool](http://www.ttu.edu/gradschool)> and click on current students). All manuscripts must conform to the published policies.

Three copies of the dissertation are required by the university. Additional copies may be required by the specific academic unit involved. They must be accompanied by an abstract of no more than 350 words.

**Dissertation Fees.** Early in the semester of graduation, the candidate will pay Student Business Services the appropriate dissertation fee. This fee covers micro-filming of the dissertation and abstract as well as binding costs for the three required copies. This fee should be paid only once. A receipt for this fee should be brought to the Graduate School. Health Sciences Center students' fees are slightly higher because four copies of the dissertation are required. Students may have additional copies of their dissertations bound at the prevailing rate.

**Grade Requirement.** For the doctor's degree, the minimum requirement for graduation is an average of 3.0 in the major subject, exclusive of credits for the doctoral dissertation, and an average of 3.0 in all other courses taken for graduate credit outside the major. Individual departments and colleges may have higher standards than this minimum, school-wide requirement.

**Time Limit.** All requirements for the doctoral degree must be completed within a period of eight consecutive calendar years, or four years from admission to candidacy, whichever comes first. Graduate credit for course work taken at Texas Tech more than eight calendar years old at the time of the final oral examination may not be used to satisfy degree requirements. Absent an extension, the student may be permitted to retake the qualify-

ing examination, and, upon passing that examination, be readmitted to candidacy by the Graduate Council for some period of time not to exceed four years.

Final corrected copies of the dissertation must be received in the Graduate School no later than one year after the final examination or within the eight-year or four-year time limit, whichever occurs first. Failure to complete this step will result in the degree not being awarded.

**Intervals Between Examinations.** At least four months must intervene between the qualifying examination and the final examination.

**Final Examination.** A final public oral examination, usually over the general field of the dissertation, is required of every candidate for the doctorate. It may be scheduled a suitable time after the dissertation (not necessarily the final copy) has been read by the advisory committee. The examination may not be administered until at least three weeks have elapsed following the candidate's submission to the Graduate Office of the notification form giving the time, place, and other information pertaining to the examination. (This form is available from the Graduate Office or on the graduate school's Web site.) The examination is conducted by the advisory committee and the Graduate Dean or a professor designated to act in place of the Graduate Dean. All members of the committee participate fully in the examination and cast a vote. Professors other than members of the committee, including the Graduate Dean's representative, may participate

in the examination, but have no vote in determining the outcome. At the conclusion of the examination, the chairperson of the advisory committee will send a written notice to the Graduate Office, giving the result of the examination.

**Publication of Student Work.** Research is an integral facet of graduate study, and students are encouraged to seek publication of work done in pursuit of advanced degrees. Many theses and dissertations completed at Texas Tech are eventually published. In research where close collaboration with faculty advisors occurs, it is entirely appropriate in some disciplines for publications to be co-authored. In those disciplines where authorship order is not always alphabetical, the student will generally be first author in publications resulting from a thesis or dissertation. In cases of considerable revision or addition of other data, order of authorship should be subject to mutual agreement, based on the nature and extent of contribution by the parties concerned, and in accordance with accepted practice in the discipline.

In cases where the student was supported in full or in part by the university or through a faculty grant to do the research involved, or when a faculty member contributes to the work in a way that is substantially above and beyond that normally expected of a major advisor, and the student elects not to pursue publication within a reasonable time, the faculty member may choose to use the data in pursuing publication, listing the student as co-author according to the conventions of the discipline involved and the relative extent of contribution or additional work required.



## Explanation of Course Offerings

Not all of the courses listed in this catalog are offered every year. A class schedule, published before the registration period begins for each term or semester, indicates the courses to be available in that term or semester and the hours at which they will meet. The university reserves the right, however, to cancel any scheduled course, as well as to withdraw any program from the list of graduate offerings, if the best interests of the institution require such action.

**Indication of Credit.** The number of semester hours of credit for each course is shown immediately following its title, usually in this form: (3:2:3). The first digit in parenthesis indicates the credit in semester hours for the course; the second, the number of lecture hours per week; and the third, the number of laboratory hours per week. If the third digit is zero, the course requires no laboratory work. A single number in parenthesis indicates the credit in semester hours. The letter V precedes the numbers in variable credit courses (as V1-12). Such courses are ordinarily research courses and permit enrollment for any number of hours up to the limit indicated by the second number in the parenthesis.

**Designation of Semester Courses Offered.** To assist students in planning their sequence of courses, some course descriptions indicate when they are normally taught. The designations used are F–fall, S–spring, SSI–first summer term, SSII–second summer term.

**Prerequisites for Courses.** Certain general prerequisites apply to all courses listed in this catalog. For example, all courses in this bulletin are numbered in the 5000 series or above and are for graduate students. Graduate standing is a prerequisite for enrollment in such courses (except for seniors within 12 hours of graduation, whose enrollment may be authorized by the Graduate Dean).

**Graduate Credit.** Although graduate students occasionally enroll in undergraduate courses to fill out deficiencies in their preparation for graduate work, course work credited toward a graduate degree must, except in rare instances, be of graduate level (5000 or above).

The following index may be helpful in interpreting the subject prefixes used in the curriculum sections of this catalog.

AAEC	Agricultural and Applied Economics
ACCT	Accounting
ACOM	Agricultural Communications
ADV	Advertising
AERS	Aerospace Studies
AGED	Agricultural Education
AGSC	Agricultural Science
AGSM	Agricultural Systems Management

AHAT	Allied Health Athletic Training
AHCD	Speech-Language Pathology and Audiology
AHOT	Allied Health Occupational Therapy
AHPA	Allied Health Physician Assistant
AHPT	Allied Health Physical Therapy
AHVR	Allied Health Vocational Rehabilitation
ANSC	Animal Science
ANTH	Anthropology
ARCH	Architecture
ART	Art
ASTR	Astronomy
ATMO	Atmospheric Science
B A	Business Administration
BINF	Biological Informatics
BIOL	Biology
BLAW	Business Law
BOT	Botany
BTEC	Biotechnology
C E	Civil Engineering
CEED	Consumer Economics and Environmental Design
CH E	Chemical Engineering
CHEM	Chemistry
CHIN	Chinese
CLAS	Classics
C LT	Comparative Literature
CMLL	Classical and Modern Languages and Literature
COIN	Cooperative Internship
COMS	Communication Studies
C S	Computer Science
CT&M	Clothing, Textiles, and Merchandising
CTEC	Construction Engineering Technology
DAN	Dance
ECO	Economics
EDBL	Bilingual Education
EDCI	Educational Curriculum and Instruction
EDEC	Early Childhood Education
EDEL	Elementary Education
EDHE	Higher Education
EDIT	Educational Instructional Technology
EDLD	Educational Leadership
EDLL	Language Literacy Education
EDSE	Secondary Education
EDSP	Special Education
E E	Electrical Engineering
EET	Electrical-Electronics Engineering Technology
E GR	Engineering Graphics
ENGL	English
ENGR	Engineering
ENTX	Environmental Toxicology
ENVE	Environmental Engineering
EPCE	Counselor Education
EPSY	Educational Psychology
ESL	English as a Second Language



ESS	Exercise and Sports Sciences	LAW	Law
F A	Fine Arts	LIBR	Library Research
FADS	Fashion Design	LING	Linguistics
FCSE	Family and Consumer Science Education	LPMD	Land-Use Planning, Management, and Design
FD T	Food Technology	MATH	Mathematics
FFP	Family Financial Planning	MBIO	Microbiology
FIN	Finance	MCOM	Mass Communications
F&N	Food and Nutrition	MD S	Multidisciplinary Studies
FREN	French	M E	Mechanical Engineering
F S	Family Studies	MER	Merchandising
GANM	Anatomy	MFT	Marriage and Family Therapy
GBCH	(Medical) Biochemistry	MGT	Management
GBTC	(Medical) Biotechnology	MILS	Military Science
G CH	Geochemistry	MKT	Marketing
GEOG	Geography	MSE	Manufacturing Systems in Engineering
GEOL	Geology	MTEC	Mechanical Engineering Technology
GERM	German	MUAL	Music, All-Level
GHSR	Health Services Research	MUAP	Applied Music
GIDN	Integrated Neuroscience	MUCP	Music Composition
GIDS	Graduate School of Biomedical Sciences Interdisciplinary Program	MUED	Music Education
GIHC	Health Communications	MUEN	Music Ensemble
GIHM	Health Organization Management	MUHL	Music History and Literature
GIPM	Preventive Medicine	MUSE	Music, Secondary
GISP	Interdisciplinary Sports Health	MUSI	Music
GMIB	(Medical) Microbiology	MUSM	Museum Science
G PH	Geophysics	MUTH	Music Theory
GPHM	Pharmacology	NURS	Nursing
GPHY	Physiology	PETR	Petroleum Engineering
GPSC	Pharmaceutical Sciences	PF&W	Personal Fitness and Wellness
GRK	Greek	PHIL	Philosophy
GSBS	Graduate School of Biomedical Sciences	PHOT	Photography
G ST	General Studies	PHYS	Physics
GTEC	General Engineering Technology	POLS	Political Science
H D	Human Development	PORT	Portuguese
HDFS	Human Development and Family Studies	P R	Public Relations
HIST	History	PRAG	Pragmatism
HLTH	Health	PSS	Plant and Soil Science
HMGT	Heritage Management	PSY	Psychology
HONS	Honors	PUAD	Public Administration
HUM	Humanities	RHIM	Restaurant, Hotel, and Institutional Management
HUSC	Human Sciences	RLS	Recreation and Leisure Services
I D	Interior Design	RUSN	Russian
I E	Industrial Engineering	RWFM	Range, Wildlife, and Fisheries Management
I S	Interdisciplinary Studies	SLAV	Slavic
ISQS	Information Systems and Quantitative Sciences	SOC	Sociology
ITAL	Italian	SPAN	Spanish
JAPN	Japanese	STAT	Statistics
JOUR	Journalism	S W	Social Work
LAIS	Latin American and Iberian Studies	TELE	Telecommunications
LARC	Landscape Architecture	TH A	Theatre Arts
LAT	Latin	TOX	Toxicology
		VIET	Vietnamese
		W S	Women's Studies
		ZOOL	Zoology

# Opportunities for Interdisciplinary Study

## Degree Programs

The Graduate School of Texas Tech encourages interdisciplinary study and research, believing that our nation's complex society and the world's rich cultural heritage can be understood best from the perspective of many academic disciplines. Few settings offer a better opportunity for such study than the university with its graduate programs, libraries, laboratories, and diversely trained faculty. Although academic specialization is the common pattern in such an environment, the Graduate School is committed to building bridges and facilitating movement across the disciplines for those who are interested, and through the years has increased the opportunities for interdisciplinary work.

Several "named" interdisciplinary options appear below with their required courses. Students should also be aware of the existence of innumerable unnamed options, for which programs are designed by individual students in conjunction with the advisor for the Interdisciplinary Studies masters' programs in the Graduate School. Such flexibility in custom-designing programs affords maximum adaptability for the rapidly changing global marketplace.

The placement of this section at the beginning of the catalog's academic offerings is a conscious effort to make better known and more visible the many opportunities for interdisciplinary study at Texas Tech.

## Biotechnology

Horn Professor David B. Knaff and Assistant Professor Daniel Hardy, Co-Directors.

Texas Tech University and the Texas Tech Health Sciences Center (HSC) jointly offer an interdisciplinary M.S. degree designed to prepare students for a laboratory research career in biotechnology. Students may pursue either of two tracks within the program: the biomedical track or the science and agriculture track. The Graduate School of Biomedical Sciences (GSBS) at Health Sciences Center administers the biomedical track, and the Texas Tech Center for Biotechnology and Genomics administers the science and agriculture track.

The science and agriculture track is a two-year program, with the first two semesters consisting of required and elective course work. The second year (nine to twelve months) is devoted in its entirety to full-time laboratory research. Students may satisfy the research requirement in either of two ways. They may complete an M.S. thesis, based on research carried out in the laboratory of a participating faculty member in one of the following departments: Animal Science and Food Technology; Biological Sciences; Chemistry and Biochemistry; or Plant and Soil Science. Alternatively, students may complete a nonthesis

internship in a biotechnology laboratory. The internship may be carried out at an industrial research laboratory, a government laboratory, or a not-for-profit foundation laboratory.

The biomedical track is a 21-month program consisting of two semesters (nine months) of course work and 12 months of full-time laboratory research. It is anticipated that students in this track will complete all of their course work during their first year, with the second year devoted completely to the research component of the degree plan. The research component may be completed either at the HSC campus or through an internship at a biotechnology laboratory. Internship locations are similar to those described for the science and agriculture track. Students who choose to do their research at the HSC campus will work with a member of the biotechnology graduate faculty and will have the option of writing an M.S. thesis. All biotechnology graduate faculty members have active research programs that emphasize use of molecular biology methods.

First-year students in both tracks take a common core curriculum consisting of a seminar course (BTEC 6101), an introductory lecture course (BTEC 6301), an introductory lab course (BTEC 5338), a course on the ethics of research (GSBS 5101), and a bioinformatics course (BINF 5301). The biomedical track requires a series of lab rotations during the second semester of the first year, while the science and agriculture track requires a second, more advanced lab course. The remaining course work requirements for the biomedical track consist of specific HSC courses, while the remaining course work requirements for the science and agriculture track are satisfied by selections from a broad list of approved electives.

Students interested in the program should have an undergraduate science degree that provides a sound background in biological sciences, preferably from a molecular perspective. A minimum of one semester of organic chemistry is required. A second semester of organic chemistry and at least one semester of physical chemistry are highly recommended. Admission will be based on the student's undergraduate record and GRE scores and on other considerations such as previous research experience and letters of recommendation. Applications from students interested in the science and agriculture track should be submitted through the Texas Tech Office of Graduate Admissions, and applications from students interested in the biomedical track should be submitted through the Graduate School of Biomedical Sciences at the Health Sciences Center.

### Courses in Biotechnology. (BTEC)

- 5302. Advanced Cell Biology (3:3:0).** Prerequisite: 8 hours of biology, 8 hours of chemistry, plus at least one semester of organic chemistry; or consent of instructor. Structure and function of cells with introduction to modern techniques for cell study. Offered to graduate students with no formal training in cell biology. (BIOL 5302)
- 5304. Growth and Development (3:3:0).** A study of differentiation, development, growth, and fattening of domestic animals and hereditary and environmental influences and interactions. SS. (ANSC 5304)

- 5321. Plant Breeding Theory (3:3:0).** Breeding and plant improvement presented at an advanced level. S, even years. (PSS 5321)
- 5325. Transgenic and Plant Cell Genetics (3:3:0).** Genome organization in plants, interspecific hybridization, cytoplasmic male sterility, self-incompatibility, tissue culture, in-vitro screening, and transformation technologies. F, odd years. (PSS 5325)
- 5337. Enzymes (3:3:0).** Prerequisite: CHEM 3311, 3312 or CHEM 4303 or equivalents. Structure, mode of action, and kinetics of enzymes. (CHEM 5337)
- 5338. Biochemical Methods (3:1:6).** Prerequisite: CHEM 4303 or 3311 or equivalent. Methodology for the isolation and characterization of macromolecules and metabolites. (CHEM 5338)
- 5339. Nucleic Acids (3:3:0).** prerequisite: CHEM 3312 or 4303 and BIOL 4320 or 5320. Eukaryotic and prokaryotic DNA cloning strategies, DNA sequence analysis and manipulation, recombinant DNA expression. (CHEM 5339)
- 5403. Biometry (4:3:2).** Introduction to biological statistics. Observation, probability, "t" test, analysis of variance, mean separation procedures, linear regression and correlation, and chi-square. Introduction to computerization of statistical analyses. F. (ANSC 5403)
- 5408. Microbial Genetics (4:3:3).** Prerequisite: MBIO 5301 or consent of instructor. Topics include current techniques of genetic analysis, molecular biology, molecular genetics, nucleic acid metabolism, and gene regulation in microorganisms, with emphasis on bacteria and bacteriophages. May not be taken for credit by students who have taken MBIO 4406. F. (MBIO 5408)
- 5414. Advanced Agricultural Biotechnology (4:3:2).** Prerequisite: Consent of instructor. Principles of biotechnology and genetic engineering. Genetic manipulations applied to problems in agricultural research and practice. F, odd years.
- 6000. Master's Thesis (V1-6).** (GBTC 6000)
- 6001. Biotechnology Internship (V1-9).** Research and training in a private-sector or government laboratory. Consent of program director required. For nonthesis students.
- 6101. Biotechnology Seminar (1:1:0).** Presentation of current research topics in areas directly relevant to biotechnology. (GBTC 6101)
- 6301. Introduction to Biotechnology (3:3:0).** Prerequisite: CHEM 3311, 3312, 3313. Scientific bases of biotechnology techniques. Applications of biotechnology and ethical and social impact. (GBTC 6301)
- 6315. Regulation of Gene Expression (3:3:0).** Prerequisite: BIOL 5320 or 4320. An advanced, in-depth analysis of current research on mechanisms that regulate eukaryotic gene expression at transcriptional and post-transcriptional levels. (BIOL 6315)
- 6322. Advanced Plant Breeding (3:3:0).** Qualitative and quantitative inheritance, heterosis, selection theory and breeding methodology for crop plant improvement, genotype by environment interaction, and application of cellular and molecular techniques to plant breeding. S, odd years. (PSS 6322)
- 6324. Molecular, Genetic, and Plant Genomics (3:3:0).** Genome mapping in plants, gene structure and expression, recombinant DNA and gene cloning methods, molecular markers, QTL analysis, physical mapping, DNA chip technology, and functional genomics. S, even years. (PSS 6324)
- 7000. Research in Biotechnology (V1-9).** Full-time laboratory research under the direct supervision of a TTU or TTUHSC graduate faculty member. For thesis-option students. (GBTC 7000)

## Fine Arts

Professor Mary Jane Hurst, Director.

An interdisciplinary doctoral program leading to the Ph.D. degree in Fine Arts is offered by the faculties in Art, Music, and Theatre and Dance. The general aim of this program is to develop leadership in the fine arts.

Accordingly, the curriculum involves an interdisciplinary approach to make candidates aware of the full scope and educational interrelatedness of the arts.

The program requires a minimum of 48 semester hours of graduate course work beyond the master's degree—30 in the major area and 18 in an interdisciplinary core of art, music, philosophy, and theatre arts. In addition, the program requires at least 12 hours enrollment in dissertation.

Work in the major area ordinarily involves a basic core along with an individualized curriculum that allows the candidate to pursue a professional goal relating to personal interests and competencies.

Each candidate will write a formal dissertation, ordinarily in the major area; however, students with appropriate backgrounds may be permitted to do interdisciplinary dissertations. The nature of the dissertation project may vary among three plans: traditional or interdisciplinary research, research devoted to solving a professional problem, or research based on an internship experience. Regardless of the major chosen, however, the research will culminate in a formal document submitted to the Dean of the Graduate School.

In addition to meeting the Graduate School's minimal requirements for admission, applicants must also be approved by their major departments and by the Fine Arts Doctoral Committee. All applicants for the program must have completed a master's degree or its equivalent with emphasis in some area of the arts.

Studies in fine arts management may be pursued within the Interdisciplinary Studies master's program. This flexible option allows students to develop management leadership for fine arts institutions and governmental agencies. Courses in business administration and public administration, as well as in the arts, are available.

Core courses for the doctoral program are as follows:

### Courses in Fine Arts. (F A)

**5314. Interdisciplinary Perspectives in the Arts (3:3:0).** An interdisciplinary course focusing upon the arts in their respective historical and cultural environments. A core course for the doctoral program in fine arts.

### Core Courses

- ART 5310. Historical and Critical Perspectives in the Visual Arts (3:3:0).**
- ART 5314. The Visual Arts in Contemporary Context (3:3:0).**
- MUSI 5310. Historical and Critical Perspectives in Music (3:3:0).**
- MUSI 5314. Music in Contemporary Context (3:3:0).**
- PHIL 5310. History of Aesthetics (3:3:0).**
- PHIL 5314. Contemporary Aesthetics (3:3:0).**
- TH A 5310. Historical and Critical Perspectives in Theatre Arts (3:3:0).**
- TH A 5314. Theatre Arts in Contemporary Context (3:3:0).**

## Heritage Management

Professor Gary Edson, Executive Director.

Horn Professor Baker; Professors Johnson, Phelan, and Schmidly; Adjunct Faculty: Dean, Ladkin, and Monk.



The Heritage Management area offers study in the following graduate degree program: *Master of Science* in HERITAGE MANAGEMENT. The program emphasizes extensive investigation in the field of heritage management. Graduates from the program are prepared to enhance local, regional, and national sociological and scientific values; encourage preservation and stewardship of cultural and natural heritage; advocate public service; and direct educational programming designed to derive maximum advantage from innovative technology without the loss of cultural identity and biodiversity. The program is configured to allow individual students to emphasize areas of special interests such as heritage administration, conservation, interpretation, education, and use (ecotourism). The program offers both theoretical and practical course work designed to prepare graduates to be leaders in the heritage management field.

Applicants will be considered for admission to the Heritage Management program once the following materials are received: official transcript of complete undergraduate course work; two letters of recommendation from persons knowledgeable of the student's professional abilities; GRE scores; a completed application form; and a career summary statement. Forms will be furnished on request. Prior to being considered for admission to the program, students must complete the appropriate application forms and satisfy the requirements of the university. Once that process is concluded, program admission and competitive scholarship awards are based on three general categories of criteria.

- **Academic Record:** All academic records may considered—60 hours, total, major, post-baccalaureate, etc.
- **Test Scores:** Scores on the General Test of the Graduate Record Examination (GRE) should be no more than five years old. Each score is considered separately, with percentile scores viewed by broad major. No test score will be considered the sole criterion.
- **Individual Profile:** Profiles may include recommendations, research background, motivation, multilingual proficiency, undergraduate institution, presentations, and interviews. Other information that admission and scholarship committees may consider is work commitment, demonstrated commitment to a particular field of work or study, and community involvement.

Interested persons should contact the Museum of Texas Tech University for a comprehensive packet of information about the program.

The Heritage Management program uses a variety of existing courses offered by various departments within the university to address individual educational and career goals. All students must develop competency in the core courses taught by selected members of the graduate faculty. (Competency is construed to mean an understanding of professional practices.)

A student majoring in the program must take at least 12 hours from the Heritage Management core curriculum, a minimum of 15 hours prescribed elective courses, 12 of elective graduate-level courses, plus 6 hours of thesis or internship. Required core courses for the program are MUSM 5327, 5331, HMGT 5324, 5327. (Internships are to be at locations approved by the student's advisory committee.) A total of 45 credit hours of graduate-level work is required for graduation. In addition, each student must pass a qualifying exam prior to beginning either the internship or thesis and must pass comprehensive written and oral exams at the conclusion of his or her studies. Students pursuing the thesis option must write and defend their thesis. The program is administered by the Executive Director of the Museum.

Following the first 9 credit hours of graduate study, each student's curriculum will be formalized through consultation with a graduate faculty advisory committee, consisting of at least three members, which reflects the student's area of emphasis. This degree plan will be approved by the program coordinator and the Executive Director of the Museum and will then be submitted to the Graduate School. When approved, it will serve as a tool for advising and review to assure completion of degree requirements.

A minor at the master's level in Heritage Management consists of 9 approved credit hours in the core curriculum; a minor at the doctoral level consists of 15 hours of Heritage Management courses of which at least 9 must be from the core curriculum.

### **Courses in Heritage Management. (HMGT)**

- 5321. Park Management (3:3:0).** Review of techniques and processes to instill an understanding of the legal and ethical responsibilities associated with the care, management, and operation of parks with heritage properties.
- 5324. Cultural Resource Management (3:3:0).** An intensive course to develop core knowledge in the principles, methods, laws, stewardship, and governance of cultural heritage as a foundation for leadership in the heritage management field.
- 5327. Heritage Planning (3:3:0).** Explores practical approaches and methods to heritage planning with emphasis on the integration of related disciplines to attain environmentally sound and socially responsible preservation, interpretation, management, and development initiatives.
- 6000. Master's Thesis (V1-6).**
- 6001. Internship (V1-6).** Prerequisite: Advancement to candidacy status. Internship carried out under the supervision of the student's major advisor. Internship at the Lubbock Lake Landmark or similar approved location to provide practical experience for the heritage management profession.
- 7000. Research (V1-12).**

### **Program Courses**

- MUSM 5327. Museum Collection Management (3:2:3).**
- MUSM 5330. Museum Law, Ethics, and Standards (3:3:0).**
- MUSM 5331. Museum Interpretation and Communication (3:2:3).**
- MUSM 5340. Museum Data Management (3:1:6).**
- C S 5356. Advanced Database Management Systems (3:3:0).**
- MGT 5370. Organization and Management (3:3:0).**
- MKT 5360. Marketing Concepts and Strategies (3:3:0).**
- LAW 6025. Land Use Planning Law (3:3:0).**
- RHIM 5350. Advanced Travel and Tourism (3:3:0).**

## Interdisciplinary Studies

Associate Graduate Deans Allan Headley and Wendell Aycok, Coordinators.

The Master of Arts or Master of Science degree program in Interdisciplinary Studies is intended for students who wish to continue education at the graduate level but do not seek specialized training concentrated in a major area. This program is not a substitute for the traditional master's degree; rather, it is designed for students with broader interests in several fields or for those whose career goals do not match fully with a single identifiable academic unit or department. Emphasis is placed on continued intellectual and cultural development in a constantly changing society where new career interests may extend over several traditional specializations.

Each program, exclusive of those tracks with required courses, is developed individually according to the student's interests and background. Among the few restrictions are the requirements that work be taken in at least three different subject areas and that no more than 12 hours be presented in any one area. Also, no more than 18 hours may be taken within a single college, except Arts and Sciences. Most students pursue the 36-hour, nonthesis plan, but the thesis may be appropriate in occasional circumstances where the student's previous work seems to qualify him or her for research.

The standard admission policy for applicants to other degree programs will apply to those seeking admission to the interdisciplinary master's program. Applicants must submit satisfactory GRE or GMAT scores and undergraduate records. Students must have a 3.0 GPA on previous graduate work. For further information, contact the coordinator of the program in the Graduate School office.

Students normally select areas of study that meet their own educational and career requirements, as described above. However, a number of study themes are identified in the following paragraphs that provide somewhat more specialized focus, while maintaining the interdisciplinary nature of the program as originally approved.

***Arid-Land Studies and International Development.*** Students may devise a plan of study focusing on aspects of international development in various parts of the world. This theme will be oriented to applied knowledge and international issues in general. Another theme addresses specifically the problems of arid and semi-arid lands. Students may take courses in several departments to satisfy the requirements in either of these areas. For further details, contact Dr. Kary Mathis, Director of the International Center for Arid and Semi-Arid Land Studies, or Dr. Gary S. Elbow, Director, Center for Applied International Development Studies.

***Environmental Evaluation.*** Students may gain a holistic view of environmental evaluation by taking courses that focus upon problems and techniques relating to natural resources and their utilization. Work in geography, geology, land and water management, atmospheric sciences, and other disciplines is tailored to each student's

interests. Persons interested in this plan should contact Dr. Jeff Lee, Department of Geography.

***Fine Arts Management.*** Courses relating to management in the fine arts may be taken in a plan leading to the degree in Interdisciplinary Studies. Courses in public administration and business administration as well as in the arts develop management leadership for fine arts institutions and governmental agencies. The Fine Arts Doctoral Committee provides counsel and supervision for this plan within the Interdisciplinary Studies program.

***Applied Linguistics.*** Courses relating to theoretical, descriptive, historical, and applied study of language structure and use may be selected in a plan leading to the degree in Interdisciplinary Studies. Studies in anthropology, bilingual education, psychology, and speech communication as well as in various languages (American Sign Language, Arabic, Chinese, English, French, German, Japanese, Spanish) will provide a comprehensive understanding of the discipline. Interested students may contact Dr. Sharon A. Myers, Department of Classical and Modern Languages and Literatures. See also "Applied Linguistics" in this section of the catalog.

***Occupational Safety and Health.*** This interdisciplinary course of study prepares students to identify and evaluate hazardous workplace conditions, to develop programs for accident prevention and control, and to gain ergonomic expertise related to occupational safety and health. Courses in human physiology, safety, air pollution control technology, ergonomics, analytical instrumentation, and other areas highlight the link between people and machines. Engineering background is helpful but not essential; the selection is sufficiently flexible for a diversity of interests. For further details contact Dr. M.M. Ayoub, Department of Industrial Engineering.

***Peirce Studies.*** Charles Sanders Peirce (1839-1914), a true American genius, made major contributions to logic, mathematics, language studies, history of science, specific areas of science such as chemistry and physics, and philosophy, among others. Currently, his ideas are being explored in fields as diverse as semeiotic and artificial intelligence. Students enrolled in Peirce studies will normally take 6 to 9 hours of PRAG 5000 and at least 30 additional hours in several defined areas, depending upon each student's future educational or occupational goals. For details, contact the program director, Dr. Kenneth Laine Ketner, Director, Institute for Studies in Pragmatism, 806-742-3128.

***Women's Studies.*** The interdisciplinary concentration of graduate work focuses on the changing position of women in society. Selected courses are offered in history, sociology, anthropology, and psychology with related work available in business administration, the humanities, and other areas of the social sciences. An emphasis on women's studies may be pertinent to careers in education, management, and personnel relations, and in the administration and delivery of social services to families, women, and children. Interested students should contact Dr. Gwen Sorell, Department of Human Development and Family Studies.

**Courses in Interdisciplinary Studies. (I S)**

- 5000. Graduate Directed Studies (V1-12).** Prerequisite: Consent of Coordinator. Advanced studies in developing cultural understanding. Projects to be assessed by faculty committee.
- 5001. Graduate Studies Abroad (V1-12).** Prerequisite: Consent of Office of International Affairs. Advanced individual studies in interdisciplinary, international, and /or multicultural experiences.
- 5301. The Nature of Science for Teachers (3:3:0).** Interdisciplinary course for teachers providing an overview of science and scientific inquiry. Special emphasis on research methods.
- 6000. Master's Thesis (V1-6).**
- 7000. Research (V1-12).**

**Courses in Pragmaticism. (PRAG)**

- 5000. Independent Research in Peirce Studies (V1-6).** Prerequisite: Consent of instructor. Directed interdisciplinary inquiry in Peirce studies. May be repeated for credit.

**Courses in Women's Studies. (W S)**

- 5000. Practicum in Women's Studies (V1-6).** Practicum experience involving women-centered projects, activities, or artistic expressions that are socially and/or communally relevant.
- 5300. Directed Studies (3:3:0).** Prerequisite: Consent of instructor and the Coordinator of Women's Studies. Content will vary to meet the needs of students. May be repeated three times for credit, as topic varies.
- 5310. Feminist Thought and Theories (3:3:0).** An examination of important theoretical writings and perspectives in Women's Studies, including the contributions of feminist theory and analysis to traditional disciplines.
- 5320. Feminist Research Methodologies (3:3:0).** Prerequisite: W S 5310 or consent of instructor. An interdisciplinary study of methods, analyses, and critiques used by feminist scholars to study feminist issues within and between a range of traditional disciplines.

*Other Options.* Studies of an interdisciplinary nature offer almost limitless combinations. Students may select from almost the entire *Graduate Catalog* and from the graduate offerings of the School of Law and Health Sciences Center. Those interested in a customized program should contact Associate Deans Allan Headley or Wendell Aycock in the Graduate School.

## Land-Use Planning, Management, and Design

Assistant Professor Saif Haq, Coordinator.

This interdisciplinary program leading to a Ph.D. degree is administered by the Dean of the College of Architecture with faculty and courses drawn from participating units throughout the university. It is designed to provide education in the several facets of physical design, with special emphasis on nonurban lands and those in arid and semi-arid environments. Included in the program are studies of the complex factors influencing the human use of resources; training in the research and evaluative methods that can be applied to interdisciplinary studies; and education in the institutional structures that shape policy and action.

This doctoral degree requires 66 semester hours of graduate work beyond the bachelor's degree, 6 of which are tool requirements, plus a minimum of 12 hours of

dissertation. This includes a 24-hour core of the program which consists of a variety of courses taught in the colleges of Agricultural Sciences and Natural Resources, Architecture, Arts and Sciences, Business Administration, Engineering and in the School of Law. This fundamental knowledge is expanded by a specialization in one of four tracks: Environmental-Natural Resource Planning and Management; Public Policy Administration; Community Planning and Design; and Historic Preservation. Additional course work, research projects, and ultimately the student's dissertation will focus on the track selected. A student also is required to present evidence of competency in an appropriate tool subject, computer science or statistics.

Requirements considered for admission to the program include GRE, grade-point average, statement of research interests and goals, and letters of recommendation on official letterhead.

Since students will come from a variety of backgrounds with different interests and career goals, there is no one standard course of study. Initial advisement and program development is conducted by the program coordinator. A degree plan is formulated by a committee drawn from three or more departments and two or more colleges will arrange a student's course of study in both the core and track specialization. The student will therefore follow a "custom-designed" program of study. The advisory committee will assist in administering comprehensive exams and direct the dissertation and the student's program in general.

The core courses for the program are listed below, although a certain flexibility is allowed. Current course descriptions may be found in the listings of the various departments.

**Core Courses**

- ARCH 5382. Urban Theory (3:3:0)**  
**C E 5396. Environmental Impact Analysis (3:3:0).**  
**GEOG 5309. Seminar in Regional Analysis (3:3:0).**  
**PHIL 5330. Philosophy of Science (3:3:0).**  
**PUAD 5340. Seminar in Public Administration (3:3:0).**  
**LAW 6025. Land Use Planning Law (V2 or 3).**  
**RWFM 5303. Synecology (3:3:0).**  
**RWFM 6301. Research Methods (3).**

**Courses in Land-Use Planning, Management, and Design. (LPMD)**

- 7000. Research (V1-12).**  
**7100. Seminar (1:1:0).**  
**8000. Doctor's Dissertation (V1-12).**

## Multidisciplinary Science

Associate Dean Allan D. Headley, Coordinator.

This interdisciplinary program leading to a *Master of Science* degree with a major in MULTIDISCIPLINARY SCIENCE is administered by the Associate Dean of the Graduate School with faculty and courses drawn from participating units throughout the university. The program is designed to meet the professional needs of K-12 teachers of science. The program requires the comple-



tion of 36 semester hours of graduate courses in the sciences, mathematics, and science education culminating with the completion of a special project.

### Program Courses

- ATMO 5302. Weather, Climate, and Applications (3:3:0).**  
**BIOL 5311. Ecology for Teachers (3:3:0).**  
**BIOL 5312. Cellular and Molecular Biology for Teachers (3:3:0).**  
**CHEM 5360. Conceptual Chemistry for Teachers I (3:3:0).**  
**CHEM 5361. Conceptual Chemistry for Teachers II (3:3:0).**  
**EDSE 5377. Science Curriculum and Instruction (3:3:0).**  
**GEOL 5340. Advances in Historical Geology (3:3:0).**  
**IS 5301. The Nature of Science for Teachers (3:3:0).**  
**MATH 5360. Advanced Mathematics for Teachers I (3:3:0).**  
**MATH 5364. Computer Literacy and Programming I (3:3:0).**  
**PHYS 5371. Conceptual Physics for Teachers (3:3:0).**  
**PHYS 5372. Astronomy for Teachers (3:3:0).**

## Museum Science

Professor Gary Edson, Executive Director.

Horn Professors Baker and Chatterjee; Professors Johnson and Phelan; Associate Professor Bradley; Adjunct Faculty: Campbell, Dean, Ladkin, and Monk.

The Museum Science area offers study in the following graduate degree program: *Master of Arts* in MUSEUM SCIENCE. The program emphasizes thorough preparation in the broad spectrum of museum theory and practice. Graduates from the program have a comprehensive background in museum studies, preparing them as generalists. In addition, students may elect to become specialists in a number of subdisciplines including collection management and care; exhibitions and interpretation; museology; museum management; and curatorship in anthropology, art, ethnology, history, and the natural sciences.

Applicants will be considered for admission to the Museum Science program once the following materials are received: official transcript of complete undergraduate course work; two letters of recommendation from persons knowledgeable of the student's professional abilities; GRE scores; a completed application form; and a career summary statement. Forms will be furnished on request. Prior to being considered for admission to the program, students must complete the appropriate application forms and satisfy the requirements of the university. Once that process is concluded, program admission and competitive scholarship awards are based on three general categories of criteria.

- **Academic Record:** All academic records may considered—60 hours, total, major, post-baccalaureate, etc.
- **Test Scores:** Scores on the General Test of the Graduate Record Examination (GRE) should be no more than five years old. Each score is considered separately, with percentile scores viewed by broad major. No test score will be considered the sole criterion.
- **Individual Profile:** Profiles may include recommendations, research background, motivation, multilingual proficiency, undergraduate institution, presen-

tations, and interviews. Other information that admission and scholarship committees may consider is work commitment, demonstrated commitment to a particular field of work or study, and community involvement.

Interested persons should contact the Museum of Texas Tech University for a comprehensive packet of information about the program.

The Museum Science program uses a variety of existing courses offered by various departments within the university to address individual educational and career goals. All students must develop competency in the core courses taught by selected members of the graduate faculty and the museum staff. (Competency is construed to mean an understanding of professional museum practices.)

A student majoring in the program must take at least 24 hours from the Museum Science core curriculum, a minimum of 15 hours of elective graduate-level courses, plus 6 hours of thesis or internship and special project. Required core courses for the program include MUSM 5321, 5326, 5327, 5330, 5331, 5332, 5333, and 5340. (Internships are normally at approved museums and facilities other than the Museum of Texas Tech University.) A total of 45 credit hours of graduate-level work is required for graduation. In addition, each student must pass a qualifying exam prior to beginning either the internship or thesis and must pass comprehensive written and oral exams at the conclusion of his or her studies. Students pursuing the thesis option must write and defend their thesis. The program is administered by the Executive Director of the Museum.

Following the first 9 credit hours of graduate study, each student's curriculum will be formalized through consultation with a graduate faculty advisory committee, consisting of at least three members, which reflects the student's area of emphasis. This degree plan will be approved by the program coordinator and the Executive Director of the Museum and will then be submitted to the Graduate School. When approved, it will serve as a tool for advising and review to assure completion of degree requirements.

A minor at the master's level in Museum Science consists of 9 approved credit hours in the core curriculum; a minor at the doctoral level consists of 15 hours of Museum Science courses of which at least 9 must be from the core curriculum.

Courses marked with an asterisk are required.

### Courses in Museum Science. (MUSM)

- \***5321. Museology (3:3:0).** Establishes a historical and theoretical framework for museum science, promotes a global perspective of museums, and acquaints students with the broad-based implications of museum work as a science.
- 5325. Museum Field Methods (3:1:6).** Prerequisite: Consent of instructor. Problems of collecting museum artifacts, specimens, and samples in the field and methods of handling material before it reaches the museum. Sections will allow work in anthropology, history, paleontology, and vertebrate biology.
- \***5326. Museum Administration (3:3:0).** Prerequisite: MUSM 5321 or consent of instructor. Instruction and investigation in aspects of museum management and administration including

policies and procedures, personnel management, budget formulation, governance, and interaction with support organizations.

- \*5327. Museum Collection Management (3:2:3).** Prerequisite: MUSM 5321 or consent of instructor. Defines the roles of museum collections and focuses on general museum concepts, procedures, and issues related to the management and care of collections. Instruction in art, humanities, and natural science collections.
- 5328. Museum Practicum (3:1:6).** Prerequisite: Consent of instructor. Individual instruction course of supervised experiences involving hands-on activities in museum administration, collections, education, and exhibitions. Sections will allow work in all areas of the Museum of Texas Tech.
- 5329. Material Culture (3:3:0).** Discussion of major trends in historical, psychological, philosophical, anthropological, and art historical literature in terms of their application to the interpretation of the past through its material culture.
- \*5330. Museum Law, Ethics, and Standards (3:3:0).** Prerequisite: MUSM 5321 or consent of instructor. Addresses the ethical considerations and legal obligations of museum collections, administration, and operations. Attention given to international concerns as well as to state and national issues.
- \*5331. Museum Interpretation and Communication (3:2:3).** Prerequisite: MUSM 5321 or consent of instructor. Investigates the theories and methods of museum exhibitions and interpretation. Includes planning, developing, and evaluating strategies of exhibitions, publications, and interpretive programs.
- \*5332. Museum Preventive Conservation (3:1:6).** Prerequisite: MUSM 5321 and 5327, or consent of instructor. A course designed to give future museum workers an awareness of the need for specialized care of artifacts. Introduction of current methods and theories pertaining to museum collection care.
- \*5333. Museum Education (3:3:0).** Prerequisite: MUSM 5321, 5327, or consent of instructor. Examination of the role of education in museum, with emphasis on the theory and practice of program development, teaching strategies, and off-site resources.
- 5335. Geology of National Parks (3:3:0).** Prerequisite: MUSM 5321, 5327, or consent of instructor. Investigation of major concepts in geology, paleontology, evolution, changing environment, history, and preservation of historical parks of the U.S.
- \*5340. Museum Data Management (3:1:6).** Prerequisite: MUSM 5321 and 5327 or consent of instructor. Introduction of traditional and electronic management of museum collection data emphasizing the philosophy of data preservation and retrieval.
- 6000. Master's Thesis (V1-6).**
- 6001. Museum Internship (V1-6).** Internship at an approved museum to include a special project approved by the student's advisory committee. Written documentation of project to provide practical information for the museum profession.
- 7000. Research (V1-12).**

## Public Administration

Assistant Professor Lisa Dicke, MPA Program Director.

The program for the Master of Public Administration degree is designed to prepare students to assume administrative positions in government and nonprofit agencies with particular emphasis on municipal government and specialty tracks associated with it. Persons already employed in government can be prepared to assume more advanced positions. The program is administered by the Center for Public Service, which is in the Department of Political Science.

Students are required to take 36 hours of graduate courses, including a specified core curriculum of 18 hours

of public administration courses. All degree candidates lacking substantial prior administrative experience are placed in a government or not-for-profit internship. Students will not be allowed to graduate with less than a B grade in any core course. A core course may be retaken only once. There are no foreign language or thesis requirements. Comprehensive examinations are given during the last semester of the candidate's course work.

Specialty tracks include public management, fiscal administration, policy analysis, health administration, health policy and planning, and nonprofit management.

**Master of Public Administration—Master of Arts in Economics.** The Center for Public Service in the Department of Political Science and the Department of Economics and Geography, both in the College of Arts and Sciences, offer a 54-hour joint degree program leading to the Master of Public Administration and Master of Arts in Economics degrees. The program is designed primarily for students who wish to complement their administrative skills with knowledge of economics. The joint M.P.A.–M.A. in Economics degree program will be particularly helpful to students intending to specialize in areas such as fiscal administration, health administration, and policy analysis.

Students wishing to pursue this dual degree program must apply to, and be accepted by, both the M.P.A. program in the Department of Political Science and the Department of Economics and Geography. To fulfill the requirements of the dual degree program, the student must take 18 hours of core courses in public administration, 18 hours of core courses in economics, and 12 hours of approved elective courses in public administration, economics, or in a related field, plus 6 hours of internship in public administration for a total of 54 hours. The first two years of study will consist entirely of the core courses in public administration and economics. The third year will consist of the balance of course work in specialized areas in public administration or economics.

**Doctor of Jurisprudence—Master of Public Administration.** The Center for Public Service, in association with the School of Law, offers a program which enables the student to earn both the J.D. and M.P.A. degrees in approximately four years of full-time study. Both degrees can be completed with 102 hours of public administration and law courses (plus 6 hours of internship) instead of the 129 hours plus internship required if pursued separately. Application must be made and approved by both the School of Law and the Graduate School. No student may complete the M.P.A. program in less than 12 months.

## Sports Health

Associate Professor Lanie Dornier, Associate Chairperson for Graduate Programs.

This interdisciplinary program leads to the Master of Science degree with a major in sports health. Students may choose from two tracks in sports health: sports injury and rehabilitation and clinical exercise physiology.

The sports injury and rehabilitation track focuses on the biomechanics of sports injury and rehabilitation. The clinical exercise physiology track serves as an educational foundation for the understanding, prevention, and rehabilitation of pathological conditions.

The program, which involves sports medicine and exercise science, is designed to provide an academic foundation for the exercise physiologist, nutritionist, cardiac and pulmonary rehabilitation specialist, coach, athletic trainer, physical therapist, physician, and others associated with conducting sport, exercise, or rehabilitation programs. Both medical and nonmedical personnel will be trained to design and implement safe and effective exercise and sport programs, prescribe appropriate treatment for individuals' recovery from injury, chronic disease, or disability. Students pursue courses offered by the Department of Health, Exercise, and Sport Sciences in the College of Arts and Sciences and the Department of Rehabilitation Sciences at the Health Sciences Center.

Both thesis and nonthesis options are available for the degree which is administered through the Department of Health, Exercise, and Sport Sciences. The thesis option requires 42 hours of course work including 6 hours of thesis credit and the nonthesis option requires 42 hours of course work and the completion of comprehensive examinations covering course content.

Current course descriptions may be found in the listings of the various departments.

### Program Courses

- ESS 5002. Internship in Sports Health (V1-6).**
- ESS 5305. Motor Learning (3:3:0).**
- ESS 5306. Mechanical Analysis of Motor Performance (3:3:0).**
- ESS 5308. Physiology of Exercise (3:3:0).**
- ESS 5310. Biomechanics of Musculoskeletal Injuries (3:3:0).**
- ESS 5311. Stress Management and Cardiac Disease (3:3:0).**
- ESS 5312. Behavioral and Psychological Aspects of Exercise (3:3:0).**
- ESS 5314. Methods in Biomechanics Research (3:3:0).**
- ESS 5315. Research Methods in Exercise and Sport Sciences (3:3:0).**
- ESS 5331. Research in Sports Health (3:3:0).**
- ESS 5332. Applied Physiology of Exercise (3:3:0).**
- ESS 5333. Administration of Sports Health Programs (3:3:0).**
- ESS 5334. Clinical Exercise Testing and Prescription (3:3:0).**
- ESS 5337. Electrocardiography (3:3:0).**
- ESS 5338. Cardiopulmonary Rehabilitation (3:3:0).**
- ESS 6000. Master's Thesis (V1-6).**
- HLTH 5313. Health Behavior and Health Promotion (3:3:0).**
- HLTH 5344. Psychosocial Aspects of Health (3:3:0).**

## Other Interdisciplinary Areas

### Applied Linguistics

Professor Rosslyn M. Smith; Associate Professor Sharon A. Myers, Graduate Advisor; Assistant Professor Greta Gorsuch.

A Master of Arts degree in Applied Linguistics is offered through the Department of Classical and Modern

Languages and Literatures. Students may select a 36-hour nonthesis or a 30-hour plus thesis option in either general applied linguistics or in teaching English as a second or foreign language. The option in general applied linguistics prepares students who plan to design programs for and/or teach second or foreign languages; it also provides a foundation in applied linguistics for students who plan doctoral studies in first and second language acquisition, second and foreign language teaching and learning, language testing and assessment, studies in second language composition, translation, language planning, or corpus linguistics. Both options include work using CMLL's digital language laboratory and SCOLA (Satellite Communications for Learning) facilities for teaching and research. Faculty from several areas (Anthropology, Bilingual Education, English, Language Literacy Education, Mass Communications, Psychology, and Spanish) offer supporting courses that may count toward the degree. Candidates must demonstrate knowledge of a language other than English. Oral and comprehensive examinations are required. Limited support is available for teaching assistantships in TESOL and may be available for teaching assistantships in Arabic, ASL, Chinese, and Japanese. Interested students may contact Dr. Sharon A. Myers, Department of Classical and Modern Languages and Literatures.

## Comparative Literature

Associate Professor Sharon Diane Nell, Director, Program in Comparative Literature; Professor Bruce Clarke, Graduate Advisor.

Administered by the Comparative Literature Committee, which is composed of faculty from the Department of English and the Department of Classical and Modern Languages and Literatures, this interdisciplinary specialization gives students the opportunity to study literature from an international perspective, to study two or more national literatures, and to concentrate attention upon the following special fields: periods, genres, theories, or relationships between literatures and other arts and disciplines.

At the master's level, there are majors in classical humanities, English, French, German, and Spanish with specializations in comparative literature. At the doctoral level, majors are offered in English and Spanish with specializations in comparative literature. Students specializing in comparative literature at both the M.A. and Ph.D. levels must be admitted to the program in which they plan to major (e.g., English, Spanish, etc.). The graduate advisor of the program in comparative literature oversees the preparation of the comparative literature specialization.

Comparative literature candidates who are not international students should have completed sufficient language study to begin or continue graduate work in the literature of at least two languages. Inquires concerning sound preparation for master's and doctor's level spe-



cializations in comparative literature should be addressed to the graduate advisor of the program in comparative literature.

At the master's level, students are required to take at least five courses for the specialization: at least two graduate literature courses in languages other than their major and at least two graduate Comparative Literature (C LT) courses. The fifth course may be an interdisciplinary elective, approved by the graduate advisor of the comparative literature program. Degree plans must be approved by both the student's major advisor and the graduate advisor in comparative literature.

At the Ph.D. level, the specialization involves a minimum of six courses: at least two in Comparative Literature (C LT); at least three graduate courses must be taught in one or more foreign languages. The sixth course may be an interdisciplinary elective, approved by the graduate advisor of the comparative literature program. A student's program is supervised by a doctoral committee drawn up in consultation with the student's major advisor and the graduate advisor in comparative literature.

### Courses in Comparative Literature. (C LT)

- 5301. Theories of Literature (3:3:0).** Intensive exploration of selected theories or methodologies of literary study. May be repeated.
- 5304. Literature and Other Disciplines (3:3:0).** Selected studies of the relations between literature and other disciplines such as history, philosophy, anthropology, psychology, and natural sciences. May be repeated for credit. Readings in English.
- 5310. Literature and Cultural Studies (3:3:0).** Places a variety of national literatures in relation to other cultural institutions and structures. May be repeated for credit. Readings in English.
- 5314. Literature and Gender (3:3:0).** Examines the representation of gender in various national literatures. May be repeated for credit.
- 5350. The Classical Tradition (3:3:0).** Designed to acquaint students with the influence of ancient Greece and Rome on Western culture. Readings in English. (CLHM 5350)
- 5355. Studies in Comparative Literature (3:3:0).** Practice of the study of comparative literature with emphasis on themes and motifs. (ENGL 5355)
- 7000. Research (V1-12).**

## Ethnic Studies

Assistant Professor Jorge Iber, Director.

Ethnic studies is offered as an interdisciplinary minor for students who may find a greater knowledge of ethnic groups and majority-minority relations a useful complement to their major area of study. With the continued prominence of public issues related to race and ethnicity it is anticipated that students from diverse fields may benefit from either a broader or a more specialized knowledge of ethnicity. Students may, if they wish, focus on African-American, Mexican-American, or Native-American Studies.

The Ethnic Studies Committee, comprised of faculty from the departments offering courses acceptable as part of the minor, supervises the minor degree plans.

A doctoral minor consists of at least 15 hours of ethnic studies courses to be taken in at least two departments outside the student's major field. A minor at the master's level consists of 6 hours of ethnic studies courses in two departments outside the major. General rules of the Graduate School governing minors at both degree levels apply.

Graduate students who wish to minor in ethnic studies should consult the Director of the Ethnic Studies Committee, Assistant Professor Jorge Iber, Department of History.

Courses marked with an asterisk will be considered acceptable as part of the minor when the topic studied deals with ethnic groups. For current course descriptions, see individual departmental listings.

### Program Courses

- ANTH 5322. Social Anthropology (3:3:0).**  
**\*ANTH 5323. Topics in Cultural Anthropology (3:3:0).**  
**\*ANTH 7000. Research (V1-12).**  
**ART 5315. Arts of the Indian Americas (3:3:0).**  
**COMS 5302. Intercultural Communication (3:3:0).**  
**\*ECO 7000. Research (V1-12).**  
**\*EDBL 5332. Foundations of Bilingual Education (3:3:0).**  
**\*EDBL 5333. Teaching the Multicultural-Multilingual Student (3:3:0).**  
**EDEC 5314. Early Education for Culturally Diverse Children (3:3:0).**  
**\*EDCI 7000. Research (V1-12).**  
**\*EDEL 7000. Research (V1-12).**  
**HIST 5319. Studies in Native-American History (3:3:0).**  
**HIST 5333. Studies in African-American History (3:3:0).**  
**\*HIST 6304. Seminar in American History (3:3:0).**  
**\*HIST 7000. Research (V1-12).**  
**\*POLS 5327. Selected Topics in American Government and Politics (3:3:0).**  
**\*POLS 7000. Research (V1-12).**  
**PSY 5332. Stereotypes and Prejudice (3:3:0).**  
**SOC 5312. Seminar in Urban Problems (3:3:0).**  
**SOC 5313. Seminar in Minority Relations (3:3:0).**  
**\*SOC 7000. Research (V1-12).**  
**SPAN 5381. Hispanic Literature of the Southwest (3:3:0).**  
**\*SPAN 7000. Research (V1-12).**

## Latin American and Iberian Studies

Associate Professor Alberto Julián Pérez, Director.

A doctoral minor in Latin American and Iberian Studies is administered by the Latin American and Iberian Studies Committee. The minor consists of 18 hours of graduate level courses taken in the participating departments and approved by the student's doctoral committee. No courses from the students' major field may be included in the minor. At least two different areas must be represented in the minor, and the maximum number of hours permitted in any one field is 9. Doctoral minors in the program must demonstrate competency, as determined by the student's committee, in Spanish and Portuguese except in special circumstances.

A minor at the master's level shall consist of a minimum of 9 hours in at least two areas outside the major.

Certain courses not listed below may be considered acceptable as part of the minor when the topic studied deals with Latin America or Iberia. Students should contact the course instructor in the department in which the course is offered and the Director of Latin American and Iberian Studies to determine if such courses are acceptable.

### **Courses in Latin American and Iberian Studies. (LAIS)**

**5300. Directed Studies (3:3:0).** Prerequisite: Consent of instructor and Director of Latin American and Iberian Studies. Content will vary to meet the needs of students. May be repeated for credit.

### **Program Courses**

- ART 5315. Arts of the Indian Americas (3:3:0).** (when course deals with Latin America)
- GEOG 5307. NAFTA, Western Hemisphere Trade, and Regional Integration in the Americas (3:3:0).**
- HIST 5355. Studies in Colonial Latin American History (3:3:0).**
- HIST 5356. Studies in National Latin American History (3:3:0).**
- POLS 5371. Area Studies in Comparative Politics (3:3:0).** (when course deals with Latin America or Iberia)
- PORT 7000. Research (V1-12).**
- SPAN 5345. History of the Spanish Language (3:3:0).**
- SPAN 5347. Language Development (3:3:0).** (offered in Mexico)
- SPAN 5348. Culture and Literature (3:3:0).** (offered in Mexico)
- SPAN 5354. Hispanic Literary Concepts (3:3:0).**
- SPAN 5355. Seminar in Hispanic Literature (3:3:0).**
- SPAN 5361. Medieval Literature (3:3:0).**
- SPAN 5362. Golden Age Literature (3:3:0).**
- SPAN 5364. Nineteenth-Century Spanish Literature (3:3:0).**
- SPAN 5366. Twentieth-Century Spanish Prose (3:3:0).**
- SPAN 5368. Twentieth-Century Spanish Theatre and Poetry (3:3:0).**
- SPAN 5370. Colonial Spanish American Literature (3:3:0).**
- SPAN 5374. Nineteenth-Century Spanish American Literature (3:3:0).**
- SPAN 5375. Modernism (3:3:0).**
- SPAN 5376. Twentieth-Century Spanish American Prose (3:3:0).**
- SPAN 5378. Twentieth-Century Spanish American Theatre and Poetry (3:3:0).**
- SPAN 5381. Hispanic Literature of the Southwest (3:3:0).**

## **Legal Studies**

Professor Marilyn E. Phelan, Coordinator.

Through arrangement with the School of Law, graduate students may take certain courses in law to supplement their programs or, in some cases, to meet the requirements for a formal minor. Enrollment of graduate students in individual law courses is subject to the availability of space and approval of the professor in charge. Graduate students should consult their advisor before enrolling in such courses to ensure that the courses are applicable to their program. Courses that may be appropriate for a minor in legal studies also are available in such areas as political science, history, business administration, and sociology.

Joint programs of study leading to the degrees of Doctor of Jurisprudence (J.D.) and Master of Business Administration (M.B.A.), Master of Public Administration

(M.P.A.), and the M.S. degree in Agricultural Economics are available. These joint degree programs are of benefit to students who contemplate careers in professional management or public service or those who envision careers in such narrowly specialized areas such as tax accounting, banking, real estate, collective bargaining, or international business. The program enables students to study, compare, and relate simultaneously the special subject matter areas and the law, completing the requirements for both degrees in three years instead of the four years required if pursued separately.

## **Neural and Behavioral Sciences**

Associate Professor James A. Carr, Chairperson of the Neural and Behavioral Sciences Advisory Committee.

Neural and Behavioral Sciences is offered as an interdisciplinary minor for graduate students who wish to broaden their knowledge of the neural and behavioral sciences while gaining a sound academic background in basic areas such as the structure and function of the nervous system.

The Neural and Behavioral Sciences Advisory Committee supervises this program and coordinates related activities on campus such as seminars, student research, and consultation for students interested in further training in the neural and behavioral sciences. The committee is composed of faculty from the College of Arts and Sciences, the College of Agricultural Sciences and Natural Resources, and the School of Medicine.

A doctoral minor normally consists of GIDN 5910 (Integrated Neurosciences: 9 semester hours) plus 9 semester hours outside the student's major field (selected from the following list). A master's minor normally consists of GIDN 5910. In special cases the committee may substitute other courses for GIDN 5910.

Graduate students who wish to minor in Neural and Behavioral Sciences should consult with one of the members of the committee: Professors Michael K. Rylander (Biological Sciences), James A. Carr (Biological Sciences), Penelope Coates (Cell Biology and Biochemistry), John McGlone (Animal Science and Food Technology), Reid Norman (Cell Biology and Biochemistry), or Shirley Poduslo (Neurology).

### **Program Courses**

- GANM 5313. Selected Topics in Cell and Developmental Biology (3:3:0).**
- GIDN 5910. Integrated Neurosciences (9:8:1).**
- GPHM 5326. Pharmacology of the Autonomic Nervous System (3:3:0).**
- GPHM 5337. Neuropsychopharmacology (3:3:0).**
- GPHY 6314. Membrane Biophysics (3:3:0).**
- PHIL 5330. Philosophy of Science (3:3:0).**
- PHIL 5331. Philosophical Psychology (3:3:0).**
- PSY 5309. Clinical Neuropsychology (3:3:0).**
- PSY 5353. Seminar in Physiological Psychology (3:3:0).**
- PSY 5385. Life Span Development: Psychobiological and Cognitive Processes in Aging (3:3:0).**
- ZOOL 5304. Comparative Endocrinology (3:3:0).**
- ZOOL 5312. Advanced Animal Behavior (3:3:0).**
- ZOOL 6320. Comparative Neuroanatomy (3:2:3).**

## Risk-Taking Behavior

Professor Nancy Bell, Coordinator.

Risk-Taking Behavior is offered as an interdisciplinary minor at the master's or doctoral level. The 15-hour minor consists of an introductory course, Seminar in Risk Taking, examining the concept of risk taking from developmental, social psychological, sociological, and biosocial perspectives. Students then choose the additional 12 hours from courses covering substance abuse and vulnerability to chemical dependency, family problems associated with risk taking, deviance, and criminology. At least two of these courses must be outside the student's home department.

The minor is administered by the Committee for Multidisciplinary Research on Adolescent and Adult Risk-Taking Behavior. The committee is composed of faculty in Human Development and Family Studies; Psychology; Education; and Sociology, Anthropology, and Social Work. The purposes of the committee are to foster collaborative research on risk taking and to serve as a resource for Texas Tech and the community. Research interests of participants include substance abuse,

codependency, decision processes associated with adolescent sexual behavior, coping and social support, gender issues in risk taking, and developmental processes associated with risk taking.

This minor should be useful for students interested in research on risk-taking behavior or for those planning to work in applied settings with adolescents and young adults or with families. Consult the program coordinator or individual departments for information on course scheduling. In addition to the courses listed below, special topics courses related to risk taking may be included with the approval of the coordinator.

### Program Courses

- EPCE 5372.** Addictions: An Overview for School and Community Counselors (3:3:0).
- HDFS 5341.** Socialization Processes and Addiction (3:3:0).
- HDFS 6320.** Seminar in Risk Taking (3:3:0).
- HDFS 6330.** Family Problems (3:3:0).
- HDFS 6371.** Practicum in Human Development and Family Studies (3:3:0).
- PSY 5382.** Psychopharmacology of Psychoactive Drugs (3:3:0).
- SOC 5311.** Seminar in Criminology (3:3:0).
- SOC 5325.** Seminar in Deviant Behavior (3:3:0).





# College of Agricultural Sciences and Natural Resources

*Professor John R. Abernathy, Dean*

Programs are available through the College of Agricultural Sciences and Natural Resources leading to the following graduate degrees:

**Master of Science** with majors in Agricultural and Applied Economics, Agricultural Education, Animal Science, Crop Science, Entomology, Fisheries Science, Food Technology, Horticulture, Range Science, Soil Science, and Wildlife Science.

**Master of Agriculture** with a major in Agriculture and specializations available through the various departments. The Master of Agriculture degree program is designed to prepare students and professionals as leaders, managers, and executives in the agricultural sciences and natural resources areas. Because the program is multidisciplinary and includes a wide choice of professional courses, it prepares graduates to enter a diversity of careers. A student may select an emphasis in the following departments: Agricultural and Applied Economics, Agricultural Education and Communications, Animal Science and Food Technology, and Plant and Soil Science. Courses for the Master of Agriculture degree program may be taken from offerings in the College of Agricultural Sciences and Natural Resources and from other colleges of the University. A minimum of 36 semester hours of graduate course work is required for this nonthesis degree. For a specific option a student would normally take 18 hours in the department concerned with the emphasis area and the balance in at least three other areas. An oral or written comprehensive examination as specified by the emphasis department is required.

**Master of Landscape Architecture** is a terminal professional degree for students with a Bachelor of Landscape Architecture degree or equivalent and a first professional degree for students with any other professional degree.

**Doctor of Philosophy** with majors in Agricultural and Applied Economics, Agronomy, Animal Science, Fisheries Science, Range Science, and Wildlife Science.

**Doctor of Education** with a major in Agricultural Education.

A University-wide interdisciplinary program leading to the Ph.D. degree in Land-Use Planning, Management, and Design is also offered. A Doctor of Education degree is available from the College of Education for students who wish to have agricultural education as a support area.

Applicants who meet the admission standards of the Graduate School also must receive formal approval from a departmental committee. Admission standards of some departments exceed those of the Graduate School.

Advisory committees for the M.S., M.Ag., and M.L.A. degrees will consist of at least three faculty members. Advisory committees for the Ph.D. degree in Agricultural and Applied Economics will consist of four or five members. Advisory committees for Ph.D. degrees in the departments of Range, Wildlife, and Fisheries Management, Plant and Soil Science, and Animal Science and Food Technology will have five members on their advisory committees.

A preliminary examination is required of all doctoral students before the end of the second semester of work toward the Ph.D. degree. The student's progress will be evaluated and recommendations will be made concerning continuation of graduate studies and leveling work necessary to remove any deficiencies revealed by the examination.

No specific language or tool requirements exist for the graduate programs. However, such requirements may be incorporated when deemed appropriate. Other requirements for the degree programs are specified in other sections of this catalog.

## Courses in Agricultural Science. (AGSC)

**5303. Ecology of Grazing Lands Systems (3:3:0).** A field oriented course on ecology, management, and research in forage-livestock systems.

## Department of Agricultural and Applied Economics

Professor Don Ethridge, Chairperson.

Professor Segarra; Associate Professors Elam, Johnson, Misra, and Ramirez; Assistant Professors Lyford, Malaga, Mohanty, and Willis; Adjunct Faculty: M. Dean Ethridge and Harman.

This department offers study in the following graduate degree programs: AGRICULTURAL AND APPLIED ECONOMICS, *Master of Science* and *Doctor of Philosophy*. The department also participates in the interdepartmental program leading to the *Master of Agriculture* degree and cooperates with the College of Business Administration in a *Master of Business Administration* degree with a concentration in agricultural business management. This M.B.A. program is administered by the College of Business Administration.

Master's programs in agricultural and applied economics require a minimum of 30 hours of graduate credit for the M.S. thesis option or 36 hours for the M.S. nonthesis option and for the Master of Agriculture degree. A student seeking a M.S. degree in Agricultural and Applied Economics may choose courses to emphasize agribusiness and trade or resource policy and development. Each candidate in the M.S. option is expected to demonstrate competency by satisfactorily completing a comprehensive written examination.

The doctoral program in agricultural and applied economics is designed to develop competence in advanced economic theory, techniques of quantitative analysis, and public administration of economic and agricultural issues.

The program has been designed to take advantage of the strengths of the department and the supporting disciplines of economics, mathematics, statistics, business administration, political science (public administration), sociology, and the other agricultural sciences. A program with different emphases in the supporting areas is possible with the approval of the departmental graduate committee. Each candidate is expected to demonstrate competency by satisfactorily completing a comprehensive written examination in each specialty field chosen, a dissertation demonstrating original independent scholarly research, and a final oral examination.

Before being recommended for admission to a degree program with a major in agricultural and applied economics, the student may be required to take (without graduate credit) undergraduate leveling courses as specified by the department.

The School of Law and the Graduate School of Texas Tech University offer a joint degree program that allows students to complete the requirements for the Master of Science degree in Agricultural and Applied Economics and the Doctor of Jurisprudence degree. This joint program can be completed one year sooner than when each is pursued separately. The M.S. component is administered by the Department of Agricultural and Applied Economics on behalf of the Graduate School, while the J.D. component is administered by the School of Law.

The joint degree program is of particular benefit to students who are interested in practicing law in a rural setting or who want to pursue certain types of careers in agribusiness finance or natural resource law. Students must be admitted to both programs but the LSAT test will suffice for both applications.

### **Courses in Agricultural and Applied Economics. (AAEC)**

- 5100. Seminar (1:1:0).** Current issues related to public policy. F, S.
- 5301. Special Study in Agricultural and Applied Economics (3).** Individual and group study in advanced topics not covered in other graduate courses. May be repeated for credit. F, S, SS.
- 5302. Food and Agriculture Sector Public Policy (3:3:0).** Prerequisite: AAEC 4305. Analysis of public policies affecting the food and fiber sector; commodity programs, environmental laws, and trade policy. F, SS.
- 5303. Advanced Production Economics (3:3:0).** Prerequisite: AAEC 3316. Criteria for resource use optimality and technology adoption; duality relationships; and linear programming. F.
- 5307. Applied Econometrics I (3:3:0).** Prerequisite: AAEC 4302. Advanced statistical methods, including multiple regression analysis, for applied economic problems; constructing econometric models; multicollinearity, autocorrelation, heteroscedasticity, and related problems. F.
- 5308. Natural Resource Economics (3:3:0).** Economic theory and empirical investigations of resource utilization with special emphasis on arid and semi-arid land areas and environmental issues. S.
- 5309. International Economic Development in Food and Fiber Sectors (3:3:0).** Prerequisite: AAEC 3315. World food and development issues; economic development of the food and fiber sector in industrialized and developing economies. F.
- 5310. Advanced Market Analysis (3:3:0).** Prerequisite: ECO 5312 and AAEC 5307. Theoretical and empirical approaches to market structures and market price behavior. S.

- 5312. Agribusiness Analysis (3:3:0).** Prerequisite: AAEC 3315. Application of economic theory and methods to management problems of the business firms in the food and fiber sector. F.
- 5313. Microcomputer Applications in Agribusiness and Research (3:2:2).** Use of microcomputers, software, and design of software for agricultural business and research purposes. Not open to majors. S, SS.
- 5315. Property Appraisal (3:3:0).** Factors governing land prices, valuation. Appraisal for use, sale, lending, condemnation, estate settlement, taxation. Not open to students with AAEC 4303 or equivalent. F.
- 5316. International Agricultural Trade (3:3:0).** Economic theory dealing with the international movement of goods, services, and capital; welfare and distributional aspects of trade; and policy issues in international agricultural trade.
- 5317. Financial and Commodity Futures and Options (3:3:0).** Mechanics of futures trading, history and functions of futures market. Role of futures and options markets in managing risks. Not open to students with AAEC 4317 or equivalent. F, S, SS.
- 5318. Finance and the Agribusiness Sector (3:3:0).** Prerequisite: FIN 5320. Applications of financial theory for the agribusiness sector. Risk, capital structure, business structure, investment analysis. S.
- 5320. Agribusiness Law (3:3:0).** Federal regulatory programs, market orders, bankruptcy. Administrative, environmental, antitrust law, Uniform Commercial Code in agricultural context. Not open to students with AAEC 4320 or equivalent. F, SS.
- 5321. Research Methodology in Economics (3:3:0).** Review of philosophical and conceptual basis of economic research and study of the procedural aspects of designing, planning, and conducting research in economics. S.
- 6000. Master's Thesis (V1-6).**
- 6301. Advanced Special Problems in Agricultural and Applied Economics (3).** Individual study in advanced topics not covered in other graduate courses. F, S, SS.
- 6302. Food, Agriculture, and Natural Resource Policy Analysis (3:3:0).** Prerequisite: AAEC 4305. Analysis of policies, programs affecting food, agricultural commodities, trade, and natural resources. Includes policies in the U.S. and other countries. F.
- 6305. Dynamic Economic Optimization (3:3:0).** Prerequisite: AAEC 5303. Development, use of mathematical economic models emphasizing static and stochastic linear, nonlinear and dynamic processes. S.
- 6308. Advanced Natural Resource Economics (3:3:0).** Prerequisite: AAEC 5308. Advanced economic theory and analysis of environmental and natural resource issues, both domestic and global. F.
- 6310. Demand and Price Analysis (3:3:0).** Prerequisite: AAEC 5311, ECO 5312. Applied price and demand analysis including complete demand systems and hedonic-characteristic price analysis. F.
- 6311. Applied Econometrics II (3:3:0).** Prerequisite: AAEC 5307. Methods and applications of single and multi-equation models in agricultural economics; logit and probit models, nonstructural models and related methods. S.
- 7000. Research (V1-12).**
- 7200. Teaching Practicum (2:3:0).** Prerequisite: Doctoral student in the program and previous or concurrent enrollment in a higher education teaching methods course. Supervised teaching at the university level.
- 8000. Doctor's Dissertation (V1-12).**

## **Department of Agricultural Education and Communications**

Professor Matt Baker, Chairperson.

Professors Briers, Cepica, Christiansen, Lawver, Shinn, and Townsend; Associate Professors Frazee and Vestal; Assistant Professors Akers, Boyd, Cummings, Dooley, Elbert, Harlin, Kieth, Lindner Lockaby, Murphy, Smith, and Wingenbach.

This department offers study in the following graduate degree programs: AGRICULTURAL EDUCATION, *Master of Science* and *Doctor of Education*. The department also participates in the interdepartmental program leading to the *Master of Agriculture* degree with an option in agricultural communications or agricultural extension education.

The Doctor of Education program is available as a resident program. The department also participates in a unique distance-delivered doctoral degree in agricultural education that is awarded by both Texas Tech University and Texas A&M University. Students in this program must apply for admission at both universities. Most course work associated with this joint doctoral degree is delivered via the Trans Texas Video Network and the World Wide Web. The Master of Science degree program may be completed with 30 hours of graduate courses plus a thesis, or 36 hours of graduate courses. The Master of Agriculture degree is a 36-hour program.

#### Courses in Agricultural Education. (AGED)

- 5001. Contemporary Issues in Agricultural and Extension Education (V1-6).** Study current issues and trends in agricultural and extension education and develop plans to improve the disciplines. May be repeated for up to 6 hours credit. F, S, SSI, SSII.
- 5301. Special Problems (3:3:0).** Investigation of problems in agricultural education or extension education of special interest to the student. May be repeated for credit. F, S, SSI, SSII.
- 5302. Research Methods and Analyses in Agricultural and Extension Education (3:3:0).** Application of research techniques in agricultural and extension education. Determining the correct research design, treatment of data, and dissemination of results. F.
- 5303. Advanced Computer Applications in Agricultural and Extension Education (3:3:0).** Using computers in agricultural and extension education programs. Includes word processing, presentation graphics, desk-top publishing, and integrated software. F.
- 5304. Advanced Methods in Agricultural Leadership (3:3:0).** Theory of motivation and behavior, leadership and management styles, change agents, and the adoption process. Practical application regarding agricultural occupations. SSI, SSII.
- 5305. Program Development in Agricultural and Extension Education (3:3:0).** Development of a total agricultural education program in communities and counties using all available resources. SSI, SSII.
- 5306. History and Philosophy of Agricultural Education (3:3:0).** Historical and philosophical foundations of agricultural education. Emphasis is on preparing leaders who can shape and interpret policy. S.
- 5307. Methods of Technological Change (3:3:0).** Dynamics of cultural change as theoretical framework for planned technological change; methods of planning and implementing change, its effect, and how it can be predicted. SSI, SSII.
- 5308. Advanced Methods in Agricultural Education (3:3:0).** Study and investigation of recent advances, concepts, and current problems in agricultural and extension education. Emphasis on programs for adults. S.
- 5309. Evaluation of Programs in Vocational, Technical, and Extension Education (3:3:0).** Techniques in evaluating vocational, technical, and extension education programs. Principles and procedures of evaluation with emphasis on focusing, designing, reporting, and managing evaluation. SSI, SSII.
- 5310. College Teaching in Agriculture (3:3:3).** Prerequisite: consent of instructor. Methods and techniques of teaching agriculture at the college level. Includes self-assessment, student assessment, course development, lesson planning, presentations, and evaluation. F.

**5311. Human Dimensions of International Agricultural Development (3:3:0).** Study current issues and trends in the human dimension of international agricultural development.

**6000. Master's Thesis (V1-6).**

**7000. Research (V1-12).**

**7100. Doctoral Seminar (1).** Group study and discussion of current developments in agricultural education. May be repeated for credit.

**7200. Professional Internship (2).** An on-the-job supervised experience program conducted in the area of the student's specialization. May be repeated for credit.

**8000. Doctor's Dissertation (V1-12).** Initiation and completion of research for advanced degree.

#### Courses in Agricultural Systems Management. (AGSM)

**5301. Investigations in Advanced Agricultural Mechanics (3).** Individual study or investigation of an advanced phase of mechanized agriculture. May be repeated for credit. F, S, SSI, SSII.

## Department of Animal Science and Food Technology

Professor Kevin R. Pond, Chairperson.

Thornton Professor Galyean; Professors Albin, McGlone, Miller, and Richardson; Associate Professors Herring, Jackson, Prien, and Thompson; Assistant Professors Blanton, Brady, Brashears, Kim, and Vizcarra; Adjunct Faculty: Allen, Cole, Greene, Morrow, Pence, Thomson, Wheeler, and Winder.

This department offers study in the following graduate degree programs: ANIMAL SCIENCE, *Master of Science* and *Doctor of Philosophy*; FOOD TECHNOLOGY, *Master of Science*. The department also participates in the interdepartmental program leading to the *Master of Agriculture* degree.

The department offers flexible degree programs preparing graduates for a wide array of positions in agriculture and allied fields. Students with bachelor's degrees in a variety of fields are welcome to study in the department.

The nonthesis, 36-hour Master of Agriculture or Master of Science degrees are offered with specializations in agricultural product processing (meats or feeds), feedlot management, formula feed production, livestock production, and ranch management. An internship is required for the Master of Agriculture.

Master of Science degree students may pursue studies in animal breeding (physiology or genetics), animal nutrition (ruminant or monogastric), animal science, food technology, or meat science. A thesis, along with at least 24 semester hours of course work, is required.

The master's degree in food technology emphasizes the technological aspects of food handling. Knowledge of the physical and biological sciences, economics, and engineering is applied to and coordinated with food development, processing, packaging, quality control, and distribution. Research programs involve food microbiology, histology, chemistry, and commodity products.

Consumer demands for a variety of highly nutritious and convenient foods of uniformly high quality create many and varied career opportunities in the food and allied industries. These careers include management, research and



development, process supervision, quality control, procurement, distribution, sales, and merchandising.

Candidates for the Doctor of Philosophy degree in Animal Science may specialize in one of several areas of interest such as animal genetics, animal nutrition, reproductive or environmental physiology, or meat science. No foreign language requirement exists, but such a requirement may be instituted at the discretion of the student's advisory committee.

Interested persons should contact the department graduate advisor. Additional general degree requirements may be found in other sections of this catalog.

Students who receive stipends have special responsibilities in research and teaching. These awards include waiver of nonresident tuition.

### Courses in Animal Science. (ANSC)

- 5000. Professional Internship (V1-6).** Prerequisite: Consent of department chairperson. Supervised study providing advanced training for Master's of Agriculture and Master's of Science (nonthesis) students. Emphasis is on creative and technical abilities.
- 5001. Problems in Animal Science (V1-6).** Prerequisite: Consent of instructor. Selected problems based on the student's needs and interests not included in other courses. May be repeated for credit with approval of department.
- 5100. Seminar (1:1:0).** Analysis of significant research. Oral presentations and discussions; enrollment required each semester of student's residence. F, S.
- 5201. Ethical Behavior and Integrity in Scientific Research (2:2:0).** Combination of lecture presentations and student analysis of behavior in science to explore aspects of scientific integrity and conduct.
- 5301. Advanced Contemporary Issues in Animal Agriculture (3:3:0).** Lecture, discussion, and seminar on current society issues facing animal and meat science. F.
- 5302. Advanced Beef Production (3:3:0).** Advanced study of beef production and management. Emphasis on the application of current research to improve the efficiency of beef production. SS, even years.
- 5303. Advanced Beef Cattle Feedyard Management (3:3:0).** Emphasis on the application of recent research to improve the management of cattle feedyard operations. Special emphasis will be placed on risk and resource management within the feedyard.
- 5304. Growth and Development (3:3:0).** A study of differentiation, development, growth, and fattening of domestic animals and hereditary and environmental influences and interactions. SS.
- 5305. Advanced Livestock Production (3:3:0).** Prerequisite: ANSC 3302. Advanced study of current research and on-farm practices of livestock production. Not open to animal science majors. S, SS.
- 5306. Advanced Animal Breeding (3:3:0).** Prerequisite: ANSC 3402 or equivalent. Advanced topics in selecting and mating farm animals with the objective of making genetic improvement. Emphasis on breeding value estimation and crossbreeding. S, odd years.
- 5308. Minerals and Vitamins in Animal Nutrition (3:3:0).** An in-depth study of vitamin and mineral chemistry, metabolism, interrelationships, and requirements for production. S, odd years.
- 5309. Genetic Prediction Methods (3:3:0).** Prerequisite: ANSC 5306 and one semester of statistics. Study of the theory and application of quantitative genetics and genetic prediction methods for animal populations. S, even years.
- 5310. Advanced Quality Control and Management in Feed Manufacturing (3:3:0).** Scientific principles and practices of quality control and management of feed manufacturing with respect to their effects on animal performance.

- 5311. Ruminant Nutrition (3:2:3).** A study of the digestive physiology of ruminants. Emphasis on rumen fermentation and its relationship to practical nutrition. Individual topics and current research information. S.
- 5312. Advanced Sheep and Goat Production (3:3:0).** Advanced study of sheep and goat production and management. Application of research in genetics, reproduction, nutrition, health, management, wool, mohair, and marketing. S.
- 5313. Advanced Animal Nutrition (3:3:0).** Prerequisite: ANSC 3301, CHEM 3401 or 3305. The role of nutrients in the metabolism of farm animals. Nutrient use and energy efficiency in production. F.
- 5314. Animal Protein and Energy Utilization (3:3:0).** An in-depth study of nitrogen, amino acid metabolism, and energy utilization in animals. Evaluation of sources and requirements for production. F.
- 5315. Neuroendocrinology (3:3:0).** Prerequisite: Consent of instructor. Course will address current research on hypothalamic-pituitary regulation of physiological systems including reproduction, growth, immune function, digestion, and behavior.
- 5316. Muscle Chemistry, Ultrastructure, and Physiology (3:3:0).** A study of muscle structure, composition, growth mechanisms of contraction, and rigor as related to livestock.
- 5317. Agricultural Systems Modeling (3:3:0).** An introductory modeling course for biological and agricultural systems. No special mathematical or programming skills needed.
- 5400. Advanced Meat Science and Muscle Biology (4:3:3).** Advanced study of meat components, their development, and effect on meat characteristics and processing properties. Emphasis on industry issues and the current scientific literature. Not for students who have taken ANSC 4400. S.
- 5401. Experimental Techniques in Meat Chemistry and Muscle Biology (4:3:3).** Histological, chemical, and biological properties of meat. Experimental techniques in meat science and muscle biology will be studied in lecture and individual lab study.
- 5403. Biometry (4:3:2).** Introduction to biological statistics. Observations, probability, "t" test, analysis of variance, mean separation procedures, linear regression and correlation, and chi-square. Introduction to computerization of statistical analyses. F.
- 5404. Physiology of Reproduction (4:3:3).** Anatomy of reproductive systems, physiological regulations of reproductive processes, estrous cycle, gonadal functions, semen evaluation, fertilization, embryology, pregnancy, parturition, lactation, reproductive efficiency, and research techniques. S, odd years.
- 5405. Advanced Processed and Cured Meat Science (4:3:3).** Prerequisite: ANSC 3101, 3201, 4400, or consent of instructor. Advanced application of scientific principles and practices to manufactured meat products. Interrelationships among muscle ingredients, processing technologies, storage conditions, and stability of cured muscle foods. S, SS even years.
- 5406. Advanced Reproductive Physiology of the Mare (4:3:2).** Current research and techniques in the reproductive physiology of the mare. Areas covered will include endocrinology, embryo transfer, in vitro fertilization, hormone manipulation, and infertility and diseases in the mare. SS, even years.
- 5407. Advanced Reproductive Physiology of the Stallion (4:3:2).** Current research and techniques on the reproductive physiology of the stallion. Areas covered will include endocrinology, collection for artificial insemination, preparation of cooled and transported semen, freezing semen, and infertility and diseases of the stallion. SS, odd years.
- 6000. Master's Thesis (V1-12).**
- 7000. Research (V1-12).**
- 8000. Doctor's Dissertation (V1-12).**

### Courses in Food Technology. (FD T)

Students should consult the Department of Education, Nutrition, and Restaurant-Hotel Management (College of Human Sciences) for additional course offerings.

- 5301. Study in Food Microbiology (3:2:3).** Isolation and identification of organisms surviving process treatment of food

products. Techniques in maintaining culture and shelf-life quality for fermented foods. Organized lecture and individualized laboratories. S, even years.

- 5302. Chemical and Instrumental Analyses of Agricultural Products (3:2:3).** Prerequisite: Consent of instructor. Application of chemical, chromatographic, and spectroscopic methods in analysis of agricultural products. F, even years.
- 5303. Study in Food Chemistry (3:2:3).** Analysis of food components and changes in their characteristics due to processing treatments. Laboratory techniques in instrumental analysis. Organized lectures and individualized lab study. F, odd years.
- 5305. Research and Study Related to Cereal and Oilseed Products (3:2:3).** Advanced practice in processing cereals and oilseeds. Particular emphasis on processing techniques involving new product development. S, odd years.
- 5307. Topics in Food Technology (3).** Students work on subjects of individual interest but opportunity is given for interaction with fellow students in the course. May be repeated for credit. F, S, SS.
- 5308. Study Related to Dairy Products (3:2:3).** Advanced principles and techniques associated with processing and quality characteristics of dairy products. Organized lecture and individualized lab study. S.
- 5309. Advances in Food Safety (3:3:0).** Regulatory and safety issues in food manufacturing and processing.
- 6000. Master's Thesis (V1-12).**

## Department of Landscape Architecture

Professor Alon Kvashny, Chairperson.  
Associate Professors Billing and Kavanagh; Assistant Professors Coffee, Hamed, Mills, and Sherrod.

This department offers study in the following graduate degree program: LANDSCAPE ARCHITECTURE, *Master of Landscape Architecture*. The department also participates in the interdisciplinary LAND-USE PLANNING, MANAGEMENT, AND DESIGN program leading to the *Doctor of Philosophy* degree. (See the "Opportunities for Interdisciplinary Study" section of this catalog.)

The M.L.A. degree is designed as a first professional degree for students with a baccalaureate degree in a discipline other than landscape architecture and an advanced professional degree for students with the Bachelor of Landscape Architecture degree or its equivalent. The advanced professional degree requires a minimum of 34 credit hours. The first professional degree requires 34 hours and in addition up to 35 hours of leveling courses.

The M.L.A. provides the flexibility to meet a variety of professional interests such as universal design, therapeutic landscape design, land use and regional planning, geographic information systems, and cultural landscape design.

Individual needs and career objectives are fully considered within the flexible degree programs, and the department welcomes qualified students with bachelor's degrees in a wide variety of fields.

Multidisciplinary environmental and outdoor recreation research within the department has had support from federal, state, and local agencies. Participating agencies have included the National Park Service, U.S. Army Corps of Engineers, U.S. Forest Service, Bureau of Land Management, Texas Parks and Wildlife Department, Office of the Governor, and southwestern cities and counties.

All of the admission requirements established by the Graduate School must be met. In addition, the department requests a letter of intent, which addresses how the program fits the applicant's career goal, transcripts of all previous course work, and a portfolio of graphic work, if available.

Nonresident tuition is waived with half-time assistantships. Students having this support have special responsibilities in research projects.

### Courses in Landscape Architecture. (LARC)

- 5001. Problems in Land-Use and Resource Planning (V1-4).** Selected problems based on student's needs and interests not included in other courses. May be repeated for credit with approval of department.
- 5100. Contemporary Issues in Landscape Architecture (1:1:0).** Seminar that focuses on design theory, design philosophy, aesthetics, and environmental policies as influenced by contemporary diversity of the profession of landscape architecture.
- 5202. Landscape Architecture as a Profession (2:2:0).** An overview of the profession of landscape architecture including practitioners and their work.
- 5205. Planting Design (2:1:2).** The characteristics of plants and their forms in landscape space. Special emphasis on preparation of planting plans.
- 5300. Graphic Techniques in Landscape Architecture (3:1:4).** The study and development of professional plan, section, isometric, and perspective graphic techniques necessary to communicate design concepts, ideas, and solutions in both color and black and white formats.
- 5301. Vegetation Theory (3:3:0).** Understanding plant types, regional patterns, and native plant communities as they influence human habitats and outdoor environments.
- 5302. Advanced Environmental Planning for Sustainable Development (3:3:0).** An introduction to environmental planning issues with emphasis on the integration of related disciplines to attain environmentally and socially sustainable development.
- 5303. Advanced Environmental Management for Sustainable Development (3:3:0).** Theory, principles, and strategies for public and private landscape protection.
- 5305. Landform Theory and Design Implementation I (3:2:2).** The study and application of principles, practices, and considerations associated with the aesthetics and engineering of designed and natural landforms; including grading and drainage, earthwork calculation, horizontal and vertical circulation alignment, and layout.
- 5308. Computer-Aided Design in Landscape Architecture (3:1:4).** Hands-on introduction to computer-aided design technology that is currently most applicable to the needs of the profession of landscape architecture.
- 5309. Advanced Computer-Aided Design in Landscape Architecture (3:1:4).** Prerequisite: LARC 5308. Advanced application of CAD in landscape architecture.
- 5310. History of Landscape Architecture (3:3:0).** Investigation of the issues, work, and personalities in landscape architecture as expressed through design and their relationship to and influence on society and nature.
- 5315. Landscape Architecture Design Implementation II (3:2:2).** Prerequisite: LARC 5305. Complex grading and drainage, drainage structures, storm water management, and horizontal and vertical circulation alignment in large scale site development.
- 5316. Landscape Architecture Design Implementation III (3:1:4).** Prerequisite: LARC 5315. The study of landscape architecture site construction and materials, products and their application, and integration to the man-made environment.
- 5410. Landscape Architecture Studio I (4:1:6).** An accelerated course exploring the visual and cultural basis for landscape design. Focus is on the landscape as art and on the vernacular or cultural nature of landscape design.

- 5420. Landscape Architecture Studio II (4:1:6).** Prerequisite: LARC 5410. Exploration of the ecological basis of landscape design, including current and historical stewardship values. Focus on how to integrate human and social desires on the land with natural systems.
- 6000. Master's Thesis (V1-6).** Prerequisite: LARC 6203.
- 6102. Administrative Aspects of Landscape Architecture (1:1:0).** The methods, procedures, and organizational structure of professional practice in landscape architecture.
- 6203. Thesis Research, Preparation, and Organization (2:2:0).** Prerequisite: LARC 6301. Preparation of thesis project content, selection of the thesis committee, and the proposal submission to the Graduate Studies Committee for approval.
- 6301. Research Methodology for Planning and Design (3:3:0).** Introduction to the research process and methods used in the design-planning field.
- 6304. Regional Land Resource Analysis (3:1:4).** Principles and techniques of the environmental systems approach to inventory, analysis, and determination of land capability and suitability as a key determinant in the land use planning process. Identification of ecologically sensitive resource areas and sites desirable for open space, conservation, and recreational use. Methods of regional economic, transportation, governmental structure and operation, public services and communication systems analysis will be related to the land use planning process.
- 6306. Special Problems (3:3:0).** Prerequisite: Consent of instructor. Methods of interpretation of planning and designing projects that influence the historical, ethnic, and cultural aspects of a region.
- 6401. Advanced Landscape Architecture Studio (4:1:6).** Essential to the development of advanced land planning concepts is the ability to ferret out fundamental facts, analyze this data, and make critical accurate judgments for sound decisions and subsequent action. Predictive consequences of planning and design decisions is stressed.
- 6402. Advanced Land Planning and Design (4:1:6).** The advanced student, through analysis and interpretation, develops comprehensive long-range plans for land development. Recreational needs, conservation, recreational economics, policies, and legislation are incorporated into this research and planning. Predictive consequences of planning and design decisions is stressed.
- 7000. Research (V1-12).**

## Department of Plant and Soil Science

Professor Dick Auld, Chairperson.

Horn Professor Emeritus Dregne; Thornton Distinguished Professor Emeritus Matches; Horn Professor Nguyen; Leidigh Professor Krieg; Piper Professor Hopper; Rockwell Professor B.L. Allen; Thornton Distinguished Professor V. Allen; Professors Abernathy, R. Allen, Auld, Lascano, Maas, Peffley, Thorvilson, and Zartman; Associate Professors Armstrong, Dotray, Green, and Phillips; Assistant Professors Burow, Maurer, McKenney, Montague, Parajulee, and Xu; Adjunct Faculty: Abidi, Archer, Baughman, Blum, Boman, Brashears, Bronson, Burke, Calhoun, Dahlberg, Gannaway, Hequet, Keeling, Leser, Mahan, Maunder, McMichael, Oliver, Peterson, Porter, Ramkumar, Rosenow, Rummel, Rush, Schubert, Sheetz, Stout, Trolinder, Trostle, Upchurch, Velton, Wanjura, Wheeler, and Zobeck.

This department offers study in the following graduate degree programs: CROP SCIENCE, ENTOMOLOGY, HORTICULTURE, and SOIL SCIENCE, *Master of Science*; AGRONOMY, *Doctor of Philosophy*. The department also participates in the interdepartmental program leading to the *Master of Agriculture* degree. Students

seeking a master's or doctor's degree in the department should consult the chairperson about their programs before enrolling for any courses.

Before being recommended for admission to a master's degree program with a major in this department, the student may be requested to provide evidence of proficiency in background for graduate work or may be required to take (without graduate credit) such undergraduate level courses as may be designated by the department.

If the preliminary examination for admission to doctoral studies reveals weaknesses in the student's subject matter background, the student may be required to take remedial courses designated by the graduate faculty of the department. The student's advisory committee will make recommendations concerning language requirements and basic work in other sciences. A Ph.D. candidate in the department is required to take written and oral comprehensive qualifying examinations prepared and conducted by the graduate committee. The purpose of these examinations is to determine whether or not a candidate possesses a depth of knowledge in their area of specialization, a breadth of knowledge in supporting areas, understanding of the scientific method, and the ability to communicate knowledge in an organized and scholarly manner.

Research, teaching, and scholarship stipends are often awarded to qualified applicants. Nonresident tuition is often waived with the award. Students having this support have special responsibilities in research and/or teaching.

### Courses in Plant and Soil Science. (PSS)

- 5000. Professional Internship (V1-6).** Prerequisite: Consent of department chairperson. Supervised study providing advanced training for master's students. Emphasis is on scientific and technical training.
- 5001. Problems in Plant and Soil Science (V1-3).** Prerequisite: Consent of instructor. Selected problems based on the student's needs and interests, not included in other courses. May be repeated for credit with approval of department.
- 5100. Seminar (1:1:0).** Current research in all aspects of plant and soil science including presentations by internationally recognized scientists. May be repeated for credit.
- 5231. Applied Geostatistics (2:2:0).** Application of regionalized variable theory to surface and subsurface land forms using semivariograms and kriging.
- 5270. U. S. and Global Cotton Fiber-Textile Industries (2:2:0).** Examination of factors affecting cotton production, processing, marketing, and utilization as an industrial raw material for textile manufacturing. SS.
- 5304. Economic Entomology (3:3:0).** Prerequisite: PSS 2401 or consent of instructor. A synthesis of the theory and practice of insect control including prediction and implementations of control strategies in agricultural systems. S, odd years.
- 5305. Advanced Field Crop Entomology (3:2:2).** Prerequisite: PSS 2401. Introduction to insects of agricultural importance, their identification, and management strategies. Pest sampling and recognition of damage to major crops will also be discussed. F.
- 5306. Advanced Insect Anatomy and Physiology (3:2:3).** Prerequisite: PSS 2401. The structure and function of insect organ systems. S, even years.
- 5307. Pesticides (3:3:0).** Advanced study of the registration, development, and legal use of pesticides. S.
- 5310. Insect Ecology (3:3:0).** The effects of environmental factors on insect abundance, composition, complexity, and dynamics of insect community systems. S, even years.



- 5316. Advanced Arboriculture (3:3:0).** Advanced principles associated with anatomical, physiological, and chemical changes in woody plants. F.
- 5317. Advanced Nursery Management (3:2:3).** Principles of nursery production, cultural management, and marketing of both wholesale and retail commodities. S, odd years.
- 5318. Advanced Turfgrass Science (3:3:0).** An advanced course in turfgrass science including turf physiology, nutrition, insects, diseases, and weed control. F, odd years.
- 5319. Advanced Interiorscaping (3:2:2).** A tropical foliage plant course for graduate students with no previous training in interiorscaping. Emphasis is placed on plant identification, selection, design, lighting and maintenance.
- 5321. Plant Breeding Theory (3:3:0).** Breeding and plant improvement presented at an advanced level. S, even years.
- 5322. Organic Plant Metabolism (3:3:0).** Considerations of cellular organization and its relation to cellular metabolism. Bioenergetics and biochemistry of the organic constituents of living systems including their synthesis and metabolism are considered. F, even years.
- 5323. Environmental Crop Physiology (3:3:0).** The plant-environment interaction in relation to growth and production of crop communities. Radiant energy, carbon dioxide, water, and temperature relationships in crop stands. S, odd years.
- 5324. Mode and Mechanism of Herbicide Action (3:3:0).** Prerequisite: Consent of instructor. Herbicide classification, activity, crop selectivity, and resistant plants. S, even years.
- 5325. Transgenic and Plant Cell Genetics (3:3:0).** Genome organization in plants, interspecific hybridization, cytoplasmic male sterility, self-incompatibility, tissue culture, in-vitro screening, and transformation technologies. F, odd years.
- 5326. Advanced Seed Science (3:3:0).** In-depth study of seed and seedling anatomy, the sequence of events and factors affecting germination and emergence, and the characteristics of dormancy and vigor. S, odd years.
- 5327. Soil-Plant-Animal Interrelationships in Grazing Lands (3:3:0).** Ecological and nutritional principles of livestock grazing are established. Mineral cycling, antiquity factors, limitations to intake, and research methodology in forage-livestock systems are presented. S, even years.
- 5328. Forages and Livestock in Pasture Ecosystems (3:3:0).** Systems of grazing management are presented from the perspective of ecosystems in pasture lands and other grazing lands with intensified management. S.
- 5329. Precision Agriculture (3:3:0).** Introduction to site-specific management of agricultural crops emphasizing collection and use of geospatial information in performing variable-rate farming practices.
- 5331. Soil Fertility and Fertilizers (3:3:0).** Not open to students having had PSS 4335. Evaluation and application of theory to soil fertility and fertilizers; a study of nutrient needs and nutrient reactions in soil; and predicting nutrient need and response. F.
- 5332. Pedology (3:3:0).** Processes of rock weathering with associated soil formation. Genesis of clay minerals. Soil forming factors and their interrelationships. S, even years.
- 5333. Soil and Plant Relationships (3:3:0).** Selected topics in soil-plant relationships. Cause and effect, management, and control of factors influencing plant growth in the soil. S, odd years.
- 5334. Soils and Crops in Arid Lands (3:3:0).** Potentials for utilizing soils, rainfall patterns, and plant characteristics for crop production in arid lands. F, odd years.
- 5335. Soil Physics (3:3:0).** Physical characteristics of soils and porous media and principles underlying flow and distribution of water, air, and heat in soils. S.
- 5336. Soil Mineralogy (3:3:0).** The mineralogical makeup of sand, silt, and clay. The relation of physical and chemical soil properties to mineralogy. S, odd years.
- 5337. Advanced Soil Classification (3:2:3).** A study of the taxonomic System of Soil Classification as used in the United States. F, even years.
- 5372. Properties and Applications of Major Textile Fibers (3:3:0).** Examination of properties and applications associated with major textile fibers, both natural and synthetic with emphasis on utility in textile manufacturing processes and end-use products.
- 5374. Textile Manufacturing Processes and Management Techniques (3:3:0).** Examination of manufacturing and management issues pertinent to fiber selection and handling, yarn spinning, fabric formation, and finishing.
- 5376. Advanced Studies in Cotton Fibers (3:3:0).** Examination of the structure of cotton fibers, meaning and measurement of fiber properties, and issues related to increasing cotton's use-value as an industrial raw material.
- 5401. Advanced Insect Taxonomy (4:3:3).** Taxonomy, keys, descriptions, biology, and literature for all insect orders will be discussed. Sight identification of over 200 families is stressed in laboratories. A specific taxon will be assigned for detailed study, and a collection is required. F.
- 5415. Advanced Floriculture (4:3:3).** Prerequisite: Consent of the instructor. Principles of floricultural crop production and greenhouse construction presented at an advanced level. S, odd years.
- 5425. Advanced Agricultural Plant Pathology (4:3:2).** Prerequisite: Approval of instructor. Identification of causal agents of plant diseases (fungi, bacteria, nematodes, and viruses). Emphasis will be placed on diagnostic methods, isolation, and inoculation. F, odd years.
- 5429. Advanced Principles of Weed Science (4:3:2).** Prerequisite: Consent of the instructor. Weeds, weed control, plant identification, and equipment presented at an advanced level. F.
- 6000. Master's Thesis (V1-6).**
- 6001. Selected Topics in Plant and Soil Science (V1-3).** Prerequisite: Consent of instructor. Individual study of advanced topics in plant and soil science. May be repeated in different areas for credit.
- 6131. Advanced Environmental Soil Science Laboratory (1:0:3).** Corequisite: PSS 6331 or consent of instructor. Discussion of current problems in environmental soil science and remediation options. Field trips required.
- 6200. Teaching Practicum (2:0:3).** Prerequisite: Graduate student in the program and concurrent or previous higher education teaching methods course. Supervised teaching at the university level.
- 6301. Quantitative Agricultural Remote Sensing (3:3:0).** A general course in the theory and application of remote sensing to quantifying soil and vegetation characteristics relevant to agriculture and natural biosystems.
- 6302. Plant Growth Modeling (3:3:0).** Development, testing, and application of mathematical models of plant growth relevant to agriculture and natural biosystems.
- 6322. Advanced Plant Breeding (3:3:0).** Qualitative and quantitative inheritance, heterosis, selection theory and breeding methodology for crop plant improvement, genotype by environment interaction, and application of cellular and molecular techniques to plant breeding. S, odd years.
- 6323. Plant-Water Relations (3:3:0).** Comprehensive understanding of biophysical factors affecting water status of plant tissue and resultant physiological responses. S, even years.
- 6324. Molecular Genetics and Plant Genomics (3:3:0).** Genome mapping in plants, gene structure and expression, recombinant DNA and gene cloning methods, molecular markers, QTL analysis, physical mapping, DNA chip technology, and functional genomics. S, even years.
- 6331. Advanced Environmental Soil Science (3:3:0).** Prerequisite: PSS 2432 or equivalent, graduate standing, or consent of instructor. Applications of soil chemical, physical, and biological principles to environmental issues. S, odd years.
- 7000. Research (V1-12).**
- 8000. Doctor's Dissertation (V1-12).**

## Department of Range, Wildlife, and Fisheries Management

Professor Ernest B. Fish, Chairperson.

Kleberg Professor Smith; Professors Britton, Fish, Parker, Schmidly, Sosebee, Wester, and Zwank; Associate Professors Ballard, Mitchell, Patino, and Wilde; Assistant Professors Boal, Dabbert, Pope, Villalobos, Wallace, and Winslow; Adjunct Faculty: Bowman, Cronin, Drawe, Gipson, Haukos, Krausman, Pence, Peterson, Rhodes, and Sullivan.

This department offers study in the following graduate degree programs: RANGE SCIENCE, WILDLIFE SCIENCE, and FISHERIES SCIENCE, *Master of Science* and *Doctor of Philosophy*.

Those interested in pursuing a master's or doctor's degree in the Department of Range, Wildlife, and Fisheries Management should consult with the chairperson prior to enrolling for any course.

Doctoral candidates may specialize in grazing management, range improvement, range animal nutrition, fire ecology, plant ecology, plant physiology, wildlife habitat management, big game ecology, waterfowl ecology, upland game ecology, fisheries, aquaculture or wetland ecology and management.

The M.S. degree requires a minimum of 24 hours of graduate course work plus 6 hours of thesis. Before being recommended for candidacy to a master's degree program, the student may be requested to take a preliminary examination to determine proficiency and background for graduate work. The student may be required to take (without graduate credit) such undergraduate leveling courses as may be designated by the graduate advisory committee. All M.S. degree candidates are required to take experimental design.

An oral and/or written preliminary examination is required of all students seeking a Ph.D. degree. If the preliminary examination reveals weaknesses in the student's background, remedial courses may be designated by the graduate advisory committee. The student's graduate advisory committee will also recommend courses to be taken in supporting disciplines. A Qualifying Examination for admission to candidacy for the Ph.D. degree will also be conducted in accordance with the requirements of the Graduate School. This Qualifying Examination is prepared and administered by the candidate's graduate advisory committee and any other professors the committee may consider necessary.

The doctorate normally requires completion of 60 to 80, or more, semester credit hours of graduate course work beyond the bachelor's degree, exclusive of credit for the dissertation. In addition to the courses required for the major, an applicant for the doctorate must have taken at least 15 semester hours of graduate course work outside the department. These hours may be taken in several supporting fields without concern for a minor specialization, depending on recommendation of the student's graduate advisory committee. However, if they are taken in a block of related courses, they may be declared as a minor.

There is no foreign language requirement for the Ph.D. degree, but such a requirement may be incorporated into individual programs at the discretion of the student's graduate advisory committee. All doctoral candidates must successfully complete or have completed two semesters of calculus, one semester of experimental design, one semester of teaching practicum (RWFM 7210), and College Teaching in Agriculture (AGED 5310) or College Teaching (EDHE 5342).

### Courses in Range, Wildlife, and Fisheries Management. (RWFM)

- 5100. Seminar (1:1:0).** An organized discussion of current problems in range, wildlife, and fisheries management. May be repeated.
- 5302. Range Research Methods (3:2:3).** Prerequisite: ISQS 5346. Study plan preparation; methods of studying vegetation; sampling techniques; increasing sampling efficiency; methods of reducing experimental error; grazing studies; utilization studies; wildlife techniques; and tests of goodness of fit for binomial, poison, negative binomials, and normal distributions. F, odd years.
- 5303. Synecology (3:3:0).** Prerequisite: RWFM 3302. An advanced study of terrestrial plant community ecology; mechanisms and consequences of species coexistence; diversity relations; causes and patterns of community development; community dynamics. Statistical and numerical analyses applicable to community ecology are discussed. F, odd years.
- 5304. Fire Behavior and Ecology (3:2:3).** Prerequisite: RWFM 3501 and 3302. An assessment of the role of fire in succession and management of plants and animals in all major vegetation types of U.S. and Canada; effect of fire on litter and soil properties; fire temperatures and heat effects; prescribed burning techniques. Field trips required. S, odd years.
- 5305. Plant Ecophysiology (3:3:0).** Prerequisite: RWFM 3302. Advanced study of the influences of the environmental complex on the processes, structure, and physiological functioning of an individual plant or species. S, even years.
- 5306. The Physiological Basis for Grazing Management (3:2:3).** A study of the physiological processes, morphological development, nutritional qualities, and palatability of range plants as a basis for grazing management strategies for domestic and wild animals. Field trips required. F, even years.
- 5307. Wetland Ecology (3:3:0).** Prerequisite: Upper-level ecology course or consent of instructor. Advanced study in the structure and functioning of wetland ecosystems. Course will also examine wetland classification. F, odd years.
- 5309. Population Estimation and Dynamics (3:3:0).** Prerequisite: AAEC 3401. Principles of estimation theory. Detailed examination of modern analysis techniques; indices, line transect, capture-recapture, Jolly-Seber, survival, and life table limitations. Computer use. S.
- 5310. Advanced Range Ecology (3:3:0).** An examination of the basic ecological principles affecting plant growth and development, distribution of plants, community structure and dynamics, and nutrient cycling. Field trips required. F, S.
- 5311. Wildlife Conservation and Management (3:3:0).** An examination of conservation principles and management practices enhancing wildlife populations. Not open to biological science majors.
- 5312. Ecology of Renewable Natural Resources (3:3:0).** An introduction to the ecology of renewable natural resources such as vegetation, wildlife, soil, and water. Not open to biological science majors.
- 5313. Advanced Big Game Ecology and Management (3:3:0).** Prerequisite: RWFM 4305 or equivalent or consent of instructor. An advanced study of the ecology and management of big game resources. Field trips required. S, even years.
- 5314. Advanced Upland Game Ecology and Management (3:2:3).** An advanced study of the ecology and management of upland game resources. Field trips are required. S, odd years.

- 5315. Advanced Studies in Range-Wildlife Habitat (3:3:0).** An ecological approach to wildlife management stressing the relationships between animals and their habitat. Focuses on rangeland habitats. Field trips required. F, S.
- 5316. Waterfowl Ecology (3:2:3).** Prerequisite: RWFM 4310. An ecological examination of waterfowl behavior, breeding biology, and habitat requirements. Field trips required. F, even years.
- 5317. Watershed Management (3:3:0).** Management concepts of watersheds as a holistic unit. Inventory techniques, information sources, analysis procedures, and economic and financial effects applicable to watershed management planning. F, S.
- 5318. Range Animal Nutrition (3:3:0).** Prerequisite: ANSC 3301 or equivalent. Study of the nutritional relationship between the range resource and grazing herbivores, including domestic livestock and wild ungulates, and techniques for range animal nutrition research. F, odd years.
- 5320. Natural Resource Biopolitics (3:3:0).** Policy, planning, and conflict resolution from a natural resource management perspective. Historical, agency, and private organization roles in natural resource management are evaluated. S.
- 5322. Advanced Nongame Ecology and Management (3:2:2).** Prerequisite: RWFM 2301 or consent of instructor. Ecological approach to nongame wildlife population management. Public policies, socioeconomic factors, population dynamics, and species-at-risk issues are examined.
- 5323. Prescribed Burning (3:2:3).** Planning, implementing, evaluating prescribed fires, and expert systems. Field trips required. S, even years.
- 5324. Physiological Ecology of Aquatic Organisms (3:3:0).** Regulatory mechanisms and adaptive significance of selected physiological processes in aquatic vertebrates. S, even years.
- 5330. Advanced Aquaculture (3:3:0).** A global overview of aquaculture including fish, aquatic invertebrates, plants, and design and operation of production facilities. F, odd years.
- 5335. Advanced Fisheries Science (3:3:0).** Scientific study of the use of aquatic organisms. Includes resources, sampling, ecology and analysis of populations, resource conflicts, and management. May not be taken for credit by students who have taken RWFM 4335. S, even years.
- 5337. Fish and Wildlife Population Modelling (3:3:0).** The development and use of models to analyze and simulate ecological processes in fish and wildlife populations and communities. S, odd years.
- 5401. Advanced Fisheries Management (4:3:3).** Theory and methodology used in managing aquatic renewable resources; applied field problems, equipment use. May not be taken for credit by students who have taken RWFM 4401. F, even years.
- 5402. Fisheries Ecology (4:3:3).** Prerequisite: Statistics and basic fisheries. An examination of population dynamics, community ecology, bioenergetics, fisheries models and other quantitative aspects of fisheries ecology. F, even years.
- 5403. Experimental Design and Analysis (4:3:2).** Prerequisite: ISQS 5346, ANSC 5403, or BIOL 6502. Principles and applications of experimental design and analysis (completely randomized designs, randomized blocks, covariance analysis, factorials, split plots, repeated measures, regression). F, even years, and S.
- 5404. Aerial Terrain Analysis (4:2:4).** Exploration of methods, the utilization of techniques, and evaluation of landscape using aerial photographs. An introduction to the theories, technical and practical aspects, and considerations of computer based geographic information systems in landscape planning, design, and management. F.
- 6000. Master's Thesis (V1-6).**
- 6001. Selected Topics in Range Science (V1-6).** Advanced topics selected by departmental recommendation. May be repeated for credit in different subject areas.
- 6002. Selected Topics in Wildlife Science (V1-6).** Advanced topics selected by departmental recommendation. May be repeated for credit in different subject areas.
- 6003. Selected Topics in Fisheries Science (V1-6).** Advanced topics selected by departmental recommendation. May be repeated for credit in different subject areas.
- 6301. Research Methods (3:3:0).** A review of the philosophy of science, scientific methods, research activities, and the planning and execution of research programs. F, even years.
- 6303. Imagery Interpretation for Natural Resource Management (3:2:2).** Prerequisite: RWFM 4403 or 5404. An advanced course in the applications of imagery producing systems for use in the inventory, analysis, planning, and management of natural resources. Involves the use of satellite imagery, infrared and radar scanning systems, as well as advanced work in interpreting standard aerial photography. S.
- 6305. Geospatial Technologies in Natural Resource Management (3:2:2).** Principles of geographic information systems and global positioning systems. Applications for natural resource inventory, planning, and management are emphasized.
- 7000. Research (V1-12).**
- 7210. Teaching Practicum (2:0:4).** Prerequisite: Doctoral student in range, wildlife, or fisheries science program and AGED 5310 or EDHE 5342. Supervised teaching experience at the university level.
- 8000. Doctor's Dissertation (V1-12).**

## International Textile Center

Professor Dean Ethridge, Director  
Instructors Abidi, Hequet, and Ramkumar.

The International textile Center is focused on research, education, and technology transfer pertinent to fibers and textiles. It specializes in those natural fibers important to Texas—cotton, wool, mohair, and cashmere. It offers the opportunity for students to execute special projects and thesis research, in collaboration with the Colleges of Agricultural Sciences and Natural Resources, Arts and Sciences, Engineering, and Human Sciences. It engages in multidisciplinary research with diverse units of Texas Tech University and the Health Sciences Center.

Specialized courses offered by the International Textile Center include PSS 5376 Advanced Studies in Cotton Fibers and PSS 5270 U.S. and Global Cotton-Textile Industries. These are taken by both students and professionals interested in plant breeding, farm production, harvesting and ginning, cotton merchandising, fiber quality control, and textile manufacturing. Information on these and other educational offerings is available on the Web at <www.itc.ttu.edu>, by calling the ITC (806) 747-3790, or by sending e-mail to <itc@ttu.edu>.

The ITC is located on east Loop 289 in a 110,000 square foot facility. It has a multimedia classroom and an executive conference room. It contains laboratories for materials evaluation, short staple spinning, long staple spinning, nonwovens, weaving and knitting, chemical processing and finishing, chemical analysis, and fabric care.



# College of Architecture

*Professor John Borrelli, Interim Dean*

Professors Peters, Watkins, James White, and John White; Associate Professors Aranha, Davis, Driskill, Giaccardo, Hill, Loudon, Mross, and Perl; Assistant Professors Beltran, Buelinckx, Flueckiger, Haq, Mead, and Shacklette; Lecturers Faulk, Jaddo, MacBurnie, Martin, and Powell.

This college offers study in the following graduate degree programs: ARCHITECTURE, *Master of Architecture* and *Master of Science*. The college also supervises the interdisciplinary program leading to the *Doctor of Philosophy* degree in LAND-USE PLANNING, MANAGEMENT, AND DESIGN.

The Master of Architecture is a professional degree program, accredited by the National Architectural Accrediting Board. The Master of Science in Architecture is a post professional academic degree.

Combined degree offerings are available as follows: A Master of Architecture and a Bachelor of Science in Civil Engineering with the Department of Civil Engineering; a Master of Architecture and a Bachelor of Business Administration (with a major in general business) with the College of Business Administration; and a Master of Architecture and a Master of Business Administration with the College of Business Administration. These degree programs may require a different core curriculum. Students wishing to pursue these programs should consult the *Undergraduate Catalog* for the undergraduate requirements. Further information on admission to the M.B.A. program is available through the College of Business Administration Graduate Services Center.

All students, including those with degrees, must follow the Graduate School and the College of Architecture admission requirements. The following criteria, all or in part, will be considered in the admission process: GRE scores, GPA, transcripts, portfolio review, letters of recommendation, statement of interest, examples of extracurricular activities, and professional work.

Transfer courses applicable to a student's degree plan at the graduate level are determined by the college's administration and the Graduate School. Refer to the section on transfer credit for procedures.

Off-campus programs are offered to enrich student experience. The college offers regional, continental, and European summer programs. The Architour Spring Break program provides the student the chance for travel and study of American architecture and architects.

Students in the college will attend all scheduled class meeting times and activities. Absences in excess of those stipulated in each individual course syllabus will result in either a F in the course or being withdrawn from the course.

The College of Architecture reserves the right to retain, exhibit, and reproduce work submitted by students. Work submitted for grade is the property of the college and remains such until it is returned to the student.

The Architecture Research Center provides faculty and students with additional opportunities for study and research. The Center conducts research and design projects. Information on research and teaching assistantships can be obtained by contacting the college.

## The Master of Architecture Accredited Professional Degree

**Mandatory Accreditation Statement.** "In the United States, most state registration boards require a degree from an accredited professional degree program as a prerequisite for licensure. The National Architectural Accrediting Board (NAAB), which is the sole agency authorized to accredit US professional degree programs in architecture, recognizes two types of degrees: the Bachelor of Architecture and the Master of Architecture. A program may be granted a five-year, three-year, or two-year term of accreditation, depending on its degree of conformance with established educational standards.

Masters degree programs may consist of a preprofessional undergraduate degree and a professional graduate degree, which, when earned sequentially, comprise an accredited professional education. However, the preprofessional degree is not, by itself, recognized as an accredited degree."

The college's Master of Architecture accredited program consists of an undergraduate curriculum of 131 hours and a graduate curriculum of 42 hours. Combined degree hours will vary with each program. Please consult the *Undergraduate Catalog* for program requirements. A comprehensive terminal design project is required. All students seeking a professional degree must complete their program in residency.

Students may enter the professional program directly from the College of Architecture's preprofessional program, or from any other program, including those with degrees in a discipline other than architecture. An audit of transcripts and portfolio will determine the amount of leveling courses required to comply with the accredited professional program.

## The Master of Science in Architecture Postprofessional Degree

The Master of Science in Architecture is for students with an accredited professional B.Arch or M.Arch. degree, or with an approved degree in another discipline. Students may choose a thesis or nonthesis option. Students selecting the thesis option must complete a minimum of 30 hours of graduate study, defend a thesis, and take both written and oral examinations (totaling 36 credit hours). Students selecting the nonthesis option must complete a minimum of 36 hours of graduate study including a terminal project and final examination.

Postprofessional degree students will have an individual degree plan developed with an advisory committee composed of a chairperson and two advisors (one member may be chosen from outside the college). With the student's full participation, the committee will plan the course of study based on the student's goals, program

resources, and faculty strengths and interests. The graduate faculty has identified several primary areas of study for this degree program including historic preservation, visualization, and special topics in architecture.

Students have the opportunity to become involved with ongoing research projects. All students seeking a degree must complete the program in residency.

### **The Doctor of Philosophy in Land-Use, Planning, Management, and Design Degree**

The interdisciplinary Ph.D. degree program in Land-Use Planning, Management, and Design accepts students from diverse educational backgrounds. An individualized program is determined by the student's chair and committee consisting of 24 credit hours of required core courses, 21 credit hours of track courses, 15 credit hours of supporting courses, and 6 hours of tool courses. A minimum of 12 hours of dissertation is required with the additional courses to complete the 66 hours of course work beyond the bachelor's degree. Students with interests in architecture, community planning and design, historic preservation, environmental-natural resource planning and management, public policy administration, and many other aspects of land use may find the program suitable to their needs.

For further information contact the LPMD coordinator at the College of Architecture.

Each student is encouraged to participate in the professional internship program. The program provides opportunities for professional experience in some of the nation's leading architectural firms. Those participating in an internship may take courses offered via distance learning which apply to their degree program, where approved in advance.

### **Courses in Architecture. (ARCH)**

- 5091. Graduate Architectural Internship (V1-6).** Prerequisite: College approval. Individual study provides opportunities for professional experience as an intern in an architectural firm. May be repeated for credit.
- 5301. Special Problems in Architecture (3).** Prerequisite: College approval. Individual study projects in architecture of special interest to students. May be repeated for credit. Particularly useful for Interdisciplinary Studies master's program.
- 5302. Product Design Workshop (3:0:6).** Introduction to the design and executed construction of a prototypical piece of furniture or other design product using an architectural design process. F.
- 5311. Special Problems in Architectural History (3).** Individual advanced studies in architectural history of special interest to the student. May be repeated for credit.
- 5313. Architecture of the 19th and 20th Centuries (3:3:0).** Social, technical, and intellectual influences on the development of 19th- and 20th-century architecture. Illustrated lectures.
- 5314. History of American Architecture (3:3:0).** Prerequisite: ARCH 2312 or approval of instructor. History of American cultural expression, using buildings as a vehicle, from the Pre-Colombian period to the present.
- 5321. Conservation, Restoration Technology, and Documentation (3:3:0).** Survey of techniques of restoration and stabilization of historic buildings; standards of workmanship; traditional methods and new technologies. Survey of documentation techniques and preservation design.
- 5322. Preservation Workshop (3:0:6).** Research on current preservation issues. Individual projects required.
- 5323. History and Theory of Historic Preservation and Policy (3:3:0).** Examination of mankind's interest in cultural and architectural heritage and the influence exerted by architectural styles upon preservation and adaptive use of buildings and sites, survey of preservation organizations and public programs.
- 5324. Architectural Conservation (3:3:0).** In-depth examination of theory and practice of historic preservation and restoration. Survey of the preservation movement in the U. S. and federal legislation supporting preservation.
- 5325. Preservation and Urban Design Policies (3:3:0).** Survey of federal and state enabling legislation; federal, state, and local policies on historic preservation and urban design, discussion of redevelopment strategies.
- 5331. Graduate Seminar (3:3:0).** Prerequisite: College approval. Critical readings, discussions, and writing assignments on a range of interdisciplinary issues and theoretical positions. May be repeated for credit. Writing Intensive.
- 5342. Architecture Drawing (3:0:9).** Skills and techniques of drawing. Translation of perceptions of three-dimensional objects and spaces into graphic expression. Outside assignments required. May be repeated once for credit.
- 5352. Computer Applications to Architecture (3:2:3).** Survey of digital computer applications to the issues and processes of architecture and planning. May be repeated for credit.
- 5353. Architectural Technology (3:3:0).** Examination of traditional and innovative uses of building materials, the application of industrial and scientific technology, and the integration of the building systems derived from these considerations. May be repeated for credit.
- 5361. Theory of Architecture (3:3:0).** Architecture as art, science, and a contemporary philosophical concept. Exploration of context and goals. Illustrated lectures. May be repeated for credit.
- 5362. Theory in Architecture (3:3:0).** Examination of theoretical issues in architecture through critical reading of texts selected from Vitruvius to the most contemporary thinkers in relation to emerging design challenges. Writing intensive.
- 5363. Architectural Design Programming (3:3:0).** Contextual and case studies; analyses of site, activities, space and spatial relationships. Systems and costs criteria. Determination of significant issues, goals, and emerging concepts.
- 5365. Architecture Research Methods (3:3:0).** Comprehensive survey of qualitative and quantitative research methods and their method-specific hypothesis formulation, data acquisition, verification, and analysis. Writing intensive.
- 5373. Environment and Site (3:3:0).** Physical and cultural environment analysis and examination of architectural responses.
- 5382. Urban Theory (3:3:0).** An extensive writing course proffering a comprehensive exploration of the relationship between culture, the city, planning, and urban design.
- 5392. Professional Practice (3:3:1).** The principles and practices of architectural business including the discussion of professionalism, administration, management, legalities, and liabilities. Exploration of current, advanced, and complex processes for the delivery of architecture.
- 5395. Thesis Research, Programming, and Schematics (3:3:1).** Prerequisite: ARCH 5365; corequisite or prerequisite ARCH 5362. Guided individual research and programming of an architectural topic, facility, and context and schematic design leading toward a comprehensive architectural thesis project in ARCH 5692. Writing intensive.
- 5501. Architecture Design Studio (5:3:9).** Tutorial studio with emphasis on the synthesis of design theory and practice. May be repeated for credit.
- 5601. Architectural Graduate Design I (6:0:12).** Knowledge and application of fundamental principles of architectural theory, organization, including the introduction to conceptual design through context, meaning and design processes as well as the introduction to graphic skills.
- 5602. Architectural Graduate Design II (6:0:12).** Prerequisite: ARCH 5601. Integration of fundamental building systems, functional requirements, spatial composition and interior-exterior relationships. Course broadens the design process and communication skills.



- 5603. Architectural Graduate Design III (6:0:12).** Prerequisite: ARCH 5602. The development of comprehensive and integrative design process and skills. Introduction to design development, design detailing, and systems integration.
- 5604. Urban Design Studio (6:0:12).** Prerequisite: ARCH 4381 or consent of instructor. Recommended as the penultimate design studio. Explores the interface between culture and architecture at the scale of the city in terms of theory and design.
- 5605. Advanced Architectural Design Studio (6:0:12).** Prerequisite or corequisite: ARCH 5362. Synthesis of human and

environmental interaction. Comprehensive architectural design of complex building types involving integration of cultural factors, programming, conceptual issues, construction technology, and cost estimation.

- 5692. Architectural Design Thesis (6:0:12).** Prerequisite: ARCH 5362, 5395, 5604, and 5605. Design and documentation of a comprehensive architectural thesis project researched, programmed, and schematically articulated in ARCH 5395.
- 6000. Master's Thesis (V1-6).**
- 7000. Research (V1-12).**





# College of Arts and Sciences

Professor Jane L. Winer, Dean

## Department of Biological Sciences

Professor Carleton Phillips, Chairperson.

Horn Professor Emeritus Jackson; Horn Professors Baker and Jones; Professors Allen, Blanton, Burns, Haigler, Heintz, Rylander, Schmidly, Willig, and Zak; Associate Professors Bilimoria, Bradley, Carr, Chesser, Collie, Densmore, Held, Holaday, Houck, Jeter, McGinley, Owen, San Francisco, Strauss, and Zhang; Assistant Professors Deslippe, Diamond, Gollahon, McIntyre, Reilly, and Tissue; Adjunct Faculty: Morrow.

This department offers study in the following graduate degree programs: BIOLOGY, MICROBIOLOGY, and ZOOLOGY, *Master of Science*; BIOLOGY and ZOOLOGY, *Doctor of Philosophy*. The master's and doctoral programs include specializations in the areas of behavior, botany, cell and molecular biology, ecology, microbiology, physiology, and systematics and evolutionary biology.

Once admitted to a master's or doctoral degree program, the student may be required by his or her advisory committee to take a preliminary, diagnostic examination that includes subject matter usually required of undergraduates. If the preliminary examination reveals serious weaknesses in the student's subject-matter background, the student may be required to take remedial courses designated by the advisory committee.

The basic degree requirements of the Graduate School determine the policy of the department.

The Department of Biological Sciences has no general requirement of a foreign language. However, it may be necessary for a student to demonstrate proficiency in a foreign language in certain programs, if such is necessary for research purposes. The student's advisory committee will make recommendations concerning language options, statistics, and basic work in other sciences.

The 36-hour nonthesis option may be elected by students working toward the M.S. degrees in biology, microbiology, or zoology. However, those students who expect to work beyond the M.S. degree, and toward the Ph.D. degree are strongly encouraged to choose the 30-hour thesis option.

All graduate students majoring in this department are required to take BIOL 6202 during their first fall semester after acceptance in the graduate degree program.

### Courses in Biology. (BIOL)

- 5301. Advanced Genetics (3:3:0).** Prerequisite: 8 hours of biology, 8 hours of chemistry, one semester of organic chemistry, or consent of instructor. Genetic and molecular analyses of inheritance. Course is offered to graduate students with limited knowledge in genetics.
- 5302. Advanced Cell Biology (3:3:0).** Prerequisite: 8 hours of biology, 8 hours of chemistry, plus at least one semester of

organic chemistry; or consent of instructor. Structure and function of cells with introduction to modern techniques for cell study. Course is offered to graduate students with no formal training in cell biology.

- 5303. Advanced Experimental Cell Biology (3:1:6).** Prerequisite: Consent of instructor and prior or concurrent enrollment in BIOL 5302. A project-oriented introduction to modern research techniques used to study cellular and molecular processes in eukaryotic cells.
- 5305. Organic Evolution for Advanced Students (3:3:0).** Prerequisite: BIOL 3301 or equivalent course in genetics. The concept of evolution, its mode and tempo of operation, and its relationship to organic diversity in its broadest sense are emphasized. S.
- 5306. Advanced Cancer Biology (3:3:0).** Prerequisite: BIOL 5320; ZOOL 5304 is recommended. This course presents a comprehensive overview covering the history of cancer biology to the most recent findings in the field. Molecular and cellular biology as well as clinical topics will be covered.
- 5309. Advanced Ecology (3:3:0).** Prerequisite: Background in organismal biology or undergraduate ecology. A detailed examination of the structural and functional relationships underlying the organization of populations, communities, and ecosystems.
- 5310. Advanced Community Ecology (3:3:0).** Prerequisite: A course in ecology or consent of instructor. An investigation of both theoretical and experimental approaches to understanding the composition, diversity, and structure of plant, animal, and microbial communities. F, even years.
- 5311. Ecology for Teachers (3:3:0).** Prerequisite: Admission to the Multidisciplinary Science Master's Program or consent of instructor. An investigation into ecology for individuals, populations, communities, and ecosystems for practicing teachers.
- 5312. Cell and Molecular Biology for Teachers (3:3:0).** Prerequisite: Admission to the Multidisciplinary Science Master's Program or consent of instructor. An investigation into cellular and molecular biology intended for practicing teachers.
- 5320. Advanced Molecular Biology (3:3:0).** Coverage includes a rigorous examination of molecular processes in cellular functioning. Experimental approaches used to investigate molecular events in eukaryotes, prokaryotes, and viruses will be emphasized. S.
- 5330. Advanced Landscape Ecology (3:3:0).** Prerequisite: Consent of instructor. In-depth examination of how we quantify patterns and effects of spatial heterogeneity on organisms and ecological processes. Discussion section is required. F, odd years.
- 5405. Systems Ecology (4:3:3).** Prerequisite: MATH 1352 or 1552, BIOL 3303 and 3307, or consent of instructor. Theory and techniques of system analysis and mathematical modeling applied to ecological problems. S, even years.
- 5407. Advanced Population Biology (4:3:3).** Prerequisite: BIOL 3301, 3303, or equivalent. Introduction to the genetics or ecology of populations including a survey of topical, historic, and current literature with emphasis on experimental evaluation of testable hypotheses. S.
- 6000. Master's Thesis (V1-6).**
- 6100. Advanced Topics in Biology (1).** Prerequisite: Consent of instructor. Special areas of current interest not commonly included in other courses. Content normally different each time offered. May be repeated for additional credit.
- 6101. Seminar (1:1:0).** Various topics in modern biology. May be repeated for credit.
- 6202. Preparation for Graduate Learning and Teaching in Biology (2:2:0).** Prerequisite: Acceptance in a graduate degree program in the Department of Biological Sciences or consent of instructor. Preparation of graduate students for the roles of scholar, researcher, and teaching assistant. Emphasizes literature research, preparation of visual aids, innovative teaching strategies, and problem-solving methods. F.
- 6301. Advanced Topics in Biology (3).** Prerequisite: Consent of instructor. Special areas of current interest not commonly included in other courses. Content normally different each time offered. May be repeated for additional credit.

- 6309. Advanced Topics in Quantitative Biology (3:3:0).** Prerequisite: Consent of instructor. Studies of current applications of mathematics, statistics, and computing to the biological sciences. Content normally different each time offered. May be repeated for additional credit.
- 6315. Regulation of Gene Expression (3:3:0).** Prerequisite: BIOL 5320 or 4320. An advanced, in-depth analysis of current research on mechanisms that regulate eukaryotic gene expression at transcriptional and post-transcriptional levels. S.
- 6350. Advanced Physiological Plant Ecology (3:3:0).** Investigation of the physiological processes of plants that contribute to understanding the ecological distribution and evolutionary success of plants in their physical environment.
- 6408. Research Techniques in Electron Microscopy (4:1:6).** Prerequisite: BA or BS in a scientific field. Introduction to operation of electron microscopes emphasizing independent work with organic or inorganic sample preparation and analysis for transmission or scanning electron microscopes.
- 6501. Cytogenetics (5:3:6).** Prerequisite: BIOL 3301 or PSS 3421. A study of genetic mechanisms of plants and animals and their correlated cytological interpretations. S, odd years.
- 6502. Biometry (5:4:3).** Prerequisite: College algebra. The application of statistical methods to data from various fields of biological research. Special emphasis on conceptual bases of univariate and multivariate tests from both parametric and nonparametric perspectives. F.
- 7000. Research (V1-12).**
- 8000. Doctor's Dissertation (V1-12).**

### Courses in Botany. (BOT)

- 5401. Advanced Plant Physiology (4:3:3).** Prerequisite: Organic chemistry or biochemistry and general botany or biology. A general plant physiology course for graduate students with no previous training in plant physiology. Emphasis is placed on recent experimental advances in the field.
- 6302. Advanced Field Botany (3:1:6).** Prerequisite: BOT 3404, 5404, or consent of instructor. A field-trip and herbarium-based course that will provide students with sophistication in the identification and classification of plants in natural areas of West Texas and adjacent regions.
- 6304. Advanced Plant Molecular Biology (3:3:0).** Prerequisite: Introductory biology, genetics, cell biology, or consent of instructor. Molecular mechanisms regulating plant metabolism and plant development. Intensive reading on current literature is required. S, even years.

### Courses in Microbiology. (MBIO)

- 5301. Advanced General Microbiology (3:2:3).** Prerequisite or parallel: Organic chemistry. Content is similar to that of MBIO 3401 except that readings or original research in one area of microbiology is required. May not be taken for credit by students who have taken MBIO 3401. F, S.
- 5303. Microbe-Plant Interactions (3:3:0).** Prerequisite: MBIO 3400 or 3401 or BIOL 3420 or BOT 3401. Biochemical, molecular, genetic, and ecological basis of pathogenic and symbiotic microbe-plant interactions. F, even years.
- 5401. Current Perspectives in Microbial Ecology (4:3:3).** Prerequisite: A course in microbiology, mycology, ecology, or related area, or consent of instructor; may not be taken for credit by students who have taken MBIO 4401. Course will examine specific theories and concepts concerning ecology of the soil microflora and microfauna, and the roles of these organisms in ecosystem functioning. S, odd years.
- 5403. Immunobiology (4:3:4).** Prerequisite: Consent of instructor. Content is similar to that of MBIO 4402 except that readings or research in one area of immunology is required. May not be taken for credit by students who have taken MBIO 4402. S.
- 5404. Pathogenic Microbiology (4:3:4).** Prerequisite: MBIO 3401 or 5301; may not be taken for credit by students who have received credit for MBIO 4404. A detailed study of pathogenic microorganisms. F, even years.

- 5408. Microbial Genetics (4:3:3).** Prerequisite: MBIO 5301 or consent of instructor. Topics include current techniques of genetic analysis, molecular biology, molecular genetics, nucleic acid metabolism, and gene regulation in microorganisms, with emphasis on bacteria and bacteriophages. May not be taken for credit by students who have taken MBIO 4406. F.

### 6000. Master's Thesis (V1-6).

- 6302. Advanced Bacterial Physiology (3:3:0).** Prerequisite: MBIO 3401 or 5301; 12 semester hours of chemistry, including biochemistry or concurrent registration; consent of instructor. Advanced study of bacterial physiology. S.
- 6306. General Virology (3:2:3).** Prerequisite: Consent of instructor. An introduction to the biology of animal, bacterial, and plant viruses. S.

### Courses in Zoology. (ZOOL)

- 5304. Comparative Endocrinology (3:3:0).** Prerequisite: ZOOL 2405, 3301, BIOL 3420, or consent of instructor. Hormones as chemical coordinators of bodily functions. S.
- 5306. Advanced Mammalogy (3:2:3).** Studies of recent advances in mammalogy. For students who have not taken ZOOL 4306. F.
- 5308. Advanced Ornithology (3:2:3).** Prerequisite: Consent of instructor. Selected topics including avian systematics, migration, physiology, ecology, and comparative behavior. S.
- 5312. Advanced Animal Behavior (3:3:0).** Comparative animal behavior with emphasis on genetics and neurophysiology and how they relate to survival. F.
- 5315. Molecular Techniques for Systematics and Evolution (3:1:4).** Prerequisite: Cell biology, molecular biology, or consent of instructor. Allows beginning graduate students to become proficient in research techniques employed in molecular systematics and evolution labs.
- 5401. Animal Histology for Advanced Students (4:2:6).** Prerequisite: ZOOL 2405 or a course in chordate anatomy or consent of instructor. Microscopic anatomy of the normal cells, tissues, and organ systems of the human and other mammals are studied. Open to graduate students who have not taken ZOOL 3401 or equivalent.
- 5406. Advanced Invertebrate Zoology (4:3:3).** Prerequisite: Consent of instructor. This course develops a comprehension of the structure, function, ecology, and evolution of invertebrate animals, with an emphasis on the relationships among taxa and the diversity within taxa. Written reports on special projects required. F.
- 5407. Vertebrate Zoology for Advanced Students (4:3:3).** Diversity, evolutionary relationships, and adaptations of vertebrates. Field trips required. Open to students who have not taken ZOOL 4307.
- 5409. Comparative Physiology for Advanced Students (4:3:3).** Prerequisite: ZOOL 2405 or 3406; BIOL 3420; CHEM 3305, 3306 recommended. A comparison of physiological functions including homeostatic mechanisms, muscle, nerve, in the major phyla. Laboratory reports written in a journal format are required.
- 5421. Ecological Entomology (4:3:3).** Prerequisite: Consent of instructor. An advanced exploration of the behavior, ecology, and evolution of insects.
- 6000. Master's Thesis (V1-6).**
- 6302. Principles of Systematic Zoology for Advanced Students (3:3:0).** Prerequisite: BIOL 3301 or equivalent; BIOL 4305 or 5305 recommended. Theory and practice of naming, describing, and classifying organisms. Speciation, phylogeny reconstruction, and other current topics in evolutionary biology emphasized. F, even years.
- 6303. Seminar in Mammalogy for Advanced Students (3:3:0).** Prerequisite: Consent of instructor. A historical perspective of mammalogy as a science including advances in ideology, character systems, and data analysis. Current topics and controversies will be addressed. S, odd years.
- 6320. Comparative Neuroanatomy (3:2:3).** Prerequisite: Consent of instructor. A comparative study of the vertebrate central nervous system, with emphasis on the structure, development, and function of the mammalian brain.

- 6321. Advanced Herpetology (3:2:3).** Prerequisite: Consent of instructor. The course will be concerned with the biology of amphibians and reptiles. Stress will be placed on classification, evolution, ecology, and anatomy of the various groups.

### Courses in Biological Informatics. (BINF)

- 5301. Biological Informatics (3:3:0).** Introduction to assessment of data in computer data bases, management of multiple layers of biological information, and exploring hidden patterns in the data.

## Department of Chemistry and Biochemistry

Horn Professor Richard A. Bartsch, Chairperson.

Horn Professors Dasgupta, and Knaff; Piper Professor Casadonte; Professors Gellene, Holwerda, Nes, Quitevis, Redington, and Roundhill; Associate Professors Birney, Bornhop, Flowers, Harman, Headley, Korzeniewski, Marx, Shelly, and Whittlesey; Assistant Professors Blake, Li, Miller, Morales, Paré, Poirier, and Shaw.

This department offers study in the following graduate degree programs: CHEMISTRY, *Master of Science* and *Doctor of Philosophy*. Graduate students may select from seven areas of specialization: analytical chemistry, biochemistry, chemical physics, chemistry education inorganic chemistry, organic chemistry, and physical chemistry.

Students majoring in this department for advanced degrees must pass three diagnostic examinations by the end of their second long semester. These examinations are based on the undergraduate curriculum. Each student is required to take the diagnostic examinations in his or her area of specialization and any two others or a series of three Biological Chemistry Examinations designed for students whose academic background emphasizes biochemistry. These examinations are offered three times a year.

A master's degree program includes a minimum of 18 credit hours of graduate-level course work, 5 credit hours of research (CHEM 7000), and 6 hours of thesis (CHEM 6000). At least one graduate course must be from outside the area of specialization. A doctoral degree program includes a minimum of 24 credit hours of graduate-level course work, 34 credit hours of research (CHEM 7000), and 12 credit hours of dissertation (CHEM 8000). At least two graduate courses must be from outside the area of specialization.

A cumulative examination system is used as the written part of the qualifying examination for the doctoral degree, with cumulatives offered eight times each year. Passing three cumulatives by the end of the second year and an additional three cumulatives by the end of the third year is required to satisfy the written part of the qualifying examination. Students in the inorganic division are required to pass a written preliminary exam instead of the cumulative examinations before the end of their third long semester. The successful oral defense of an independent research proposal is required after satisfying the written part of the qualifying examination requirement. A successful oral defense

of the Ph.D. research plan must be completed before the end of the second year.

### Courses in Chemistry. (CHEM)

- 5010. Individual Studies in Chemistry (V1-6).** Prerequisite: Consent of instructor. A structured independent graduate studies course under the guidance of a faculty member. May be repeated for credit.
- 5101, 5102. Seminar (1:1:0 each).** Prerequisite: Graduate standing in chemistry. Required of all graduate students majoring in chemistry.
- 5301. Advanced Inorganic Chemistry I (3:3:0).** Prerequisite: CHEM 4309 or equivalent. Principles of coordination chemistry. Structure, bonding, properties, and reactions of complex compounds.
- 5302. Advanced Inorganic Chemistry II (3:3:0).** Prerequisite: CHEM 5301. Reaction mechanisms of inorganic compounds.
- 5304. Topics in Inorganic Chemistry (3:3:0).** Prerequisite: Consent of instructor. Special areas of inorganic chemistry not commonly included in other courses. May be repeated for additional credit.
- 5310. Polymer Chemistry (3:3:0).** Prerequisite: CHEM 4311 or 3307 and 3306, or equivalents. An introduction to the chemistry of macromolecules, including the synthesis, structures, properties and applications of polymers.
- 5314. Advanced Analytical Chemistry (3:3:0).** Prerequisite: CHEM 2501, 3307, 3308, or equivalents. General principles and special methods of analytical chemistry.
- 5315. Atmospheric Chemistry (3:3:0).** Prerequisite: Consent of instructor. An advanced course covering the production, monitoring, and fate of gases, vapors, and particulates in planetary atmospheres.
- 5316. Aquatic Chemistry (3:3:0).** Prerequisite: Consent of instructor. An advanced course in the analytical, physical, and inorganic chemistry of naturally occurring aqueous solutions and suspensions.
- 5317. Selected Topics in Analytical Chemistry (3:3:0).** Prerequisite: Consent of instructor. Special areas of analytical chemistry not commonly included in other courses. May be repeated for additional credit.
- 5318. Analytical Separation Science and Technology (3:3:0).** Prerequisite: Consent of instructor. The science and technology of analytical separation techniques, including chromatography, electrophoresis, field flow fractionation, and capillary separation.
- 5319. Electrochemical Analysis (3:3:0).** Prerequisite: Consent of instructor. Principles and applications of electrochemistry with emphasis on topics in electroanalytical chemistry.
- 5320. Analytical Spectroscopy (3:3:0).** Prerequisite: Consent of instructor. A detailed fundamental assessment and survey of the important techniques in analytical spectroscopy.
- 5321. Advanced Organic Chemistry I (3:3:0).** Prerequisite: CHEM 3305 and 3306 or equivalents. Principles and reactions of organic chemistry, with emphasis on the most recent developments from the current literature.
- 5322. Advanced Organic Chemistry II (3:3:0).** Prerequisite: CHEM 5321. Principles and methods of synthesis of organic compounds.
- 5323. Modern Principles of Organic Chemistry I (3:3:0).** A survey of modern organic chemistry with emphasis on reactions and contemporary theory. Not appropriate for graduate students in the department.
- 5324. Modern Principles of Organic Chemistry II (3:3:0).** Prerequisite: CHEM 5323. A continuation of CHEM 5323. Primarily intended for graduate minors in chemistry. Will serve as the prerequisite for other graduate courses in organic chemistry. Not appropriate for graduate students in the department.
- 5325. Topics in Organic Chemistry (3:3:0).** Prerequisite: CHEM 5321. Special areas of organic chemistry not commonly included in other courses. May be repeated for additional credit.
- 5326. Organic Spectroscopic Analysis (3:3:0).** Prerequisite: CHEM 3306 or equivalent. Theory and interpretation of spectra of organic compounds: MS, IR, UV-Vis, carbon and proton NMR.



- 5327. Physical Organic Chemistry I (3:3:0).** Prerequisite: CHEM 5321. Properties and reactions of organic compounds and the mechanisms of organic reactions considered from the standpoint of the principles of physical chemistry.
- 5330. Biochemistry I (3:3:0).** Prerequisite: CHEM 3401 or 3105, 3106, 3305, 3306 or equivalents. Properties of biological compounds. Chemical processes in living systems. For advanced study by graduate students with majors outside the department. Not appropriate for graduate students in the department.
- 5331. Biochemistry II (3:3:0).** Prerequisite: CHEM 5330. Properties of biological compounds. Chemical processes in living systems. For advanced study by graduate students with majors outside the department. Not appropriate for graduate students in the department.
- 5332. Biochemistry III (3:3:0).** Prerequisite: CHEM 5330. Third semester of a three semester general biochemistry series for nonmajors. Topics include nucleotide metabolism and cellular processes involving nucleic acids. Not appropriate for graduate students in the department.
- 5333. Proteins (3:3:0).** Prerequisite: CHEM 3311, 3312 or CHEM 4303 or BCH 5921 or equivalents. Chemical and physical properties of proteins. Primary and conformational structure determination.
- 5334. Topics in Biological Chemistry (3:3:0).** Special areas of biochemistry not commonly included in other courses. May be repeated for additional credit.
- 5335. Physical Biochemistry (3:3:0).** Prerequisite: CHEM 3307 or 4311 and CHEM 3311, 3312 or equivalents. Biophysical methods and approaches to the study of structure-function relationships in biopolymers.
- 5336. Lipids (3:3:0).** Prerequisite: CHEM 3305, 3306, 3311, and 3312. Structure and function of lipids. Emphasis is placed on the methods of characterization, evolution, biosynthetic pathways, and biological roles of lipids.
- 5337. Enzymes (3:3:0).** Prerequisite: CHEM 3311, 3312 or CHEM 4303 or equivalents. Structure, mode of action, and kinetics of enzymes.
- 5338. Biochemical Methods (3:1:6).** Prerequisite: CHEM 4303 or 3311 or equivalent. Methodology for the isolation and characterization of macromolecules and metabolites.
- 5339. Nucleic Acids (3:3:0).** Prerequisite: CHEM 3312 or 4303 and BIOL 4320 or 5320. Eukaryotic and prokaryotic DNA cloning strategies, DNA sequence analysis and manipulation, and recombinant DNA expression.
- 5340. Physical Chemistry Principles I (3:3:0).** Prerequisite: CHEM 1307, 1308, PHYS 1308, 1105, 2301, 1106, MATH 1551, 1552 or equivalents. A foundation course, for the graduate student minoring in chemistry, covering a wide range of principles. Prerequisite for other courses in physical and inorganic chemistry. Not appropriate for graduate students in the department.
- 5341. Physical Chemistry Principles II (3:3:0).** Prerequisite: CHEM 5340. A foundation course, for the graduate student minoring in chemistry, covering a wide range of principles. Prerequisite for other graduate courses in physical and inorganic chemistry. Not appropriate for graduate students in the department.
- 5342. Advanced Physical Chemistry (3:3:0).** Prerequisite: CHEM 3307, 3308, or equivalents. Introduction to quantum mechanics, spectroscopy, and the electronic structures of atoms and molecules.
- 5343. Quantum Chemistry (3:3:0).** Prerequisite: CHEM 5342. The application of non-relativistic wave mechanics to problems of chemical structure and reactivity.
- 5344. Kinetics of Chemical Reactions (3:3:0).** Prerequisite: CHEM 3307, 3308, or equivalents. A survey of chemical kinetics including transition state theory, the theory of mass spectra, spectroscopic methods, and models of reactions in solution.
- 5345. Molecular Spectroscopy (3:3:0).** Prerequisite: CHEM 5342. Principles of electronic, vibrational, and rotational spectroscopy and applications for determining molecular structure and other properties.

- 5346. Statistical Mechanics for Chemists (3:3:0).** Prerequisite: CHEM 5342. Equilibrium and non-equilibrium systems including ensembles, density matrices, and time-correlation functions.
- 5348. Topics in Physical Chemistry (3:3:0).** Prerequisite: CHEM 3307, 3308, or equivalents. Special areas of physical chemistry not commonly included in other courses. May be repeated for additional credit.
- 5349. Physical Chemistry Principles for Biological Sciences (3:3:0).** Prerequisite: CHEM 1307, 1308, 1107, 1108; PHYS 1308, 2301, 1105, 1106 or 1306, 1307, 1103, 1104; MATH 1351, 1352 or equivalents. A physical chemistry course for graduate students in biological sciences. Topics: Thermodynamics, electrochemistry, chemical kinetics, and quantum mechanics. Not appropriate for graduate students in the department.
- 5360. Conceptual Chemistry for Teachers I (3:3:0).** An integrated course for teachers. Topics include water, acids-bases, the periodic table, compounds, reactivity, structure, and energy.
- 5361. Conceptual Chemistry for Teachers II (3:3:0).** Prerequisite: CHEM 5360. A continuation of CHEM 5360, covering organic chemistry, biochemistry, equilibrium, kinetics, polymers, and nuclear chemistry.
- 6000. Master's Thesis. (V1-6).**
- 7000. Research (V1-12).**
- 8000. Doctor's Dissertation (V1-12).**

## Department of Classical and Modern Languages and Literatures

Professor P. G. Christiansen, Chairperson.

Horn Professor and Qualia Chair J. Pérez; Professors Finco, George, Larmour, G. Pérez, Smith, and Wood; Associate Professors Beard, Cravens, Holland, McClain, McVay, Myers, Nell, A. Pérez, and Stein; Assistant Professors Cabrera, Collopy, Connelly, Fry, Grair, Gorsuch, Grinstein, Pulido, Qualin, Santos, and Zamora; Visiting Assistant Professor Harris.

This department offers study in the following graduate degree programs: APPLIED LINGUISTICS, CLASSICS, GERMAN, and ROMANCE LANGUAGES, *Master of Arts*; SPANISH, *Doctor of Philosophy*. Students majoring in Romance Languages may specialize in French or Spanish. The department also participates in the inter-departmental program in comparative literature. See the section entitled "Opportunities for Interdisciplinary Study" in this catalog for details.

Before beginning a graduate program in this department, students should consult the graduate advisor of the particular program concerning departmental admission procedures and degree requirements. Admission to the Graduate School requires departmental recommendation as well as approval by the Graduate Dean.

The master's program offers advanced study in literature and linguistics. It is intended to be a distinctly different educational experience from undergraduate study. It requires study in greater depth and the development of critical thinking. Applicants for the M.A. degree in Spanish may complete 24 hours of graduate courses and a thesis or 36 hours of course work. The degree may include a six-hour minor. Applicants for the M.A. degree in

Applied Linguistics, Classics, French, or German may complete 30 hours of graduate courses and a thesis or 36 hours of course work. Areas of emphasis include literature, comparative literature, and linguistics. Candidates for the M.A. degree in this department must demonstrate a reading knowledge of a second foreign language. Candidates for the M.A. degree in Applied Linguistics must demonstrate knowledge of a language other than English (see also the Applied Linguistics section of this catalog). Oral and written comprehensive examinations are required. This department also participates in the joint MBA-MA program. See a full description under the College of Business Administration section of this catalog.

Graduate minors are available in Applied Linguistics, Classics, French, German, Greek, Latin, Portuguese, Russian, and Spanish.

The doctoral program in Spanish requires both greater breadth of study than the M.A. program and greater concentration in the area selected for specialization. To fulfill these requirements the student must demonstrate a reasonable comprehensive knowledge of literature and the ability to engage in original research. In order to qualify for admission to candidacy for the Ph.D. degree in Spanish, applicants must complete a graduate minor in another language or demonstrate a reading knowledge of two approved languages other than English or Spanish. Any substitution must be submitted in writing to the Spanish graduate advisor and approved by the candidate's doctoral committee.

Students in the Ph.D. program may minor outside the department or within the department in one of the above areas. The courses for the minor may also consist of a cluster of courses on a related topic taken in several departments.

Course work for the Ph.D. generally amounts to 60 hours beyond the B.A. degree including at least 45 hours of course work in Spanish and 15 additional hours in a minor program outside the major field. In addition the student must satisfy the preliminary examination requirement, pass qualifying examinations, and prepare and defend a dissertation.

### Courses in Classics. (CLAS)

- 5301. Studies in Greco-Roman Literature (3:3:0).** Selected studies in major authors, genres, or themes. May be repeated for credit.
- 5305. Aims and Methods of Classical Scholarship (3:3:0).** A general overview of aims and methods of ancient studies covering primary and secondary sources.
- 5350. The Classical Tradition (3:3:0).** Designed to acquaint students with the influence of ancient Rome and Greece on Western culture. Readings in English.
- 6000. Master's Thesis (V1-6).**
- 7000. Research (V1-12).**

### Courses in English as a Second Language. (ESL)

- 5301. Advanced Writing for International Students (3:3:0).** Focusing on advanced writing projects, the preparation of theses and dissertations, and the preparation of research for publication.

### Courses in French. (FREN)

- 5100. Advanced Problems in French Language and Literature (1).** An individualized research project course. Contents will vary to meet the needs of students.
- 5101. Teaching French in College (1:1:0).** Classroom organization and explanation as well as demonstrations of instructional techniques. Does not count toward the minimum requirement of a graduate degree. Must be taken pass-fail by all teaching assistants each semester.
- 5312. Medieval Literature (3:3:0).** Reading and philological interpretation of selected Old French texts.
- 5315. Studies in French Language and Literature (3:3:0).** This course concentrates on topics in French civilization, linguistics, and literature with content varying to meet the needs of students. May be repeated for credit.
- 5316. Sixteenth Century Literature (3:3:0).** Readings, analysis, and interpretation of selected works of the sixteenth century.
- 5317. Seventeenth-Century Literature (3:3:0).** Reading, analysis, and interpretation of selected works of the seventeenth century.
- 5318. Eighteenth Century Literature (3:3:0).** Reading, analysis, and interpretation of selected works of the eighteenth century.
- 5319. Nineteenth Century Literature (3:3:0).** Readings, analysis, and interpretation of selected works of the nineteenth century. Course content may vary. May be repeated for credit.
- 5320. Twentieth Century Literature (3:3:0).** Readings, analysis, and interpretation of selected works of the twentieth century. Course content may vary. May be repeated for credit.
- 5321. French Cinema (3:3:0).** Presentation of the major trends of French cinema from the beginnings to the present. Course content may vary. May be repeated for credit.
- 5327. French Civilization (3:3:0).** Historical, geographical, social, and artistic aspects of the development of the culture of France. Course content will vary. May be repeated for credit (new).
- 5328. Francophone Literature and Culture (3:3:0).** Readings and topical studies relating to French-speaking cultures (in Africa, Europe, U. S., Quebec, and Caribbean) and French and Francophone culture that may require special treatment. May be repeated for credit.
- 5329. Studies in Literary Criticism and Theory (3:3:0).** Current and traditional ways of analyzing literary texts in their cultural contexts with emphasis on theory. Course content will vary. May be repeated for credit.
- 5341, 5342. Intensive French for Graduate Research I and II (3:3:0 each).** French readings with related grammar to acquaint graduates with French as a research skill; equivalent of two years of normal course work. Not intended to meet major or minor degree requirements.
- 6000. Master's Thesis (V1-6).**
- 7000. Research (V1-12).**

### Courses in German. (GERM)

- 5301. Business German for Graduate Study (3:3:0).** Oral and written German with special attention to idiomatic expressions currently in use in commercial and technical fields.
- 5302. German Culture and Society for Graduate Study (3:3:0).** Examination of current cultural, social, political, and economic trends in the German-speaking world.
- 5303, 5304. Intensive German for Graduate Research I, II (3:3:0 each).** Accelerated grammar course acquainting graduates with German as a research skill to be used in translating research articles in the graduate's field. Equivalent to two years of normal course work. Not intended to meet major or minor degree requirements.
- 5305. Diction and Stylistics of the German Language (3:3:0).** Mastery of grammar and idiomatic usage of German with a concentration on academic and professional contexts.
- 5314. The History of the German Language (3:3:0).** Development of German from its origins to the present with emphasis on its phonological, morphological, and syntactic change.
- 5315. German Literature from 800 to 1700 (3:3:0).** Representative readings from the Hildebrandslied through the Middle Ages, the Reformation, and the Baroque.

- 5316. Middle High German (3:3:0).** A study of the language and literature of Germany from about 1100 to 1350.
- 5317. The German Novelle (3:3:0).** A detailed study of the German Novelle from its origins to the early 1900s, with special emphasis on its development in the nineteenth century.
- 5318. German Romanticism (3:3:0).** Study of German literature from 1790 to 1830.
- 5319. The German "Klassik" (3:3:0).** Introduction to the classical works of Goethe and Schiller and other authors of the period.
- 5320. German Women Writers (3:3:0).** Study of literary works produced by German women writers with emphasis on the 20th century.
- 5321. Seminar in Modern German Literature (3:3:0).** Study of various genres of twentieth-century German literature, with special emphasis on philosophical and psychological aspects. May be repeated for credit.
- 5323. German Lyric (3:3:0).** An introduction to the evolution of German lyric forms with close analysis of selected poems representative of the 18th, 19th, and 20th centuries.
- 5324. German Literature of the Enlightenment (3:3:0).** A study of German literature from 1700 to 1785, including "Aufklärung," "Sturm und Drang," and "Empfindsamkeit."
- 6000. Master's Thesis (V1-6).**
- 7000. Research (V1-12).**

### Courses in Greek. (GRK)

- 5330. Greek Prose (3:3:0).** Selected readings from Greek texts in history, philosophy, oratory, rhetoric, biography, and the novel. Topics may vary. May be repeated for credit.
- 5340. Greek Poetry (3:3:0).** Selected readings in Greek poetic texts from various genres. Topics may vary. May be repeated for credit.
- 7000. Research (V1-12).**

### Courses in Italian. (ITAL)

- 7000. Research (V1-12).**

### Courses in Latin. (LAT)

- 5304. Latin Poetry: Epic, Lyric, Elegiac, and Pastoral (3:3:0).** Study of one or more poetic genres. May be repeated for credit.
- 5310. Seminar in Latin Literature (3:3:0).** Content will vary to meet the needs of the students. May be repeated for credit.
- 5341. Intensive Latin for Graduate Research I (3:3:0).** Grammar and readings for reading knowledge. Equivalent to one year of normal course work. Not for classics majors or Latin minor graduate degree requirements.
- 5342. Intensive Latin for Graduate Research II (3:3:0).** Prerequisite: LAT 5341 or 1402. Continuation of LAT 5341. Equivalent to completion of LAT 2302. Not for classics majors or Latin minor graduate degree requirements.
- 5360. Latin Prose (3:3:0).** Selected readings from Latin texts in history, philosophy, oratory, rhetoric, epistolography, satire, biography, and the novel. Topics may vary. May be repeated for credit.
- 7000. Research (V1-12).**

### Courses in Linguistics. (LING)

- 5310. Second and Foreign Language Testing (3:3:0).** This course is designed to give language teachers a working knowledge of testing principles applied to second and foreign language classrooms and programs.
- 5315. Pedagogical Grammar of English as a Second or Foreign Language (3:3:0).** A study of aspects of English grammar most frequently taught in ESL or EFL classrooms and an examination of the place of grammar instruction in interlanguage development.
- 5320. Second and Foreign Language Composition (3:3:0).** A study of second and foreign language theories and research in composition learning and teaching and their implications for methods of teaching second and foreign language composition.

- 5322. Methods of Teaching Modern Second and Foreign Languages (3:3:0).** Theory and practice of teaching modern second and foreign languages.
- 5325. Technology for Teaching Second and Foreign Languages (3:3:0).** A study of theory, research, and practice in the use of technology for teaching second and foreign languages including audio, video, CALL, and Internet technologies.
- 5330. Second and Foreign Language Acquisition (3:3:0).** A study of the theories and processes of second and foreign language acquisition, with emphasis on adult learners.
- 5335. Linguistic Analysis for Bilingual Education and ESL (3:3:0).** Linguistic analysis (applied, descriptive, and/or contrastive) as it relates to teaching bilingual education or English as a foreign or second language.
- 5345. Seminar in Applied Linguistics (3:3:0).** Study of current topics of interest in applied linguistics. Course content will vary. May be repeated for credit.
- 6000. Master's Thesis (V1-6).**
- 7000. Research (V1-12).**

### Courses in Portuguese. (PORT)

- 5355. Readings in Luso-Brazilian Literature (3:3:0).** Advanced topics in Luso-Brazilian literature. May be repeated for credit.
- 7000. Research (V1-12).**

### Courses in Russian. (RUSN)

- 7000. Research (V1-12).**

### Courses in Spanish. (SPAN)

- 5100. Advanced Special Problems in Spanish Language and Literature (1).** An individualized research project course. Contents will vary to meet the needs of students.
- 5304. Advanced Business Spanish I (3:3:0).** Prerequisite: Consent of instructor. Foundation in business vocabulary and discourse of management. Emphasis on geographic and cultural understanding of the Spanish-speaking world.
- 5305. Advanced Business Spanish II (3:3:0).** Prerequisite: Consent of instructor. Foundation in the vocabulary and discourse of economics and finance in Spanish.
- 5340. Spanish Language and Linguistics (3:3:0).** Spanish phonology, dialectology, morphology, or Spanish syntax. May be repeated for credit with different emphasis.
- 5341, 5342. Intensive Spanish for Graduate Research I, II (3:3:0 each).** Spanish readings with related grammar to acquaint graduates with Spanish as a research skill; equivalent to two years of normal course work. Not intended to meet major or minor degree requirements.
- 5345. History of the Spanish Language (3:3:0).** Prerequisite: One year of Latin or equivalent. The development of the Spanish language from its earliest forms to the present.
- 5347. Language Development (3:3:0).** Mastery of language skills through readings, compositions, and directed oral projects. Offered only in programs abroad each summer.
- 5348. Culture and Literature (3:3:0).** Analysis and interpretation of cultural and literary expressions of the host country. Offered only in programs abroad each summer.
- 5350. Teoría de la Novela (3:3:0).** Prerequisite: Consent of the instructor. Introduction to the history and theory of prose fiction applied to Hispanic and Spanish American novels.
- 5352. Methods of Literary Criticism (3:3:0).** Theories and practices of literary analysis and criticism.
- 5353. Bibliography and Methods of Research (3:3:0).** Systematic study of bibliographical materials, methods, and problems in the field of Hispanic research.
- 5354. Hispanic Literary Concepts (3:3:0).** A study of movements, genres, influences, forms, themes, and other concepts in Hispanic literatures from the Middle Ages to the present.
- 5355. Seminar in Hispanic Literature (3:3:0).** Advanced topics in Hispanic literature. May be repeated for credit.
- 5361. Medieval Literature (3:3:0).** Spanish literature from its earliest monuments to the end of the Middle Ages.



- 5362. Golden Age Literature (3:3:0).** Selected authors, works, and genres.
- 5364. Nineteenth-Century Spanish Literature (3:3:0).** A history of Spanish literature in the nineteenth century.
- 5366. Twentieth-Century Spanish Prose (3:3:0).** A comprehensive study of the principal literary currents, authors, and works with emphasis on the contemporary period.
- 5368. Twentieth-Century Spanish Theatre and Poetry (3:3:0).** A comprehensive study of the principal literary currents, authors, and works with emphasis on the contemporary period.
- 5370. Colonial Spanish American Literature (3:3:0).** A study of this literature from the Pre-Colombian era to the end of the Spanish American baroque.
- 5374. Nineteenth-Century Spanish American Literature (3:3:0).** A comprehensive study of the principal literary currents, authors, and works of the nineteenth century.
- 5375. Modernism (3:3:0).** A detailed study of Spanish American Modernism.
- 5376. Twentieth-Century Spanish American Prose (3:3:0).** The development of prose fiction in Spanish America during the twentieth century.
- 5378. Twentieth-Century Spanish American Theatre and Poetry (3:3:0).** The development of the theatre and poetry in Spanish America during the twentieth century.
- 5381. Hispanic Literature of the Southwest (3:3:0).** The origin and development of Hispanic literature in the southwest, including Spanish literature (1539-1820), Mexican literature (1821-1848), and Mexican-American literature (1849-present).
- 5392. The Play in Spanish (3:3:0).** Prerequisite: Consent of instructor. Intensive analysis of a play and preparation for two public performances.
- 6000. Master's Thesis (V1-6).**
- 7000. Research (V1-12).**
- 8000. Doctor's Dissertation (V1-12).**

## Department of Communication Studies

Associate Professor K. David Roach, Chairperson.  
Professor Stewart; Associate Professors Bliese, Olaniran, and Williams; Assistant Professors Gring and Hughes.

This department offers study in the following graduate degree program: COMMUNICATION STUDIES, *Master of Arts*.

The graduate program for the master's degree in communication studies requires a minimum of 30 semester hours of course work plus 6 hours of thesis. Required courses are COMS 5300, 5301, 5305, 5306, and 5307.

### Courses in Communication Studies. (COMS)

- 5111. Communication Instruction in Higher Education I (1:1:0).** First of two courses required of all communication studies teaching assistants. Provides individual development in philosophies and practices unique to teaching basic oral communication courses.
- 5112. Communication Instruction in Higher Education II (1:1:0).** Second of two courses required of all communication studies teaching assistants. Provides individual development in philosophies and practices unique to teaching basic oral communication courses.
- 5300. Communication Theory (3:3:0).** A comprehensive overview of contemporary communication theories and research. Students will read original work beginning with general semantics theory and culminating with the most recently published reviews of theoretical work in communication studies.
- 5301. Qualitative Research Methods (3:3:0).** The course will introduce research methods of discourse analysis, conversation analysis, ethnography, applied qualitative communication research, and development of grounded theory. Students must engage in field work, interview participants, and write essays based on gathered data to complete this course successfully.
- 5302. Intercultural Communication (3:3:0).** An examination of the relationship between culture and communication and approaches to studying intercultural communication.
- 5303. Communication in Small Groups (3:3:0).** A study of factors affecting interpersonal communication in small group settings. Course content includes consideration of both theoretical and applied orientations to the study of small group communication.
- 5304. Communication in Organizations (3:3:0).** This course examines theoretical perspectives, contemporary research, and practical models of human communication in complex organizations.
- 5305. Quantitative Research Methods (3:3:0).** The study of quantitative research methods in communication research, emphasizing research designs, quantitative treatments, and analysis. Course requirements will include data entry, statistical analysis, and a research prospectus.
- 5306. Theories of Rhetoric (3:3:0).** An in-depth study of rhetorical theories which have had significant impact on the research, teaching, and practice of communication behavior. Students must write a lengthy research paper in order to successfully complete this course.
- 5307. Historical—Critical Research Methods (3:3:0).** Survey of contemporary methods of rhetorical criticism and their application in analyzing a wide variety of message types. Students must write multiple essays exemplifying rhetorical criticism in order to successfully complete this course.
- 5309. Conflict Management and Problem Solving (3:3:0).** In-depth study of, and research into conflict resolution through mediation and negotiation.
- 5313. Theories of Persuasion (3:3:0).** Analysis of representative theories and models of persuasive processes and their implications for communication behavior. Theories of public, interpersonal, and mass communication are included.
- 5314. Communication Issues in Health and Health Care (3:3:0).** An exploration of the nature and roles of discourse processes in health care interactions, including interpersonal, organizational, public, and intercultural communication contexts.
- 5315. Nonverbal Communication (3:3:0).** Examines communicative functions of nonverbal message behavior. Considers a variety of behavioral domains and interaction contexts from both theoretical and practical perspectives.
- 5318. Interpersonal Communication (3:3:0).** Communication theory and research on historical and contemporary topics in interpersonal communication contexts.
- 6000. Master's Thesis (V1-6).**
- 6302. Seminar in Interpersonal Communication (3:3:0).** A research course focusing on specific topics in interpersonal communication. Topics vary with students' needs. May be repeated for credit.
- 6303. Seminar in Organizational Communication (3:3:0).** A research course focusing on specific topics in organizational communication. Topics vary with students' needs. May be repeated for credit.
- 6304. Seminar in Rhetorical Theory (3:3:0).** A research course focusing on specific topics in rhetorical theory. Topics vary with students' needs. May be repeated for credit.
- 6307. Seminar in Instructional Communication (3:3:0).** A research course focusing on specific topics in instructional communication. Topics vary with students' needs. May be repeated for credit.
- 6308. Seminar in Cultural and Intercultural Communication (3:3:0).** A research course focusing on specific topics in cultural and intercultural communication. Topics vary with student's needs. May be repeated for credit.
- 7000. Research (V1-12).**

## Department of Economics and Geography

Professor Joseph E. King, Chairperson.

Professors Elbow, Kruse, Steinmeier, and Templer; Associate Professors Becker, Ewing, Lee, McComb, Rahnama, and von Ende; Assistant Professors Al-Hmoud, Carter, Carton, Crooker, Mulligan, and Salazar.

This department offers study in the following graduate degree programs: *ECONOMICS*, *Master of Arts* and *Doctor of Philosophy*.

Although no graduate major is offered in geography, minors for both the master's and doctor's degrees are available. The geography faculty also participates in the University's interdisciplinary *Doctor of Philosophy* program in LAND-USE PLANNING, MANAGEMENT, AND DESIGN and in the arid land studies, environmental evaluation, and international development plans of the Interdisciplinary Studies master's program. Selected geography graduate-level courses may be used to fulfill requirements for these degrees.

Students seeking a degree in economics should consult with the graduate advisor or the chairperson of the department.

The Master of Arts program requires a thesis and 24 semester hours beyond the bachelor's degree. A student may instead select a nonthesis 36-semester hour plan. In addition to the traditional program, the student may take courses with an applied emphasis in economics and related minor fields after consultation with the graduate advisor.

The candidate for the doctor's degree must choose three specializations from within the areas of international economics, economic development, monetary economics, public finance, labor economics, agricultural economics, natural resource economics, industrial organization, and special fields of economics.

The doctoral student in economics must demonstrate a mathematical proficiency in calculus and analytical geometry.

### Courses in Economics. (ECO)

- 5300. The Economic Environment (3:3:0).** A rigorous study of microeconomic and macroeconomic theory with applications to the major problems of the economy. Emphasis is on microeconomics.
- 5310. Price and Income Theory (3:3:0).** Designed for graduate students who need intensive study of intermediate economic price and income theory.
- 5311. Macroeconomic Theory and Policy (3:3:0).** Prerequisite: ECO 3311 or 5310. Market clearing and non-market clearing business cycle models and their policy implications. Emphases include inflation, real growth, unemployment, and balance of payments and their interactions.
- 5312. Microeconomic Analysis (3:3:0).** Prerequisite: ECO 5310 or consent of instructor. Theory of household and firm choice, duality, commodity, and factor market structures, general equilibrium and welfare economics. Emphasis on theory and policy applications.
- 5313. Mathematical Economics I (3:3:0).** Prerequisite: Consent of instructor. The application of mathematical techniques to economic model-building.
- 5314. Econometrics I (3:3:0).** Prerequisite: AAEC 5311 or ISQS 5349 or consent of instructor. Topics chosen from the following: problems in single and multiple regressions, qualitative choice models, specification tests, estimation of rational expectations models, and fixed-effects models.
- 5315. Mathematical Economics II (3:3:0).** Prerequisite: ECO 5313 or consent of instructor. Advanced topics in the application of mathematics to economic model-building including dynamic models and programming techniques.
- 5316. Time Series Econometrics (3:3:0).** Prerequisite: ECO 5314. Contemporary issues in time series econometrics. Topics include dynamic models, ARMA models, stationarity, causality and exogeneity, unit root tests, integration and error correction.
- 5317. Natural Resource and Environmental Economics (3:3:0).** Prerequisite: ECO 5312 or consent of instructor. Covers theory and policy in natural resource and environmental economics. Optimal rules for renewable and nonrenewable patterns of use, public policy. Intensive study of one sector (energy, water, forestry).
- 5318. History of Economics (3:3:0).** This course examines various historical episodes and their influence on the development of economic theories.
- 5323. Monetary Theory I (3:3:0).** Prerequisite: ECO 3323 or 5310. Introduction to monetary theories and their policy implications. Partial and general equilibrium models of price levels, inflation rates, income flows, and interest rates are developed in an open economy context.
- 5324. Seminar in Public Finance (3:3:0).** Prerequisite: Consent of instructor. Analysis of economic effects of taxation, governmental expenditures, debt management, and budgetary planning and administration.
- 5325. Seminar in Economic Policy (3:3:0).** Prerequisite: Consent of instructor. Analysis of major economic issues, theories, or policies. May be repeated for credit.
- 5328. Monetary Theory II (3:3:0).** Prerequisite: ECO 5323 or consent of instructor. Recent developments and controversies in monetary theory and policy. Emphasis on leading edge issues and literature and on development of research skills in monetary economics.
- 5329. Current Problems in Public Finance (3:3:0).** Prerequisite: Consent of instructor. Research in and analysis of public goods, public choice, public budgeting, cost-benefit analysis, and intergovernmental fiscal relations.
- 5332. Advanced International Finance (3:3:0).** Prerequisite: Advanced graduate standing and consent of instructor. Advanced study of theory, problems, and policies associated with the international monetary system. (FIN 5332).
- 5333. Advanced International Economics (3:3:0).** Prerequisite: ECO 3333 or consent of instructor. Advanced study of theory, problems, and policies in international economics.
- 5337. Health-Care Economics (3:3:0).** Prerequisite: ECO 5300 or equivalent. The application of economic principles to the analysis of problems and the formulation of policies in the health-care sector of the economy.
- 5346. Game Theory (3:3:0).** Introduction to game theory with an emphasis on economic applications.
- 5347. Topics in Industrial Organization (3:3:0).** Prerequisite: ECO 5312 or consent of instructor. Study of recent research in applied microeconomics and business behavior. Topics include oligopoly, vertical integration, collusion, and the empirical links between monopoly power and profitability.
- 5381. Empirical Studies in Macroeconomics (3:3:0).** Prerequisite: ECO 5311 or consent of instructor. Contemporary theoretical and empirical macroeconomic issues. Use of empirical studies to evaluate competing hypotheses. Student conducted empirical studies.
- 5382. Advanced Microeconomics (3:3:0).** Prerequisite: ECO 5312 or consent of instructor. Topics include investment and capital theory, uncertainty, general equilibrium, and welfare.
- 6000. Master's Thesis (V1-6).**
- 7000. Research (V1-12).**
- 8000. Doctor's Dissertation (V1-12).**

## Courses in Geography. (GEOG)

- 5300. Geographic Information Systems (3:2:3).** Review of basic cartographic principles and the use of geographic information systems for thematic mapping and spatial analysis. Laboratory emphasizes experience with GIS software.
- 5301. Remote Sensing of the Environment (3:2:3).** Review of remote sensing techniques, including air photo interpretation and digital satellite image processing. Emphasis on the use of remote sensing imagery in geographic information systems.
- 5302. Advanced Geographic Information Systems (3:2:3).** Prerequisite: GEOG 5300 or equivalent. An advanced course in geographic information systems. Major topics include data acquisition, database management, and spatial analysis techniques. Laboratory emphasizes experience with professional GIS software.
- 5303. Advanced Human Geography (3:3:0).** Consideration of current research in human geography with special reference to the spatial aspects of natural resource-environmental analysis. May be repeated as topic varies.
- 5304. Advanced Physical Geography (3:3:0).** Consideration of current research in physical geography with special reference to the spatial aspects of natural resource-environmental analysis. May be repeated as topic varies.
- 5306. Seminar in Geography of Arid Lands (3:3:0).** Systematic and regional review and analysis of the physical nature and problems of human utilization of the arid and semi-arid lands of the earth.
- 5307. NAFTA, Western Hemisphere Trade, and Regional Integration in the Americas (3:3:0).** Consideration of spatial and cultural aspects of trade and economic development in the Western Hemisphere with emphasis on NAFTA, Mercosur, CACM, and regional integration organizations.
- 5309. Seminar in Regional Analysis (3:3:0).** Consideration of the objectives and methods of regional analysis and the application of research techniques to the spatial analysis of selected regions. May be repeated as topic varies.
- 5310. Readings in Geography (3).** Conference course. May be repeated for credit.
- 7000. Research (V1-12).**

## Department of English

Professor Madonne Miner, Chairperson.

Horn Professors Higdon and McDonald; Professors Aycock, Barker, Clarke, Dragg, Hurst, Kuriyama, C. Rude, D. Rude, Shaw, and Whitlark; Associate Professors Ceniza, Conrad, Crowell, Daghistany, Desens, Kemp, Patterson, Purinton, Samson, Schoenecke, and Wenthe; Assistant Professors Baake, Carter, Chico, Donnelly, Gadeken, Grass, Jones, Lang, McFadden, Manriquez, Poch, Rickly, Rossini, Shelton, and Shu.

This department offers study in the following graduate degree programs: ENGLISH, *Master of Arts and Doctor of Philosophy*; TECHNICAL COMMUNICATION, *Master of Arts*; TECHNICAL COMMUNICATION AND RHETORIC, *Doctor of Philosophy*. The department also participates in the interdepartmental programs in linguistic studies and in comparative literature at the master's and doctor's levels. See the section of this catalog entitled "Opportunities for Interdisciplinary Study" for details.

Before beginning a graduate program in English, students must consult the Director of Graduate Studies concerning departmental admission procedures and degree requirements. Admission to the Graduate School requires departmental recommendation as well as approval by the Graduate Dean. Information on the requirements is available at the Web site <[www.english.ttu.edu](http://www.english.ttu.edu)>.

The master's degree program in English offers advanced study in literature, creative writing, rhetoric, and linguistics. It is intended to be not merely a continuation of undergraduate work but a distinctly different educational experience requiring study in greater depth and the development of critical thinking.

Applicants for the M.A. degree in English may complete 30 hours of graduate courses and a thesis or 36 hours of course work. Areas of specialization are English and American literature, comparative literature, composition and rhetoric, and creative writing. Supporting work is available in bibliography, film, literary criticism, linguistics, teaching college composition, and technical and professional writing. Reading knowledge of one foreign language is required. In their final semester in the M.A. program, thesis students must successfully complete an oral defense and nonthesis students must submit a portfolio of their work for faculty review.

The doctoral program in English requires both greater breadth of study than the M.A. program and greater concentration in an area selected for specialization. To fulfill these requirements the student must demonstrate a reasonably comprehensive knowledge of literature and the ability to engage in original research.

Doctoral students in English may specialize in an area of English literature, American literature, two closely related areas of English and American literature, composition and rhetoric, comparative literature, or creative writing. They may minor outside the department or create a secondary specialization within the department in one of the above areas or in linguistics or technical communication. Course work for the Ph.D. generally amounts to 60 hours beyond the B.A. degree, including at least 45 hours of course work in English. All students are reviewed annually for satisfactory progress. In addition, the student must pass a qualifying examination and prepare and defend a dissertation. Reading knowledge of two foreign languages or high competence in one language is required.

The master's degree program in technical communication combines study of the history, theory, research, and genres of technical communication with practice in applying this knowledge. The thesis option requires students to complete 24 hours of graduate courses in technical communication and electives or a minor, 6 hours of research methods, and a thesis. The nonthesis option requires students to complete 36 hours of graduate courses in technical communication, electives, and a minor. Students who elect the nonthesis option must pass a comprehensive examination in the semester of graduation.

The doctoral program in technical communication and rhetoric aims to engage the students in acquiring broad knowledge of the history, theory, research, genres, and practice of technical communication and rhetoric; specialized knowledge of some aspect of communication or rhetoric; and ability to conduct independent research. The Ph.D. requires at least 60 hours of graduate courses beyond the bachelor's degree, proficiency in research methodology, and a dissertation. The 60 hours include



45 hours in the specialization. The remaining 15 hours may be used for a minor in a field other than technical communication and rhetoric or for more courses in the specialization, including communication-related courses in other departments. A minor may be taken in one department or may consist of a cluster of courses on related topics from different departments.

The master's degree in technical communication is also available on-line. Application and admission processes and degree requirements are similar to those for the nonthesis option for the degree. All distance students complete 36 hours of graduate course work in technical communication, language- and communication-related electives, or a minor. One of the courses requires a substantial independent research project that could result in an article for publication. Prospective students are advised to consult the program Web site at <english.ttu.edu/tc/DL> for details of degree requirements and the course schedule.

### Courses in English. (ENGL)

Courses with "Studies" in their titles as well as ENGL 5377 and 5380 may be repeated for credit when the topic varies.

- 5301. Old English (3:3:0).** Survey of the grammar and vocabulary of Old English together with readings.
- 5303. Studies in Medieval British Literature (3:3:0).** Concentrated studies in British literature to 1500, treating in various semesters poetry, prose, drama, and major authors.
- 5304. Studies in Renaissance British Literature (3:3:0).** Concentrated studies in British literature, 1500-1600, treating in various semesters poetry, prose, drama, and major authors.
- 5305. Studies in Shakespeare (3:3:0).** Emphasis on the comedies, tragedies, histories, poetry, or a combination of these.
- 5306. Studies in Seventeenth-Century British Literature (3:3:0).** Concentrated studies in British literature, 1600-1660, treating in various semesters poetry, prose, drama, and major authors.
- 5307. Studies in Restoration and Eighteenth-Century British Literature (3:3:0).** Concentrated studies in British literature, 1660-1800, treating in various semesters poetry, prose, drama, and major authors.
- 5309. Studies in Nineteenth-Century British Literature (3:3:0).** Concentrated studies in British literature, 1800-1900, treating in various semesters poetry, prose, drama, and major authors.
- 5313. Studies in Twentieth-Century British Literature (3:3:0).** Concentrated studies in British literature, 1900-present, treating in various semesters poetry, prose, drama, and major authors.
- 5315. Studies in British Fiction (3:3:0).** Concentrated studies in British fiction, treating in various semesters major figures and movements.
- 5320. Studies in Seventeenth- and Eighteenth-Century American Literature (3:3:0).** Concentrated studies in American literature, 1600-1800, treating in various semesters poetry, prose, drama, and major authors.
- 5323. Studies in Nineteenth-Century American Literature (3:3:0).** Concentrated studies in American literature, 1800-1900, treating in various semesters poetry, prose, drama, and major authors.
- 5324. Studies in Twentieth-Century American Literature (3:3:0).** Concentrated studies in American literature, 1900-present, treating in various semesters poetry, prose, drama, and major authors.
- 5325. Studies in American Fiction (3:3:0).** Concentrated studies in American fiction, treating in various semesters major figures and movements.
- 5334. History of the English Language (3:3:0).** An exploration of the external and internal history of the English language and the people who speak it. Considers linguistic, historical, and literary materials.
- 5335. Principles of Language (3:3:0).** A broad introduction to the major subfields of descriptive and applied linguistics. Covers theoretical and practical issues in modern analyses of language.
- 5337. Studies in Linguistics (3:3:0).** Special topics.
- 5340. Research Methods (3:3:0).** Survey of research methods in literature and language providing experience with bibliography, microform collections, scholarly journals, and other research tools.
- 5342. Critical Methods (3:3:0).** Survey of contemporary critical methods with special attention to their application to literature.
- 5343. Studies in Literary Criticism (3:3:0).** Concentrated study of specific problems in literary theory and its application to literature.
- 5350. Studies in Drama (3:3:0).** Concentrated studies in American, British, or world drama.
- 5351. Studies in Film and Literature (3:3:0).** Readings, analysis, and research in the interrelationships between film and literature.
- 5352. Studies in Fiction (3:3:0).** Concentrated studies in world fiction.
- 5353. Studies in Poetry (3:3:0).** Concentrated studies in American, British, or world poetry.
- 5355. Studies in Comparative Literature (3:3:0).** Theory and practice of the study of comparative literature, with emphasis on themes and motifs.
- 5360. History and Theories of College Composition (3:3:0).** Seminar in history and contemporary theories of composition and rhetoric studies. Required for all new teaching assistants and graduate part-time instructors.
- 5361. Theories of Invention in Writing (3:3:0).** Classical and modern theories of rhetorical invention.
- 5362. Rhetorical Analysis of Text (3:3:0).** Classical and modern theories of rhetorical analysis.
- 5363. Composition Research (3:3:0).** Survey of research methods in composition studies with emphasis on current research trends.
- 5364. History of Rhetoric (3:3:0).** Survey of history and theories of rhetoric with an emphasis on applications to written communication.
- 5365. Studies in Composition (3:3:0).** Consideration of classical and modern theories and research in written composition.
- 5366. Teaching Technical and Professional Writing (3:3:0).** The theory and teaching of technical and professional writing with special attention to developing course objectives, syllabi, and teaching techniques.
- 5367. Methods of Teaching College Composition (3:3:0).** Prerequisite: ENGL 5360. Introduces methods of teaching writing through assigned readings, supervised participation in teaching activities, and seminar discussion.
- 5368. Studies in Written Argumentation (3:3:0).** History and theories in written argumentation.
- 5369. Discourse and Technology (3:3:0).** Study of the effects of computer networks and digitally mediated knowledge management on theoretical, practical, and pedagogical notions of discourse and discourse communities.
- 5370. Studies in Creative Writing (3:3:0).** Prerequisite: Consent of creative writing staff. Theory and practice of creative writing in various genres.
- 5371. Foundations of Technical Communication (3:3:0).** Theory and practice of technical communication.
- 5372. Technical Reports (3:3:0).** Theory and practice of reports and proposals.
- 5373. Technical Manuals (3:3:0).** Theory and practice of manual development and design.
- 5374. Technical Editing (3:3:0).** Substantive editing and design of technical documents.
- 5375. Document Design (3:3:0).** Theory and practice of creating comprehensible, usable, and persuasive texts.

- 5376. Writing for the Computer Industry (3:3:0).** Design and testing of written, on-line, and multimedia documents that support computer software and hardware.
- 5377. Theoretical Approaches to Technical Communication (3:3:0).** Intensive analysis and application of one or more theories of technical communication.
- 5378. Graduate Internship in Technical Communication (3:0:0).** Prerequisite: Consent of the Director of Graduate Studies. Substantial writing and editing experience combined with research.
- 5380. Advanced Problems in Literary Studies (3:3:0).** Concentrated studies in works, authors, or approaches.
- 5390. Writing for Publication (3:3:0).** This course is designed to teach students in Ph.D. programs how to write clear and effective articles for professional journals in their field.
- 6000. Master's Thesis (V1-6).**
- 7000. Research (V1-12).**
- 8000. Doctor's Dissertation (V1-12).**

## Department of Environmental Toxicology

Professor Ronald Kendall, Chairperson.

Professor Dixon; Associate Professors Anderson, Cobb, Dickerson, Hooper, and Wang; Assistant Professors McMurry, E. Smith, and Theodorakis; Adjunct Faculty: Allen, Baker, Bradley, Carr, Chesser, Chuiko, Coats, Dasgupta, Densmore, Deslippe, Fedler, Frame, Gill, Johnson, Martin, Mehta, Mora, Otis, Patino, Pence, Peterson, Porter, Ramkumar, Roberto, Scott, D. Smith, P. Smith, Stegeman, H. Strahlendorf, J. Strahlendorf, Sutton, Warner, and Woods.

This department offers study in the following graduate degree programs: ENVIRONMENTAL TOXICOLOGY, *Master of Science* and *Doctor of Philosophy*. In addition, a combined degree leading to a joint J.D.—Master of Science in cooperation with the Texas Tech School of Law is also offered.

Because of the multidisciplinary nature of environmental toxicology, prospective students should contact the graduate advisor for the program to discuss prerequisites and prior training. Generally, strong background in the natural, physical, or health sciences will provide the necessary preparation. Students interested in pursuing a degree must complete applications to the Graduate School <[www.ttu.edu/gradschool/gradadmit.htm](http://www.ttu.edu/gradschool/gradadmit.htm)> and the Environmental Toxicology Graduate Program <[www.tiehh.ttu.edu/Education/application.asp](http://www.tiehh.ttu.edu/Education/application.asp)>.

The M.S. program (36 hours) and the Ph.D. program (72 hours) are composed of course work emphasizing the principles of toxicology, the environmental fate of chemicals, statistical approaches to study design and data handling, and seminars in environmental toxicology. Supplemental course work, research, and thesis or dissertation hours are chosen by the student with the guidance of their committee, allowing for focus on the student's particular research emphasis. Students pursuing either degree must perform an original research project, prepare a written thesis or dissertation, and defend the work in a public defense.

### Courses in Toxicology. (TOX)

- 6115. Interdisciplinary Seminar in Environmental Toxicology (1:1:0).** Prerequisite: Graduate standing or consent of instructor. Seminar on timely topics by experts in aspects of environmental toxicology. Focuses on basic and applied research, regulatory decision-making, and industry perspectives. Required for all environmental toxicology students. May be repeated for credit.

### Courses in Environmental Toxicology. (ENTX)

- 6000. Master's Thesis (V1-6).**
- 6100. Graduate Seminar (1:1:0).** Prerequisite: Graduate standing or consent of instructor. A participatory seminar where graduate students condense, review, and present research findings on focused topics. Subject matter varies by semester. May be repeated for credit.
- 6105. Introductory Seminar in Environmental Toxicology (1:1:0).** Prerequisite: Graduate standing or consent of instructor. Topics include laboratory orientations, safety, quality assurance, good laboratory practices (GLP), animal care and use, standard operating procedures (SOP), and administrative procedures. Required for all new students in environmental toxicology.
- 6251. Analytical Toxicology Laboratory (2:0:2).** Corequisite: ENTX 6351 or consent of instructor. Extraction, cleanup, and quantitative analysis of environmental chemicals and their degradates. Reinforces and applies theories taught in ENTX 6351.
- 6300. Advanced Topics in Environmental Toxicology (3:3:0).** Special areas of current interest not generally covered in other courses. Content normally different each time offered. May be repeated for credit.
- 6325. Principles of Toxicology I (3:3:0).** Prerequisite: Graduate standing in the department or consent of instructor. First half of two semester course. Examines the foundations of toxicological sciences. Covers principles, disposition, and first half of toxicity mechanisms.
- 6326. Principles of Toxicology II (3:3:0).** Prerequisite: ENTX 6325. Second half of two semester course. Covers remaining mechanisms, toxic agents, and applied toxicology.
- 6327. Molecular Toxicology (3:3:0).** Prerequisite: ENTX 6325 and 6326 or consent of instructor. Molecular mechanisms and control of phase I and phase II xenobiotic metabolizing enzymes, oxidative stress, and carcinogenesis. Emphasizes prototypical chemicals with multiple modes of action.
- 6331. Reproductive and Developmental Toxicology (3:3:0).** Prerequisite: ENTX 6325 and 6326 or consent of instructor. Mechanistic treatment of chemical effects on reproductive and developmental processes and the resulting impacts on reproductive function, fertility, and the developing offspring.
- 6341. Pesticides in the Environment (3:3:0).** Prerequisite: Graduate standing or consent of instructor. A survey course on the fate and significance of pesticides in soil, water, and plants. Topics include pesticide classes and modes of action, microbial degradation, and nontarget effects.
- 6345. Chemical Sources and Fates in Environmental Systems (3:3:0).** Prerequisite: Organic and analytical or environmental chemistry or consent of instructor. Environmental phenomena and physical properties of chemicals are used to understand processes governing chemical fate in the environment from global to micro scales.
- 6348. Chemodynamics (3:3:0).** Prerequisite: ENTX 6345 or consent of instructor. Rate of transportation, disposition, and degradation of chemicals are explored using transport phenomena equations.
- 6351. Analytical Toxicology Lecture (3:3:0).** Prerequisite: ENTX 6345 or consent of instructor. Theory of isolation, detection, identification, and quantification of toxic substances and their transformation products in environmental and biological samples.
- 6361. Environmental and Wildlife Toxicology (3:3:0).** Prerequisite: Organic chemistry, ecology, or consent of instructor.

Examines exposure and effects of chemicals in wildlife, their study in the lab and field, and use of conducting ecological risk assessments.

- 6365. Fundamentals of Aquatic Ecotoxicology (3:3:0).** Prerequisite: Graduate or advanced undergraduate background in biological, chemical, or environmental sciences or consent of instructor. Covers effects of water pollution on aquatic organisms and human health. Subjects include fate and transport in aqueous systems, acute toxicity and toxicity tests, and effects of pollutants on aquatic systems from the molecular to the global levels.
- 6366. Advanced Environmental Toxicology (3:3:0).** Prerequisite: ENTX 6325 and 6326, 6345, or consent of instructor. Examines toxicological principles at population, community, and ecosystem levels stressing population dynamics, life history changes, community composition, and ecosystem dynamics.
- 6367. Advanced Wildlife Toxicology (3:3:0).** Prerequisite: ENTX 6325 and 6326, 6345, or consent of instructor. Environmental contaminant effects on reproduction, health, and well being of wildlife species and applications to ecological risk assessment.
- 6371. Procedures and Techniques in Ecological Risk Assessment (3:2:1).** Prerequisite: ENTX 6325, 6326, and 6345. Emphasizes testing techniques, site assessment and monitoring procedures, regulatory requirements, and field and laboratory techniques for ecological risk assessments.
- 6381. Quality and Ethics in Science (3:3:0).** Prerequisite: Basic statistics or consent of instructor. Principles and practices of obtaining and documenting quality in science. History, methods, costs, examples, and role of quality and ethics in regulatory and professional climates.
- 6385. Statistical Applications in Environmental Toxicology (3:3:0).** Prerequisite: STAT 5302 or equivalent. Designed for students who wish to understand the interrelationships of statistical distributions and particular statistical approaches to environmental toxicology data analysis.
- 6391. Modeling and Simulation in Ecotoxicology (3:2:1).** Prerequisite: Calculus. Model development, implementation, and simulation applied to ecotoxicology; stressor responses; toxicokinetics; individual organism effects; individual-based models; population, community, and landscape effects; parameter estimation; design and analysis of simulation experiments; and model validation.
- 6431. Biomarkers in Toxicology (4:2:2).** Prerequisite: ENTX 6325 and 6326. Lecture and laboratory on biomarker theory and use. Biochemical, physiological, histological responses to chemical exposure, effects and susceptibility are studied. Laboratory stresses individual and team approaches.
- 7000. Research (V1-12).**
- 8000. Doctor's Dissertation (V1-12).**

## Department of Geosciences

Professor Richard E. Peterson, Chairperson.  
 Professor Emeritus Reeves; Horn Professor Chatterjee;  
 Pevehouse Professor Asquith; Professors Barnes, Barrick,  
 Güven, Haragan, Leary and Lehman; Associate Professors  
 Chang, Gurrola, Karlsson; Assistant Professors Doggett,  
 Nagihara, Ridley, Schroeder, and Yoshinobu; Adjunct Faculty:  
 Johnson; Joint Faculty: Gill, Lee, and Rainwater.

This department offers study in the following graduate degree programs: ATMOSPHERIC SCIENCE and GEOSCIENCE, *Master of Science*; GEOSCIENCE, *Doctor of Philosophy*.

Master's degree candidates may specialize in areas within geology, atmospheric science, and geophysics. At the doctoral level, research specializations for the major

in geoscience are available in (a) sedimentology, sedimentary petrology, petroleum geology; (b) clay mineralogy and low temperature geochemistry, igneous petrology, high temperature geochemistry, and stable-isotope geochemistry; (c) paleobiology and biostratigraphy; (d) geophysics, structural geology, tectonics; and (e) integrated studies in earth and atmospheric sciences. Details concerning the specific makeup of these groups are available from the department.

General degree requirements are those of the Graduate School. Admitted students are strongly encouraged to associate themselves with a faculty member or members by the end of their first semester in residence. The instructor(s) will serve as the student's principal advisor and will be responsible for the student's degree program.

The department encourages students with bachelor's degrees from other sciences to enter the geosciences graduate program. Required leveling work will be determined on an individual basis, primarily by the staff member(s) in the student's field of interest. A graduate minor may be taken either inside or outside this department.

Requirements for the master's degree in atmospheric science beyond those stipulated by the Graduate School, if any, are determined in each case by the student's thesis committee. Requirements for the master's degree in geoscience are completion of 27 graduate hours in geology, geophysics, or related fields; 3 hours in science or engineering beyond those required for an undergraduate degree; and 6 hours of thesis credit. A 36-hour nonthesis option in geoscience is also available.

Requirements for the doctor's degree follow those of the Graduate School. The first year Ph.D. student will be expected to prepare and defend a research proposal. The intent of this work is to determine whether the individual is capable of Ph.D.-level research. In the second year, the student will formalize the dissertation topic and committee. Under normal circumstances, the committee will consist of between 3 and 5 members, including the faculty advisor. The Comprehensive Examination will be completed before the end of the fourth long semester in residence. One tool subject is required. Tool subjects include foreign language, computer science, and statistics and are determined by the graduate advisor and the student's dissertation committee. The tool can be met by taking two successive courses in the tool subject for a total of at least 6 semester hours, except for foreign language, the requirements for which are outlined in an earlier section of this catalog.

### Courses in Atmospheric Science. (ATMO)

- 5101. Atmospheric Science Seminar (1:1:0).** Discussions of current research or selected topics of interest. May be repeated for credit.
- 5301. Individual Studies in Atmospheric Science (3:3:0).** Prerequisite: Consent of instructor. A structured independent graduate studies course under the guidance of a faculty member. May be repeated for credit.
- 5302. Weather, Climate, and Applications (3:3:0).** Basic principles of atmospheric science, with particular emphasis on applications, including severe weather, air pollution, and global climate change.



- 5315. Atmospheric Convection (3:3:0).** Observations and models of convection in the atmosphere. Governing equations for shallow and deep convection. Natural and man-made plumes. Numerical and laboratory simulation of atmospheric convection.
- 5316. Dynamics of Severe Storms (3:3:0).** Observations and theoretical studies of severe storms. Conceptual and numerical models of storm structure and development.
- 5319. Boundary Layer Meteorology (3:3:0).** Boundary-layer turbulent transfer processes are examined, including diffusion, mixing, diabatic modification, low-level jet formation, and moisture discontinuities.
- 5320. Mesometeorology (3:3:0).** Temporal and spatial analysis of mesoscale phenomena, including thunderstorms. Models of mesoscale circulations.
- 5321. Cloud and Precipitation Physics (3:3:0).** Processes of cloud droplet nucleation; initial growth of droplets and cloud droplet size spectra; theories of natural precipitation processes and techniques for precipitation enhancement.
- 5327. Radar Meteorology (3:3:0).** Applications of radar to investigation of precipitating weather systems. Emphasis is given to analysis and interpretation of radar data in conjunction with other data sources.
- 5328. Synoptic Meteorology (3:2:3).** Basic techniques of interpreting meteorological data. Applications of analysis techniques to basic research and weather forecasting.
- 5331. Analysis of Geophysical Data Fields (3:3:0).** The application of fourier analysis, times series and spectral analyses, and objectives analysis to geophysical data fields.
- 5332. Regional Scale Numerical Weather Prediction (3:3:0).** Regional scale dynamics, numerical solution of geophysical problems, and numerical prediction of severe weather events such as tornadic storms and flash floods.
- 6000. Master's Thesis (V1-6).**
- 7000. Research (V1-12).**

### Courses in Geochemistry. (G CH)

- 5300. Individual Studies in Geochemistry (3:3:0).** A structured independent graduate studies course under the guidance of a faculty member. May be repeated for credit.
- 5303. Trace Element Geochemistry (3:3:0).** Theoretical basis for trace element distribution and fractionation. Trace element "fingerprints," use of stable and radioactive isotopes and rare-earth elements in petrology.
- 5305. Environmental and Aqueous Geochemistry (3:3:0).** Prerequisite: Inorganic chemistry or equivalent. Theoretical and applied aspects of geochemistry occurring in the upper crust. May be repeated for credit.
- 5307. X-ray Powder Diffraction Methods (3:2:3).** Fundamental and practical aspects of X-ray diffraction on polycrystalline substances such as minerals, rocks, and other solids.
- 5309. Clay Mineralogy (3:2:3).** Atomic structures of clay minerals in relation to physical, engineering, and colloid chemical properties of these materials. Instrumental methods of clay analysis such as X-ray diffraction and ion exchange methods.
- 5350. Isotope Geochemistry (3:3:0).** Principles of isotope chemistry as applied to the earth and solar system. Radioactive and stable isotope systematics.
- 5405. Inorganic Geochemistry (4:4:0).** Origin of elements and isotopes. Theory and application of isotopic systems, element mobility, thermodynamics, solution geochemistry, and geochemical cycles.

### Courses in Geology. (GEOL)

- 5001. Problems in Geosciences (V1-6).** Independent study under guidance of a faculty member.
- 5101. Seminar (1:1:0).**
- 5211. Sedimentary Petrology (2:2:0).** Origin, classification, and diagenesis of siliciclastic and carbonate sediments and sedimentary rocks. May be repeated for credit.
- 5212. Sedimentary Petrology Methods (2:0:6).** Textural analysis, mineral separation, and thin section petrography of siliciclastic and carbonate sediments and sedimentary rocks. May be repeated for credit.

- 5300. Individual Studies in Geology (3:3:0).** A structured independent graduate studies course under the guidance of a faculty member. May be repeated for credit.
- 5303. Advanced Igneous Petrology (3:3:0).** Phase relations, geochemistry, and tectonic setting of igneous rocks. Emphasis on modern concepts of magma origin and differentiation. May be repeated for credit.
- 5305. Tectonic Evolution of Western North America (3:3:0).** Prerequisite: Consent of instructor. Survey of the geologic and tectonic evolution of the western margin of North America over the past 3 billion years.
- 5310. Advanced Quantitative Methods in Geology (3:3:0).** This class will emphasize computer methods of error analysis, data processing, and modeling of geological data. Applications to current research problems will be included.
- 5311. Micropaleontology (3:2:3).** Lectures and labs are designed to acquaint the student with basic lab techniques, morphology, and classification within the major microfossil groups, and to demonstrate the usefulness and importance of microfossils as biostratigraphic and paleoecologic tools.
- 5314. Problems in Stratigraphy (3:3:0).** Analysis of selected stratigraphic units emphasizing geometry, paleogeography, environments of deposition, depositional models, and theoretical problems.
- 5322. Sedimentary Processes (3:3:0).** Principles of fluid dynamics important in sedimentation, interpretation of primary sedimentary structures, and description of depositional environments.
- 5323. Depositional Systems and Basin Analysis (3:3:0).** Sedimentary Facies models for clastic and carbonate depositional systems and models for sedimentary basins in different tectonic settings.
- 5325. Petrophysics (3:3:0).** Physical properties of reservoir rocks, including porosity, permeability, composition, and texture. Interrelationships between rock characteristics and electric log responses in geologic exploration and exploitation.
- 5327. Problems in Paleontology (3:2:3).** Subjects include origin of life, Precambrian life, origin and relationships of fish, amphibians, reptiles, dinosaurs, pterosaurs, birds, and primates; mass extinction and impact cratering processes.
- 5340. Advances in Historical Geology (3:3:0).** Survey of currently important topics in earth processes and history for science educators, with an emphasis on how geologists interpret modern and past geologic events.
- 5341. Digital Imagery in Geosciences (3:2:3).** Introduction to digital image processing, visualization, and raster GIS modeling applied to geosciences. Involves computer lab exercises.
- 5342. Spatial Data Analysis and Modeling in Geosciences (3:2:3).** Introduction to vector GIS data manipulation, geostatistics, and spatial modeling applied to geosciences. Involves computer lab exercises.
- 5362. Advanced Tectonics (3:3:0).** Survey of the plate tectonics paradigm in terms of its historical development and modern application.
- 5399. Advanced Petrophysics (3:3:0).** Analysis of complex reservoirs, such as shaly sands, carbonates with complex pore geometries, fractured reservoirs, and gas-bearing dolomites. The development and use of new logging tools is also covered.
- 5410. Vertebrate Paleontology (4:3:3).** An introduction to the principles of paleontology governing evolution, morphology, and phylogeny of major groups of vertebrates.
- 5420. Geological Correlation (4:2:6).** Principles and methods of correlation of stratigraphic units with the geological time scale including chronostratigraphy, biostratigraphy, ecostratigraphy, sequence stratigraphy, event stratigraphy, chemostratigraphy, and related techniques.
- 5428. GIS in Natural Science and Engineering (4:3:3).** Survey of the broad spectrum of geo-information science and technology applied to researches in natural science and engineering. Involves computer lab exercises.
- 6000. Master's Thesis (V1-6).**
- 7000. Research (V1-12).**
- 8000. Doctor's Dissertation (V1-12).**

**Courses in Geophysics. (G PH)**

- 5221. Advanced Seismic Exploration Methods (2:1:3).** Methods to collect, process, and interpret seismic data are discussed.
- 5223. Advanced Applied Electrical Methods (2:1:3).** Electromagnetic, resistivity, and ground penetrating radar methods of geophysical investigation are discussed.
- 5231. Seismology (2:2:0).** Seismic wave and ray theory is discussed.
- 5233. Electrical Methods (2:2:0).** Theory and numerical representation of electromagnetic and electrical methods are discussed.
- 5300. Individual Studies in Geophysics (3:3:0).** Prerequisite: Consent of instructor. A structured independent graduate studies course under the guidance of a faculty member. May be repeated for credit.
- 5310. Geophysical Fluid Dynamics (3:3:0).** Survey of dominant modes of wave motion in the atmosphere. Scale analysis for problems in atmospheric dynamics with application to mid-latitude synoptic scale systems.
- 5324. Radiative Transfer (3:3:0).** Principles of radiation, the radiative transfer equation. Applications to absorption, emission, and scattering processes. Determination of physical properties from satellite measurements.

## Department of Health, Exercise, and Sport Sciences

Professor T. Gilmour Reeve, Chairperson.

Associate Professors Dornier, Hall, James, Massey-Stokes, McComb, and Meaney; Assistant Professors Lochbaum, Miller, Roncesvalles, Scheuermann, Smucker, Tacon, and Williams; Adjunct Faculty: Henry.

This department offers study in the following graduate degree programs: EXERCISE AND SPORT SCIENCES and SPORTS HEALTH, *Master of Science*.

The M.S. degree in exercise and sport sciences provides advanced study in biomechanics, exercise physiology, motor behavior, sport and exercise psychology, sports management, or teaching physical education and sport. The degree program consists of a minimum of 36 hours of graduate work, thesis and nonthesis options are available. The department will determine and prescribe any necessary leveling work. There is no foreign language requirement.

The M.S. degree in sports health is an interdisciplinary program offered in conjunction with the Health Sciences Center. Students in the sports health program may specialize in clinical exercise physiology or preventive and rehabilitative sports health. The program requires at least 42 hours of graduate work. Thesis and nonthesis options are available. A complete description of the sports health program appears in the section of this catalog entitled "Opportunities for Interdisciplinary Study."

Students seeking either degree should consult with the chairperson of the department or the associate chairperson for graduate programs about their programs before enrolling in any courses.

The department also offers a joint Doctor of Philosophy degree in physiology with the Department of Physiology at the Health Sciences Center. The joint doctoral

program is designed to include both basic and applied physiology course work with laboratory experiences using animal and human models.

**Courses in Exercise and Sport Sciences. (ESS)**

- 5001. Workshop in Health, Physical Education, and Recreation (V1-6).** A maximum of 6 hours credit may be earned in one or more semesters.
- 5002. Internship in Sports Health (V1-6).** Prerequisite: 12 hours of approved course work in sports health and/or departmental approval. A maximum of 6 hours credit may be earned in one or more semesters.
- 5003. Internship in Sports Administration (V1-6).** Prerequisite: 18-24 hours of approved course work in sports administration and departmental approval. A maximum of 6 hours credit may be earned in one or more semesters.
- 5303. Psychology of Sport (3:3:0).** Theory and practice of the major psychological dimensions underlying the behavior of the coach and athlete in the sport context.
- 5305. Motor Learning (3:3:0).** The study of the principles and concepts of human behavior related to and affected by human movement with emphasis on motor skill learning.
- 5306. Mechanical Analysis of Motor Performance (3:3:0).** A study of the laws and principles governing human motion. Emphasis on analysis of sports movement with applications to the teaching and learning of motor skills.
- 5307. Motor Development (3:3:0).** The study of human development from conception through adulthood. Examines and discusses theoretical perspectives and motor development research throughout the life span.
- 5308. Physiology of Exercise (3:3:0).** Effect of muscular activity on body processes.
- 5309. Children in Sport (3:3:0).** The study of the physiological, psychological, and sociological variables that influence children's participation in sport.
- 5310. Biomechanics of Musculoskeletal Injuries (3:3:0).** Biomechanics of the musculoskeletal system including bone, cartilage, ligament, tendon, and muscle tissue. Emphasis on joint and tissue forces in order to understand injury mechanisms.
- 5311. Stress Management and Cardiac Disease (3:3:0).** A study of the physiological adaptation and the psychological causes of stress. Intervention techniques and management strategies will be emphasized.
- 5312. Behavioral and Psychological Aspects of Exercise (3:3:0).** The study of psychological processes and behaviors as they relate to exercise adoption, participation, and adherence. Motivation, personality, and behavior modification research will be discussed.
- 5313. Applied Psychology of Sport (3:3:0).** Applied aspects of psychological skills in sport and exercise and how individuals can use these skills to positively affect sport and exercise participation, performance, motivations, and enjoyment.
- 5314. Methods in Biomechanics Research (3:3:0).** Prerequisite: ESS 5306 or consent of instructor. Examination of methods of research, instrumentation, and quantitative application of kinematic and kinetic concepts in the biomechanical analysis of human movement.
- 5315. Research in Exercise and Sport Sciences (3:3:0).** Research methods, research design, treatment and interpretation of data.
- 5317. Seminar in Exercise and Sport Sciences (3:3:0).** Specific research topics in exercise and sport sciences will be studied. May be repeated for credit.
- 5322. Management of Sport and Athletics (3:3:0).** Methods of organizing and administering sport and athletic programs. Study of staff, program, budget, health and safety, facilities, publicity, history, duties of an athletic director, and national, state, and local controls.
- 5323. History and Philosophy of Physical Education (3:3:0).** Historical and philosophical factors influencing physical education.

- 5324. Marketing and Promotion in Sport (3:3:0).** Understanding the sport industry. Developing knowledge and skills of marketing process in sport operations. Sport sponsorship, promotion, and public relations.
- 5325. Legal and Ethical Aspects of Sport (3:3:0).** Ethical theory and professional ethics of sport managers. The principles of laws (constitutional, tort, contractual, labor, and antitrust laws, etc.) effecting sport management.
- 5326. Supervision of Physical Education (3:3:0).** Principles, problems, relationships, and procedures in evaluation of content, instructional methods, and teacher effectiveness. For school administrators, district and school physical education coordinators, athletic directors, and city recreation directors.
- 5327. Sport Facility Planning and Management (3:3:0).** Principles, terminology, and standards for planning, construction, use, and maintenance of facilities.
- 5328. Sport in American Culture (3:3:0).** Analysis of the place of sport in American society and the impact of sport on American culture.
- 5329. Teaching in Physical Education (3:3:0).** An examination of instructional theory methods and management duties for novice instructors of university sport skill, fitness, and wellness courses. Required for graduate teaching assistants.
- 5331. Research in Sports Health (3).** Prerequisite: ESS 5315. Required for non-thesis candidates for the M.S. degree in sports health.
- 5332. Applied Physiology of Exercise (3:3:0).** Prerequisite: ESS 5308 or equivalent. Applied principles of exercise physiology including cardiorespiratory, biochemical, and environmental considerations.
- 5333. Administration of Sports Health Programs (3:3:0).** An in-depth study of the administration and management of sports health programs.
- 5334. Clinical Exercise Testing and Prescription (3:3:0).** Prerequisite: ESS 5308 or consent of instructor. Advanced theory and practical application to clinical aspects of exercise testing and prescription. Concentration on diseased and disabled populations.
- 5337. Electrocardiography (3:3:0).** An in-depth study of exercise-electrocardiography (ECG) preparation, administration, and interpretation.
- 5338. Cardiopulmonary Rehabilitation (3:3:0).** Topics in cardiopulmonary rehabilitation including program management, organization, advanced diagnostic testing, and prescriptive procedures.
- 6000. Master's Thesis (V1-6).**
- 7000. Research (V1-12).**
- 8000. Doctor's Dissertation (V1-12).**

### Courses in Health. (HLTH)

- 5313. Health Behavior and Health Promotion (3:3:0).** Provides an overview of various health behavior theories and their application to health promotion and education.
- 5344. Psychosocial Aspects of Health (3:3:0).** This course is an examination of psychosocial factors and processes that influence health status, health beliefs, behaviors, and outcomes.

## Department of History

Professor Bruce Daniels, Chairperson.

Horn Professor Kuethe; Professors Barr, Bell, Carlson, Howe, King, and Rainger; Associate Professors Brink, Miller, Reckner, Steinhart, Traylor, Troyansky, and Walker; Assistant Professors Alford, D'Amico, Deslandes, Forsythe, Gray, Iber, Lorcín, McBee, Mosher, Pelley, Snead, Stoll, and Willett; Adjunct Faculty: Frankum, Paksoy, Pike and Tydeman.

This department offers study in the following graduate degree programs: HISTORY, *Master of Arts* and *Doctor of Philosophy*.

Information on departmental admission standards, prerequisites, and other matters dealing with graduate study in history may be acquired by writing the graduate advisor or the chairperson of the department.

A student in the standard master's degree program must complete 30 hours of graduate courses including HIST 5304, one seminar in the 6000-course series, a 6 hour nondepartmental minor, and 6 hours in thesis work. Course work is planned in consultation with the graduate advisor or thesis director soon after admission to the graduate program. The department requires a reading knowledge of one foreign language. A student with an interest in archival administration may substitute a 6 semester hour minor, composed of HIST 5309 and 3 hours of archival practicum (taken as HIST 7000), for the usual 6 hour minor in another department which is required for the standard master's degree.

To provide a program of study for persons whose interests may not be oriented toward formal research, the department offers a nonthesis master's plan designed to contribute significantly to their intellectual development. The plan is not recommended for students contemplating doctoral work. To complete the program, a student must offer a minimum of 30 semester hours in history and 6 in a minor. Of the history hours, 6 must be from HIST 5304, 5305, or 5306 and at least 6 must be from seminars at the 6000 level with a grade of B or better under two or more instructors. No more than 18 semester hours may be offered in any one of the five areas of United States, European, Latin American, African, and Asian history. Students following the nonthesis route must pass a comprehensive examination during the semester they plan to graduate.

The department offers doctoral work in five areas of history: United States, European, Latin American, Asian, and African. For purposes of examining students, these areas are subdivided into fields as follows:

United States: Chronological grouping—Colonial and early Republic, nineteenth-century United States, and twentieth-century United States history. Topical grouping—African American, agricultural and rural, diplomatic, economic, environmental, Hispanic-Latino, immigration, legal and constitutional, military, Native American, science and technology, social and cultural, southern, sports, Texas, urban, western, and women's history.

Europe: Ancient, medieval, early modern Europe to 1789, modern Europe, modern Britain and the Empire-Commonwealth, science and technology. Early modern European history and modern European history may each be subdivided into two topical or chronological fields.

Latin America: Colonial and national history.

Asia: Asian history.

Africa: African history.

Doctoral students must choose five fields of study for their programs, at least two of which shall be outside the area in which they propose writing the dissertation. At least four of the fields must be in history. The fifth field may be in history, or in another discipline, or it may be composed of courses from different departments with a



thematic unity and logical relationship to the student's overall plan of study. No more than 6 hours in a composite field may be in history (such as archives courses). A student choosing two fields in the area of United States history shall select at least one field from the chronological grouping. All programs shall include at least one field in Europe (science and technology may not be the sole field in Europe), and one in the United States. Dissertations may be written in United States, Latin American, European, or Southeast Asian history (projects in other areas require the specific approval of the department's graduate studies committee). All doctoral programs must include HIST 5305 and two seminars in the 6000-course series, or their equivalents. Students writing dissertations in American history must take HIST 5306.

In the preliminary examination, the student is tested orally in five fields of study. The purpose of the examination is to determine if the student should be encouraged to continue study toward the doctorate, and, if so, to provide specific recommendations on steps to be taken before the qualifying examination. In this latter examination, the student is expected to show command of five fields.

The standard language requirement for the Ph.D. degree is a reading knowledge of two of the following: French, German, Latin, and Spanish. In appropriate cases, with the approval of the student's advisory committee and the graduate studies committee, one of the choices may be another language, or a relevant research tool (such as computer science or statistics). For dissertations in the area of Southeast Asia utilizing the Vietnam Archive, the approved languages are normally French and Vietnamese.

### Courses in History. (HIST)

- 5101. Teaching of History in College (1:1:0).** An observation-and-advice course rather than a seminar. Concerned with supervision of teaching assistants: classroom visitation, judgment on performances, and advice and assistance to individual instructors.
- 5304. Historical Methods (3:3:0).** Research methods; bibliography, government documents, newspapers, dissertations, archives and manuscripts, oral history, quantitative history, historical archeology; literary organization and style; footnote and bibliographic forms.
- 5305. Historiography (3:3:0).** A survey of major historians and historical works from Herodotus to the present, emphasizing the development of history as an intellectual orientation and as an academic discipline.
- 5306. Recent Interpretations of American History (3:3:0).** A survey of recent major works discussing chronological periods and topics in American history. Required of some master's and doctoral students.
- 5307. Studies in World History (3:3:0).** This course provides an overview of the field of world history emphasizing both the global past and methodological debates.
- 5308. Historical Studies of Religion (3:3:0).** A survey of scholarly attempts to understand the history of religion emphasizing historiographical achievements and methods.
- 5309. Administration of Archival and Manuscript Collections (3:3:0).** An intensive study of archival principles and techniques emphasizing current trends and challenges, with an opportunity for professional management and/or research facility enhancement through in-service training.
- 5311. Studies in United States Colonial and Revolutionary History (3:3:0).** Topics vary from semester to semester, including seventeenth-century Massachusetts, the coming of the American Revolution, and the new nation after 1776.
- 5312. Studies in Nineteenth-Century United States History (3:3:0).** Selected topics in the history of the United States, 1789-1890 with emphasis on bibliography and problems of interpretation. Extensive readings of monographs and journals.
- 5313. Studies in Recent United States History (3:3:0).** Selected periods in twentieth-century American history—the Progressive Era and the 1920s, the New Deal and World War II, and the postwar years.
- 5315. Studies in Texas History (3:3:0).** Topics vary with interests and needs of each class; emphasis on Spanish heritage, Texas Revolution, Republic, political, economic, and social developments, ethnic groups.
- 5316. Studies in Southern History (3:3:0).** An analysis of the major issues and controversies of the South with emphasis on the period from the American Revolution to the present.
- 5317. Studies in Frontier and Western American History (3:3:0).** An examination of selected areas with emphasis on exploration, settlement, Anglo-American expansion, foreign and Indian conflicts, life-ways, and resulting changes in American institutions.
- 5319. Studies in Native-American History (3:3:0).** A reading seminar on the literature of Native-American history and the Native Americans of the plains and the southwest.
- 5321. Studies in American Legal and Constitutional History (3:3:0).** An examination of selected topics concerning the history of the bar, judiciary, police, corrections, legal doctrines, and statutory law.
- 5322. Studies in United States Diplomatic History (3:3:0).** American diplomacy and foreign policy with emphasis on either pre-1900 or post-1900 periods. Stress on the literature of United States diplomatic history.
- 5323. Studies in the History of Science and Technology (3:3:0).** Topics vary to include 20th-century American science, the industrial revolution, and the social relations of science and technology.
- 5325. Studies in American Economic History (3:3:0).** Historical analysis and interpretation of growth and change in the United States economy, with emphasis on ideas and institutions in business and agriculture.
- 5326. Studies in American Environmental History (3:3:0).** A reading in American environmental and conservation historical literature from the Age of Discovery to the present environmental movement.
- 5327. Studies in United States Immigration and Urban History (3:3:0).** Explores a series of problems in United States immigration and urban history since the mid-nineteenth century.
- 5328. Studies in American Military and Naval History (3:3:0).** A study of American military and naval history. Emphasis on development of institutions and national struggles.
- 5333. Studies in African-American History (3:3:0).** Studies of African influences, racial ideas, slavery, and post-emancipation efforts to achieve civil and political rights, education, economic opportunity and the creation of social institutions.
- 5337. Studies of Women in American History (3:3:0).** A survey of significant literature and analysis of problems related to the study of women in American history.
- 5338. Studies in American Social History (3:3:0).** Reading, analysis, and critical reviews of pivotal works. Emphasis on varieties and impact of social history on topics such as family, community, race, gender, and work.
- 5340. Studies in Ancient History (3:3:0).** Study of selected topics in the political or intellectual history of Greece and Rome based upon a study of the sources, in translation if advisable.
- 5341. Studies in Medieval History (3:3:0).** Study of selected topics in the intellectual history of the early and high middle ages. Individual reports discussed in a seminar situation.
- 5342. Studies in Renaissance and Reformation History (3:3:0).** Study of selected topics in the intellectual or religious history of the Renaissance or the Reformation. Individual reports discussed in a seminar situation.

- 5343. Studies in Eighteenth-Century European History (3:3:0).** Examines the social, cultural, and intellectual history of Europe in the era of the Enlightenment and the French Revolution.
- 5344. Readings in European Nationalism (3:3:0).** Takes a cross-disciplinary approach to the study of European nationalism. Emphasizes historians' contribution to this field. May be repeated for credit.
- 5345. Studies in the History of Fascist and Related Right-Wing Movements in Europe (3:3:0).** Examines individually and collectively themes of nationalism, anti-Semitism, militarism, and anti-Marxism, chiefly in the period 1918-1945.
- 5346. Studies in Modern European History (3:3:0).** Examines the social, cultural, and political history of Europe from 1815 to the present.
- 5347. Studies in British History (3:3:0).** An organized studies course covering selected topics in British history. Topics vary according to the students' needs.
- 5348. Studies in Roman Law (3:3:0).** Topics in the historical development of classical Roman law. Designed to meet the needs of both law and graduate students.
- 5349. Readings in Modern East Central European History (3:3:0).** The history and historiography of modern East Central Europe from the Revolutions of 1848 to the collapse of Communism in 1989. May be repeated twice for credit.
- 5350. Studies in African History (3:3:0).** A survey of African history focusing on major problems of interpretation. Includes political, economic, religious, and cultural change; pre-colonial and colonial encounters.
- 5351. Slavery in a World Perspective (3:3:0).** An examination of the main areas and epochs in which slavery institutions were central: Antiquity, Medieval Europe, Pre-Colonial Africa, the West Indies, and Southern U.S.
- 5352. Studies in Asian History (3:3:0).** A reading and research course in Asian history focusing on developments in nineteenth- and twentieth-century social, political, and cultural history.
- 5355. Studies in Colonial Latin American History (3:3:0).** Explores the principal historical literature and interpretations for Colonial Spanish America from the conquest to independence.
- 5356. Studies in National Latin American History (3:3:0).** Examines the history of the areas since independence with emphasis on modernization. Includes consideration of Latin America as a civilization while revealing unique characteristics of the individual countries.
- 5362. Studies in the History of Aging and the Family (3:3:0).** Examines topics in historical demography and the history of childhood, gender, family types, aging, the aged, and death. Emphasis on Europe and the United States.
- 5366. Studies in Religious History (3:3:0).** Investigations of the development of religious institutions, the relationship between religion and society, and cross-cultural religious phenomena.
- 6000. Master's Thesis (V1-6).**
- 6304. Seminar in American History (3:3:0).** A research course featuring formal papers on selected topics. Topics chosen in consultation with the instructor.
- 6305. Seminar in European History (3:3:0).** Research seminar, with stress on methodology, types of research materials available in our library in European history, delivery of reports, and submission of an extensive term paper.
- 7000. Research (V1-12).**
- 8000. Doctor's Dissertation (V1-12).**

## School of Mass Communications

Professor Jerry Hudson, Director.  
 Professor Harp; Associate Professors Carveth, Oskam, Parkinson, Reeves, Saathoff, Thornhill, and Watts; Assistant Professors Bichard, Callison, Chambers, and Johnson.

This school offers study in the following graduate degree program: MASS COMMUNICATIONS, *Master of Arts*.

The master's program is designed to prepare students to enter the communications industry or to continue studies toward the Ph.D. degree in advanced communications theory, issues, and research. Depending upon courses selected, students are prepared for careers in media (journalism, publishing, and electronic communications), advertising, public relations, human-resource development, and related fields. Careers in the communications industry include professional opportunities in marketing, sales, technological product development, research and analysis, strategic planning, or other positions with broad spheres of national and international influence.

The student is offered two curriculum options: A 31-hour program of work culminating in the traditional research-based master's thesis; or a 37-hour program requiring completion of either comprehensive written exams or a written report based upon a master's-level professional project. Students choosing the option of comprehensive written exams must complete 37 hours of course work. Students choosing the master's-level professional project must complete 31 hours of course work plus 6 hours of MCOM 6050. The thesis, comprehensive exams, and master's level professional project are all executed under faculty-committee direction. Up to 6 hours may be taken in cognate areas.

Students seeking the master's degree should consult the director of the school or the school's graduate coordinator before enrolling in any courses.

Upon entering the school's program, graduate majors without prior academic or professional experience in one of the fields of mass communications may be required to take up to 9 hours of graduate leveling work. Such courses must be in addition to the graduate-hour requirements noted in the program options above. Students should consult the graduate coordinator regarding the means of fulfilling these requirements.

### Courses in Mass Communications. (MCOM)

- 5160. Proseminar in Mass Communications (1:1:0).** Designed to bring together students and faculty for professional and academic interchange with emphasis on research interests of faculty and advanced graduate students. Pass-fail only.
- 5320. Mass Communications Law (3:3:0).** A study of the legal problems facing journalists, broadcasters, and advertisers including libel, privacy, and regulation of telecommunications media and commercial speech.
- 5330. Critical Studies in Mass Communications (3:3:0).** Surveys a wide range of interpretive methods, cultural theories, and critical issues. Includes units on advertising, journalism, entertainment television, and the music industry.
- 5344. Seminar in Public Opinion and Propaganda (3:3:0).** A study of propaganda theory and methods. Bases of public opinion. Opinion-making processes in governments, political parties, pressure groups.
- 5347. Studies in International Communications (3:3:0).** A critical examination of the structure, control, and performance of the media systems of nations and regions.
- 5349. Administration of Communications Media (3:3:0).** For mass communications majors only. Problems of executive planning and management of newspapers, magazines, and broadcast media.
- 5362. Seminar in Mass Communications (3:3:0).** A comprehensive exploration of theory and research into the social, psychological, and economic problems affecting modern mass communications.

- 5364. Research Methods (3:3:0).** Basic communications research designs: exploratory, survey, experimental, content, and secondary analysis. Measures of central tendency, contingency analysis, correlation analysis.
- 5366. Seminar in Mass Communications Theory (3:3:0).** In-depth study of the theory and epistemology of mass communications. Integration, comparison, and extension of theories with respect to a specific problem area including practice in development of research hypotheses.
- 5370. Internship in Mass Communications Administration (3).** Prerequisite: MCOM 5349 and approval of instructor. Supervised experience in an established career-related area of mass communications administration. May not be substituted for MCOM 6050.
- 5372. Survey Research Methods (3:3:0).** Methodological and practical issues covering the design, conduct, and analysis of surveys, including sampling, questionnaire wording and design, survey administration, and analysis and presentation of results. For majors and nonmajors.
- 5374. Data Analysis (3:3:0).** Prerequisite: MCOM 5364. The use and interpretation of statistics for data analysis. Covers the selection of statistical techniques, the use of statistics packages, and the interpretation of results.
- 5376. Content Analysis Research (3:3:0).** The preparation, practice and analysis of data using content analysis. Course focuses on coding, categorizing, characterizing, and organizing data. For majors and nonmajors.
- 5378. Electronic Information Retrieval and Dissemination (3:3:0).** Strategies to find, evaluate, and interpret data using Internet resources. Writing articles and creating Web publications and pages.
- 6000. Master's Thesis (V1-6).**
- 6050. Master's Report (V1-6).**
- 7000. Research (V1-12).**

### Courses in Journalism. (JOUR)

- 5314. Editorial and Specialty Reporting (3:3:0).** Prerequisite: JOUR 2310, MCOM 3309, or equivalent. Evaluating contemporary problems. Editorial thinking and research; writing editorials and interpretive articles.
- 5316. Science and Technology Reporting (3:3:0).** Prerequisite: JOUR 4370 or consent of instructor. Instruction, discussion, and application of techniques of researching and writing science and technology stories for news media. Focus on current topics in science and technology.
- 5370. Public Affairs Reporting (3:3:0).** Prerequisite: 2310, 3312, or consent of instructor. A course in the interrelation and writing of news on social, political, and economic topics. Lecture and discussions implemented through off-campus laboratory assignments.
- 7000. Research (V1-12).**

### Courses in Advertising. (ADV)

- 5322. Contemporary Issues in Advertising (3:3:0).** In-depth study of, and research into, current ethical, social, psychological, political, and economic issues affecting advertising performance. Majors and nonmajors.
- 5326. Advertising and the Consumer (3:3:0).** Survey and analysis of current behavioral science findings as related to advertising.
- 7000. Research (V1-12).**

### Courses in Public Relations. (P R)

- 5342. Contemporary Issues in Public Relations (3:3:0).** In-depth study of, and research into, current ethical, social, psychological, political, and economic issues affecting public relations performance. Majors and nonmajors.
- 5343. Public Relations Problems and Cases (3:3:0).** Use of contemporary public relations problems and cases to study planning, strategy, and tactics, including the organization, execution, and control of the PR function in organizations.

- 5344. Public Relations in Health Care Communications (3:3:0).** Study and application of public relations theory and research in health care services. Addresses communication techniques among diverse publics of health care providers and organizations.

- 5345. Public Relations in the Nonprofit Sector (3:3:0).** A seminar format course that addresses the communication theory and research related to planning, implementing, and evaluating public relations in the nonprofit sector.

- 7000. Research (V1-6).**

### Courses in Telecommunications. (TELE)

- 5331. Contemporary Issues in Telecommunications (3:3:0).** In-depth study of, and research into, current ethical, social, psychological, political, and economic issues affecting telecommunications. Majors and nonmajors.

- 7000. Research (V1-12).**

### Courses in Photography. (PHOT)

- 5310. Seminar in Contemporary Issues in Visual Communications (3:3:0).** A research oriented course on current trends in visual communications. Topics may vary.

- 7000. Research (V1-12).**

## Department of Mathematics and Statistics

Professor Lawrence Schovanec, Chairperson.

Horn Professor and Ex-Students Association Distinguished Professor Martin; Horn Professor Ruymgaart; Professors E. Allen, L. Allen, Anderson, Barnard, Bennett, Chanda, Dayawansa, Duran, D. Gilliam, Gustafson, Harris, Lewis, Mansouri-Ghiassi, Newman, Pearce, M. Shubov, V. Shubov, Smith, Strauss, Victory, and Yang; Associate Professors Ackleh, Byerly, Drager, Gornet, Lee, Sun, Wang, Weinberg, and White; Assistant Professors Gelca, Hodjicostas, Juan, Korchagin, Paige, Seshaiyer, Surles, Toda, Venkataraman, and Williams; Adjunct Faculty: Berg, and X. Gilliam.

This department offers study in the following graduate degree programs: *MATHEMATICS*, *Master of Arts*, *Master of Science*, and *Doctor of Philosophy*; *STATISTICS*, *Master of Science*.

Students seeking an advanced degree in mathematics or statistics should consult with the Graduate Director of the Department of Mathematics and Statistics before enrolling in any courses. The department offers a number of graduate courses that are suitable for students who wish to complete a minor in mathematics or statistics.

The Department of Mathematics and Statistics does not have a foreign language requirement for the master's degree. Any foreign language requirement for the Ph.D. degree will be at the discretion of the student's dissertation advisor.

The M.A. degree in mathematics consists of 36 hours of graduate work, including 3 hours of credit for a departmental report. The student must complete three sequences chosen from algebra, analysis, geometry, probability and statistics, number theory, applied mathematics, and computer literacy and programming. This degree is offered primarily for those students who wish to teach mathematics at the secondary level or at a junior college.



The M.S. degree in mathematics consists of 36 hours of graduate work, including 3 hours of credit for a departmental report, or 30 hours of graduate work including 6 hours of credit for the master's thesis. The student must complete at least two of the core sequences listed on the Ph.D. program for the 36-hour plan and at least one of the core sequences for the 30-hour plan. In the 36-hour plan a minor of 9 hours is permitted and in the 30-hour plan a minor of 6 hours is permitted. In each case the minor must be approved by the graduate advisor.

A M.S. degree in mathematics with emphasis in computer science is also offered. The degree consists of 36 hours with 3 hours of credit for a departmental report. This plan calls for 18-21 hours of graduate course work in mathematics and 12-15 hours of graduate course work in computer science. Of the 18-21 hours of mathematics course work, at least two sequences from the list in the departmental handbook must be completed. The 12-15 hours of computer science course work constitute adjunct requirements and must be approved by the graduate advisor.

The M.S. degree in statistics consists of 36 hours of graduate work including 3 hours of credit for a departmental report or 6 hours of credit for the master's thesis. Up to 3 hours of graduate work are permitted in other areas such as agriculture, biology, business, economics, engineering, psychology, sociology, or fields as approved by the graduate advisor.

Each doctoral student will undergo a preliminary examination as early as possible during graduate training. The examinations will be administered annually in May and the results evaluated by the Graduate Programs and Policies Committee of the Mathematics and Statistics Department. Details concerning the preliminary examinations can be found in the departmental handbook. Each doctoral student must also pass a qualifying examination in a specialty area.

Each degree plan must be approved by the graduate advisor.

### Courses in Mathematics. (MATH)

- 5101. Seminar in Algebra (1:1:0).** Discussion of current research and topics of interest in algebra. Must be taken pass-fail. May be repeated for credit.
- 5102. Seminar in Analysis (1:1:0).** Discussion of current research and topics of interest in analysis. Must be taken pass-fail. May be repeated for credit.
- 5103. Seminar in Control Theory (1:1:0).** Discussion of current research and topics of interest in control theory. Must be taken pass-fail. May be repeated for credit.
- 5104. Seminar in Statistics (1:1:0).** Discussion of current research and topics of interest in statistics. Must be taken pass-fail. May be repeated for credit.
- 5105. Seminar in Topology (1:1:0).** Discussion of current research and topics of interest in topology. Must be taken pass-fail. May be repeated for credit.
- 5106. Seminar in Applied Mathematics (1:1:0).** Discussion of current research and topics of interest in applied mathematics. Must be taken pass-fail. May be repeated for credit.
- 5107. Seminar in Biomathematics (1:1:0).** Discussion of current research and topics of interest in biomathematics. Must be taken pass-fail. May be repeated for credit.
- 5304. Applied Mathematics for Behavioral and Management Sciences I (3:3:0).** Topics cover the calculus of a single variable. Applications emphasized. Computing is introduced and utilized. Not for mathematics, physical science, or engineering majors.
- 5305. Applied Mathematics for Behavioral and Management Sciences II (3:3:0).** Topics cover the calculus of several variables. Introduction to probability theory and linear algebra. Applications emphasized. Computers and symbolic manipulator software are utilized. Not for mathematics, physical science, or engineering majors.
- 5310, 5311. Principles of Classical Applied Analysis I, II (3:3:0 each).** Fourier series and integrals, discrete Fourier series, Laplace transforms, calculus of variations, Sturm-Liouville problems, integral equations, equations of fluids and solids, and ordinary and partial differential equations.
- 5312. Control Theory I (3:3:0).** Prerequisite: MATH 2360, 3354, 4351, or consent of instructor. Linear dynamical systems, stability, frequency response and Laplace transform, feedback, state-space description, and geometric theory of linear systems. (M E 5312)
- 5313. Control Theory II (3:3:0).** Prerequisite: MATH 5312, 5316, 5318, or consent of instructor. Quadratic regulator for linear systems, Kalman filtering, non-linear systems, stability, local controllability, and geometric theory of non-linear systems. (M E 5313)
- 5316. Applied Linear Algebra (3:3:0).** Prerequisite: Consent of instructor. Solution of linear systems, matrix inversion, vector spaces, projections, determinants, eigenvalues and eigenvectors, Jordan form, computational methods, and applications.
- 5318, 5319. Intermediate Analysis I, II (3:3:0 each).** The real number system, introduction to metric spaces, sequences, continuity, differentiation, Riemann integration, power series, functions of several variables, and differential forms.
- 5320, 5321. Functions of a Complex Variable I, II (3:3:0 each).** Prerequisite: MATH 4350 or 4356. Analytic functions as mappings; Cauchy theorems, Laurent series, maximum modulus theorems and ramifications; normal families; Riemann mapping theorem; Weierstrass factorization theorem; Mittag-Leffler theory; analytic continuation; and harmonic functions.
- 5322, 5323. Functions of a Real Variable I, II (3:3:0 each).** Prerequisite: MATH 5319 or equivalent. General measure and integration theory,  $L^p$  theory, differentiation theory, and basic functional analysis.
- 5324, 5325. Topology I, II (3:3:0 each).** Prerequisite: MATH 4350 or consent of instructor. Point set theory; introduction to combinatorial topology and homology theory.
- 5326, 5327. Modern Algebra I, II (3:3:0 each).** Prerequisite: MATH 3360 or consent of instructor. Groups; rings; fields; linear algebra; Galois theory.
- 5330, 5331. Theory of Ordinary Differential Equations I, II (3:3:0 each).** Prerequisite: MATH 4351, 4354, or consent of instructor. Existence and uniqueness results, continuation of solutions, continuous dependence on data, linear equations, oscillation and comparison theorems, boundary value problems, and stability analysis.
- 5332. Partial Differential Equations I (3:3:0).** Prerequisite: MATH 4351, 4354, or consent of instructor. Topics include first order equations, method of characteristics, parabolic, hyperbolic and elliptic equations, variational and Hilbert space methods.
- 5334, 5335. Numerical Analysis I, II (3:3:0 each).** Prerequisite: MATH 5316 or equivalent. Stability and error analysis; numerical solution of ordinary and partial differential equations; integral equations.
- 5340, 5341. Functional Analysis I, II (3:3:0 each).** Prerequisite: MATH 5322. Hilbert and Banach space theory, linear operator theory, the closed graph theorem, the open mapping theorem, the principle of uniform boundedness, linear functionals, dual spaces and weak topologies, distribution theory, topological vector spaces, spectral theory of compact and unbounded self-adjoint and unitary operators, and semi-group theory.

- 5342, 5343. Advanced Topics in Analysis I, II (3:3:0 each).** Prerequisite: Consent of instructor. Current topics in analysis. May be repeated for credit.
- 5344, 5345. Topics in Numerical Analysis I, II (3:3:0 each).** Prerequisite: MATH 5335. Current advanced topics in numerical analysis; research work using computers. May be repeated for credit.
- 5346. Advanced Topics in Applied Mathematics I (3:3:0).** Prerequisite: Consent of instructor. Current topics in applied mathematics. May be repeated for credit.
- 5347. Advanced Topics in Control Theory (3:3:0).** Prerequisite: Consent of instructor. H $\infty$  theory of linear and non-linear systems, stochastic control, geometric theory of non-linear systems, distributed parameter control systems, and computational methods in control.
- 5354. Biomathematics I (3:3:0).** Prerequisite: Differential equations and linear algebra or consent of instructor. Qualitative and quantitative behavior of deterministic biological models are studied.
- 5355. Biomathematics II (3:3:0).** Prerequisite: Statistics, differential equations, and linear algebra or consent of instructor. Qualitative and quantitative behavior of stochastic biological models are studied.
- 5356. Topics in Biomathematics (3:3:0).** Prerequisite: Biomathematics II or consent of instructor. Current topics in biomathematics are studied such as biomechanics, mathematical epidemiology, mathematical neurology, mathematical ophthalmology, and image processing. May be repeated for credit.
- 5360, 5361. Advanced Mathematics for Teachers I, II (3:3:0 each).** Prerequisite: Consent of instructor. Selected topics in mathematics. May be repeated for credit.
- 5362. Theory of Numbers (3:3:0).** Prerequisite: MATH 4362. Diophantine equations; binary quadratic forms; algebraic numbers; theory of number-theoretic functions; partitions; the prime number theorem.
- 5364, 5365. Computer Literacy and Programming I, II (3:3:0 each).** Development of computer literacy and programming ability, algorithms and data structures, and recursion.
- 5382, 5383. Advanced Probability I, II (3:3:0 each).** Prerequisite: MATH 5319 or consent of instructor. Measure and integration; axiomatic foundations of probability theory; random variables; distributions and their characteristic functions; stable and infinitely divisible laws; limit theorems for sums of independent random variables; conditioning; Martingales.
- 5399. Advanced Problems (3).** Prerequisite: Graduate standing in mathematics. May be repeated for credit.
- 6000. Master's Thesis (V1-6).**
- 6310. Master's Report (3).**
- 7000. Research (V1-12).**
- 8000. Doctor's Dissertation (V1-12).**

### Courses in Statistics. (STAT)

- 5302, 5303. Applied Statistics I, II (3:3:0 each).** Prerequisite: Consent of instructor. Graphical presentation of data, histograms, confidence intervals for binomial probabilities, one-sample and two-sample t-test, regression and correlation with two variables, hypothesis testing and confidence intervals; multivariate regression and correlation, partial correlation coefficients, analysis of variance and covariance, multiple comparison procedures. Emphasis on analysis of research data. Not for mathematics, statistics, engineering, or physical science majors; these students should take STAT 5384, 5385.
- 5326. Statistical Analysis (3:3:0).** Prerequisite: Calculus or consent of instructor. Descriptive statistics, testing and estimation in one- and two-sample problems, analysis of variance, multiple comparisons, linear regression and correlation, nonparametric methods.
- 5328, 5329. Intermediate Mathematical Statistics I, II (3:3:0 each).** Prerequisite: MATH 2350 or consent of instructor. Probability space; special families of distribution functions;

expectations; conditional distributions; sampling distributions; point and interval estimation; hypothesis testing; distribution of functions of random variables; regression; nonparametric techniques.

- 5370. Decision Theory (3:3:0).** Prerequisite: MATH 4343 or STAT 5329 or consent of instructor. Game theory; statistical decision; Bayesian statistics.
- 5371. Regression Analysis (3:3:0).** Prerequisite: STAT 5326 and 5329. Estimation and testing in linear regression, residual analysis, influence diagnostics, multicollinearity logistic regression, nonlinear regression.
- 5372. Nonparametric Statistical Inference (3:3:0).** Prerequisite: MATH 4343 or STAT 5329 or consent of instructor. Statistical inference, rank order statistics; chi-square and slippage tests; Kolmogorov and Smirnov type tests; confidence intervals and bands; runs tests; applications.
- 5373. Design of Experiments (3:3:0).** Prerequisite: MATH 4343 or STAT 5329 Principles of design and analysis of experiments; Latin squares; split plots; incomplete block designs; efficiency.
- 5374. Theory of Linear Statistical Models (3:3:0).** Prerequisite: MATH 4343 or STAT 5329. Multivariate normal; covariance matrix and operations; distribution of quadratic forms; general linear hypothesis of full and non-full rank; specific linear models.
- 5375. Statistical Multivariate Analysis (3:3:0).** Prerequisite: STAT 5329 or consent of instructor. Multivariate normal distribution; estimation of the mean vector and covariance matrix; distribution of sample correlation coefficients; the generalized  $T^2$  statistic; classification; distribution of the sample covariance matrix.
- 5376. Advanced Statistical Methods (3:3:0).** Prerequisite: MATH 4343 or STAT 5329 or consent of instructor. Applied regression analysis; cluster analysis; factor analysis; modeling; special topics in designs; sensitivity analysis; non-linear estimation. May be repeated for credit.
- 5377. Statistical Sampling Theory (3:3:0).** Prerequisite: MATH 4343 or STAT 5329. Theory of simple random sampling; stratified random sampling; cluster sampling; ratio estimates; regression estimates; other sampling methods.
- 5378. Stochastic Processes (3:3:0).** Prerequisite: STAT 5329. Markov chains; Markov processes in discrete and continuous time; diffusion processes; Brownian motion and transformations of Brownian motion; non-Markovian processes.
- 5379. Time Series Analysis (3:3:0).** Prerequisite: STAT 5329 or consent of instructor. Stationary and nonstationary time series; finite linear models; identification, filtering, and diagnostic checks of such models; spectral analysis of time series data; forecasting and control.
- 5380, 5381. Advanced Mathematical Statistics I, II (3:3:0 each).** Prerequisite: STAT 5329; STAT 5380 is prerequisite for STAT 5381. Theory of estimation and tests of statistical hypotheses; sequential analysis.
- 5384. Statistics for Engineers and Scientists I (3:3:0).** Prerequisite: MATH 2350 or consent of instructor. Probability, descriptive statistics, distributions, estimation, hypothesis testing, nonparametric statistics, data analysis using the computers. Not for mathematics or statistics majors.
- 5385. Statistics for Engineers and Scientists II (3:3:0).** Prerequisite: STAT 5384 or consent of instructor. Continuation of STAT 5384; simple and multiple regression analysis; analysis of variance; nonparametric statistics; categorical data analysis; quality control; reliability; data analysis using the computer. Not for mathematics or statistics majors.
- 5386. Statistical Computing and Simulation (3:3:0).** Prerequisite: Consent of instructor. Methods of approximating functions and probabilities; computational methods in linear algebra; introduction to theory and applications of random number generation; testing generators.
- 6000. Master's Thesis (V1-6).**
- 6310. Master's Report (3).**
- 7000. Research (V1-12).**

## Department of Philosophy

Professor Frederick Suppe, Chairperson.

Professors Averill and Curzer; Associate Professors Nathan and Schaller; Assistant Professors Meskin, Rupert, Sowaal, and Webb; Visiting Assistant Professor Kim.

This department offers study in the following graduate degree program: PHILOSOPHY, *Master of Arts*. The master's degree program is aimed at providing a broad background in philosophy while encouraging complementary work in an approved minor field of study.

The student may choose to complete 27 hours of graduate course work and then write and defend a master's thesis. Alternatively, the student may complete 36 hours of graduate course work and then take an oral exit examination. Up to one third of the student's course work may consist of graduate courses in disciplines other than philosophy, subject to the approval of the departmental graduate advisor.

For specific information on admission to the program, prospective students should contact the Department of Philosophy and the Graduate School. Students from fields other than philosophy are encouraged to apply although they may be required to complete a certain amount of philosophy leveling work during their first year of enrollment.

### Courses in Philosophy. (PHIL)

- 5301. Studies in Greek Philosophy (3:3:0).** Studies in the Pre-Socratics, Plato, Aristotle, and Hellenistic philosophy. May be repeated as topic varies.
- 5302. Studies in Modern Philosophy (1600-1800) (3:3:0).** Studies in major philosophical works of the modern period drawn from such philosophers as Descartes, Spinoza, Leibniz, Locke, Berkeley, Hume, and Kant. May be repeated as topic varies.
- 5305. Studies in American Philosophy (3:3:0).** Studies in major American philosophers and philosophical movements from colonial times to the present. May be repeated as topic varies.
- 5308. Basic Issues in Contemporary Philosophy (3:3:0).** Major philosophical theories and controversies of the twentieth century. Works will be drawn from such philosophers as Wittgenstein, Russell, Heidegger, Husserl, Quine, Davidson, and Kripke. May be repeated as topic varies.
- 5310. History of Aesthetics (3:3:0).** Major philosophical theories of art and beauty from classical Greece to the twentieth century. May be repeated as topic varies.
- 5311. Issues in Logic and Epistemology (3:3:0).** A study of one or two questions about the justification of our knowledge of the external world, the mind, mathematics, or logic. May be repeated as topic varies.
- 5314. Contemporary Aesthetics (3:3:0).** Current problems in aesthetics: the nature of a work of art, of aesthetic experience and judgment; issues of interpretation and evaluation in the arts. May be repeated as topic varies.
- 5320. Seminar in Ethics (3:3:0).** Selected topics in ethical theory: relativism, moral reasons, the nature of moral value, deontological and teleological ethics. May be repeated as topic varies.
- 5321. Social and Political Philosophy (3:3:0).** Study of selected social or political philosophers or of selected topics such as justice, liberty, equality, liberalism, conservatism, and rights. May be repeated as topic varies.
- 5322. Law and Philosophy (3:3:0).** Study of works of legal philosophers and central issues in philosophy of law such as legal obligation, nature of law, interpretation, privacy, law and morality. May be repeated as topic varies.
- 5324. Philosophy of Religion (3:3:0).** Central issues in philosophy of religion including the nature of religion, the existence of God, the relation between faith and reason, and the problem of evil.
- 5330. Philosophy of Science (3:3:0).** Methodological and conceptual issues in the physical and social sciences. Emphasis upon scientific investigation as a way of knowing. May be repeated as topic varies.
- 5331. Philosophical Psychology (3:3:0).** Central issues in philosophy of the mind, including the nature of the mental and the relation between mental and physical. Emphasis on thought and perception. May be repeated as topic varies.
- 5340. Seminar in Metaphysics (3:3:0).** An intensive study of one or two topics which include the nature of existence, cause, identity, kinds and their instances, change, and/or mind. May be repeated as topic varies.
- 5341. Great Figures in Philosophy (3:3:0).** In-depth study of the works of just one or two great philosophers. May be repeated as topic varies.
- 6000. Master's Thesis (V1-6).**
- 7000. Research (V1-12).**
- 8000. Doctor's Dissertation (V1-12).**

## Department of Physics

Professor Lynn L. Hatfield, Chairperson.

Horn Professors Estreicher and Menzel; Bucy Professor Wigmans; Professors Borst, Cheng, Gangopadhyay, Lichti, Lodhi, and Myles; Associate Professors Akchurin, Gibson, Glab, Holtz, Huang, Lamp, and Papadimitriou; Assistant Professor Thacker; Joint Faculty Dallas, Kristiansen, Krompholz, Poirier, Quitevis, and Temkin.

This department offers study in the following graduate degree programs: PHYSICS, *Master of Science* and *Doctor of Philosophy*. Options in applied physics leading to the M.S. and Ph.D. degrees are also offered. These interdisciplinary options afford flexibility in course work and area of research concentration. Specializations in chemical physics (in cooperation with the Department of Chemistry and Biochemistry) and biophysics (in cooperation with the Health Sciences Center and the University Medical Center) are also available. An M.S. degree involving industry internships is available to selected graduate students.

A core curriculum consisting of PHYS 5301, 5303, 5305, and 5306 forms the nucleus of the Master's and Ph.D. programs and is the basis for the comprehensive master's final examination and the Ph.D. qualifying examination. A student selecting any of the degree options may designate a minor consisting of a minimum of 6 hours of course credit in a related area and satisfy any additional requirements of the minor department. (These 6 hours may be taken in the Physics Department.) Full-time study towards the master's degree should be completed in about two years.

All graduate students must enroll in PHYS 5101 for the first four semesters and PHYS 5104 whenever on a teaching assistantship. PHYS 5312, 5322, and 5307 are tools courses that develop necessary skills for use in other courses and in research. They are most useful when taken early.

*M.S. Degree in Physics, Thesis Option.* A minimum of 24 hours of course credit plus 6 hours of thesis re-



search with a minimum of 18 hours in the department. The thesis is defended in a final oral examination.

**M.S. Degree in Applied Physics, Thesis Option.** A minimum of 24 hours of course credit plus 6 hours of thesis research with a minimum of 9 hours in a specified applied area. This may be in a subfield of physics or in a related discipline, with the master's thesis from that area. The thesis is defended in a final oral examination.

**M.S. Degree in Applied Physics, Internship Option.** 24 hours of course credit with a separate course sequence as discussed with the graduate advisor, plus two semesters of internship in a regional industry or research laboratory arranged through the department. A report is written following each internship period, and defended in an oral examination. Twelve hours of internship or report credit is required beyond the course work.

**M.S. Degree in Physics, Nonthesis Option.** 36 hours of course credit with a minimum of 24 hours in the department, plus passing a comprehensive master's final examination. This option is normally reserved for students in the Ph.D. program.

**Ph.D. Degree in Physics and Ph.D. Degree in Applied Physics.** 45 hours of course work in the major beyond the B.S. degree and 15 hours outside the major, plus dissertation research. The 15 hours may be taken partially or entirely in the Physics Department. They also may be counted toward a minor. The student should consult with the graduate advisor and the research advisor about the details.

The core courses for the Ph.D. degree are the same as those for the M.S. degree plus PHYS 5302 and 6306. Further selections should be made from PHYS 5304, 5307, 5311, 5322, 7304, and 5300 (which may be repeated in different topics).

Ph.D. degree students taking the applied physics option normally take the same core courses as above. Other courses in the degree plan are worked out between the student and the graduate advisor in consultation with the research advisor.

We encourage all students to get involved in research early by taking PHYS 7000, which may count toward the degree. Thesis hours in PHYS 6000 are 6 hours for the M.S. with thesis option and 12 hours of PHYS 8000 for the Ph.D. should be taken as early as possible.

Students seeking the Ph.D. degree must pass a preliminary examination and a qualifying examination as described in the departmental *Graduate Booklet* and in accordance with Graduate School requirements. The examination topics are from general undergraduate physics and graduate core courses. After completing the research, the candidate prepares the dissertation and makes a public oral defense before the dissertation committee.

### Courses in Physics. (PHYS)

- 5001. Master's Internship (V1-12).** Internship in an industrial or research laboratory setting. Arranged through the department and directly related to degree program with approval of Internship Coordinator.
- 5101. Seminar (1:1:0).** Must be taken by every graduate student for at least the first four semesters. Taken pass-fail.

- 5104. Instructional Laboratory Techniques in Physics (1:1:0).** Laboratory organization and instructional techniques. Does not count toward the minimum requirement of a graduate degree. Must be taken pass-fail by all teaching assistants when on appointment.
- 5231. Solid State Device Seminar (2:2:1).** The structures of simple semiconductor devices and physical description of their electrical function; includes basic device related measurement.
- 5300. Special Topics (3:3:0).** Prerequisite: Approval of graduate advisor. Topics in semiconductor, plasma, surface, particle physics, spectroscopy, and others. May be repeated in different areas.
- 5301. Quantum Mechanics I (3:3:0).** Experimental basis and history, wave equation, Schrödinger equation, harmonic oscillator, piecewise constant potentials, WKB approximation, central forces and angular momentum, hydrogen atom, spin, two-level systems, and scattering. M.S. and Ph.D. core course.
- 5302. Quantum Mechanics II (3:3:0).** Prerequisite: PHYS 5301 or equivalent. Quantum dynamics, rotations, bound-state and time-dependent perturbation theory, identical particles, atomic and molecular structure, electromagnetic interactions, and formal scattering theory. Ph.D. core course.
- 5303. Electromagnetic Theory (3:3:0).** Electrostatics and magnetostatics, time varying fields, Maxwell's equations and conservation laws, electromagnetic waves in materials and in waveguides. M.S. and Ph.D. core course.
- 5304. Solid State Physics (3:3:0).** Prerequisite: PHYS 5301 or equivalent. A survey of the microscopic properties of crystalline solids. Major topics include lattice structures, vibrational properties, electronic band structure, and electronic transport.
- 5305. Statistical Physics (3:3:0).** Elements of probability theory and statistics; foundations of kinetic theory. Gibb's statistical mechanics, the method of Darwin and Fowler, derivation of the laws of macroscopic thermodynamics from statistical considerations; other selected applications in both classical and quantum physics. M.S. and Ph.D. core course.
- 5306. Classical Dynamics (3:3:0).** Lagrangian dynamics and variational principles. Kinematics and dynamics of two-body scattering. Rigid body dynamics. Hamiltonian dynamics, canonical transformations, and Hamilton-Jacobi theory of discrete and continuous systems. M.S. and Ph.D. core course.
- 5307. Methods in Physics I (3:3:0).** Provides first-year graduate students the necessary skill in mathematical methods for graduate courses in physical sciences; applications such as coordinate systems, vector and tensor analysis, matrices, group theory, functions of a complex variable, variational methods, Fourier series, integral transforms, Sturm-Liouville theory, eigenvalues and functions, Green functions, special functions and boundary value problems. Tools course.
- 5309. Atomic and Molecular Physics (3:3:0).** Prerequisite: PHYS 5301 or equivalent. A survey of atomic and molecular physics. Major topics include group theory, molecular orbital theory, and energy transfer processes.
- 5311. Nuclear Physics (3:3:0).** Prerequisite: PHYS 5301 or equivalent. Symmetries in nuclear physics, nuclear interactions, nuclear models, nuclear reactions, scattering, resonance, nuclear energy, applications.
- 5312. Techniques of Graduate Research (3:1:4).** Use of equipment and shop tools; design and performance of experiments; reports; literature search; writing of scientific papers; and other fundamental aspects of graduate research. Tools course.
- 5315. Electromagnetism I (3:3:0).** Prerequisite: PHYS 2301, MATH 3350, 3351, or equivalent. Survey of the fundamental laws and applications of electromagnetism. For graduate students in departments other than physics.
- 5316. Electromagnetism II (3:3:0).** Prerequisite: PHYS 5315. Electromagnetic fields and special relativity. For graduate students in departments other than physics.
- 5322. Computational Physics (3:2:2).** Numerical modeling of physical systems. Data acquisition and analysis. Graphics for displaying complex results. Quadrature schemes and solution of equations. Use of minicomputers and microcomputers. Tools course.

- 5324. Classical Mechanics I (3:3:0).** Prerequisite: PHYS 1308, MATH 3350, 3351, or equivalent. Introduction to Newtonian Mechanics, Euler-Lagrange Equations, and Hamilton's Principle. For graduate students in departments other than physics.
- 5330. Semiconductor Materials and Processing (3:3:0).** Survey of semiconductor materials deposition, characterization, and processing techniques with emphasis on the fundamental physical interactions underlying device processing steps.
- 5332. Semiconductor Characterization and Processing Laboratory (3:1:4).** A hands-on introduction to semiconductor processing technology and materials characterization techniques. Intended to accompany PHYS 5330.
- 5335. Physics of Semiconductors (3:3:0).** Theoretical description of the physical and electrical properties of semiconductors; Band structures, vibrational properties and phonons, defects, transport and carrier statistics, optical properties, and quantum confinement.
- 5336. Device Physics (3:3:2).** Principles of semiconductor devices; description of modeling of p/n junctions, transistors, and other basic units in integrated circuits; relationship between physical structures and electrical parameters.
- 5371. Conceptual Physics for Teachers (3:3:0).** Inquiry-based course in elementary physical principles of mechanics, heat, electricity, and magnetism.
- 5372. Astronomy for Teachers (3:3:0).** Inquiry-based course in solar system, stellar, and galactic astronomy. Discusses history of human understanding of the universe.
- 5380. Introduction to Microsystems (3:3:0).** Fundamentals of microelectromechanical (MEMS) and microfluidic systems. Project-based course introduces basic microsystem design, analysis, simulation, and manufacture through several case studies using representative devices.
- 6000. Master's Thesis (V1-6).**
- 6002. Master's Report (V1-6).**
- 6306. Advanced Electromagnetic Theory (3:3:0).** Prerequisite: PHYS 5303. Classical theory of electromagnetic fields, radiation, scattering and diffraction, special theory of relativity and electrodynamics, special topics. Ph.D. core course.
- 7000. Research (V1-12).**
- 7304. Condensed Matter Physics (3:3:0).** Prerequisite: PHYS 5304. Problems of current interest in condensed matter physics. Topics include transport properties in solids, superconductivity, magnetism, semiconductors, and related topics.
- 8000. Doctor's Dissertation (V1-12).**

## Department of Political Science

Professor Philip Marshall, Chairperson.

Professors Cochran, Dometrius, Fox, Lee, and Mayer; Associate Professors Barkdull, Emmert, Khan, Saideman, and Van Wart; Assistant Professors Collins, Dicke, Gerber, Greene, Maestas, and Sieberg.

This department offers study in the following graduate degree programs: POLITICAL SCIENCE, *Master of Arts* and *Doctor of Philosophy*. The department also participates in the interdisciplinary program in PUBLIC ADMINISTRATION leading to the *Master of Public Administration* degree. See the section on "Opportunities for Interdisciplinary Study" in this catalog for further description of this program.

The department emphasizes and encourages specialization in the following areas of political science: American institutions and behavior, public policy, public administration, comparative politics, and international relations. In addition, the department offers graduate courses in political theory and methodology.

To be admitted to the graduate program, the student must submit three letters of recommendation from former teachers. In addition, the student must complete the verbal and quantitative GRE exams, and those scores will be considered in the admission decision. Finally, students should have an overall GPA of at least 3.0 in undergraduate and graduate work. M.A. and Ph.D. students must develop their courses of study in consultation with the departmental graduate advisor; M.P.A. students, with the advisor for the M.P.A. program.

Master's degree work may follow either of two plans: 24 hours of course work plus a thesis, or 36 hours of course work without a thesis. M.A. students are required to take POLS 5381 and 5482. The M.P.A. program requires 36 hours of course work and an internship assignment. Courses are scheduled so that the degree may be obtained in evening study.

The doctoral degree requires a minimum of 60 semester hours of graduate work beyond the bachelor's degree, exclusive of credit for the dissertation. A minimum tool requirement for all Ph.D. students is the successful completion of POLS 5381 and 5482 (or their equivalents) plus POLS 5383. Additional language or tool requirements may be imposed at the time of the student's preliminary examination and will be tailored to the student's field of specialization.

Students are required to complete course work in one major field and two minor fields, one of which may be taken outside the department. For the qualifying examination, the student will select one major field and one minor field, and will be tested in those fields only. However, if the student chooses to take a minor outside the department, the outside field will automatically be counted as the second minor field and will be exempted from examination.

A brochure providing additional information regarding requirements and procedures may be obtained from the department.

### Courses in Political Science. (POLS)

- 5100. Colloquium in Political Science (1:1:0).** Prerequisite: Consent of instructor. Presentations of current research and discussions of the political science profession by department and visiting faculty. Credit-no credit. May be repeated.
- 5200. Teaching College Political Science (2:2:0).** Prerequisite: Consent of instructor. Strategies and innovations in teaching political science at the college level, including supervised teaching. May be repeated and taken as independent study. Credit-no credit. Does not count toward minimum degree requirements.
- 5201. Research and Writing in Political Science (2:2:0).** Prerequisite: Consent of instructor. Guided research on topics suitable for publication including manuscript preparation, presentation, and critiques. Credit-no credit. May be repeated and taken as independent study.
- 5321. Seminar in Political Behavior (3:3:0).** Current research on mass political behavior, including public opinion, political socialization, and voting behavior. Topics vary each semester. May be repeated for credit.
- 5322. The American Political System (3:3:0).** Advanced study in subjects relevant to an understanding of how the political process is affected by the environment of politics.
- 5323. American Political Parties, Interest Groups, and Politics (3:3:0).** Advanced study of the political process, ori-

ented to recent research in the area of political parties, elections, and the recruitment of political leadership.

- 5324. The Executive (3:3:0).** Study of the executive branch of government in the United States, with particular emphasis on the presidency.
- 5325. The United States Congress (3:3:0).** An examination of the Congress, from formal organization, member recruitment, and theories of representation, to Congressional reform, policy-making, and interbranch relations.
- 5327. Selected Topics in American Government and Politics (3:3:0).** Problems in American government and politics. Varying topics from semester to semester.
- 5329. Urban Government and Politics (3:3:0).** The structure and function of urban political systems; the distribution of political, economic, and social power; correlates of urban public policy; intergovernmental relations; and minority group politics.
- 5330. Ancient and Medieval Political Theory (3:3:0).** Political ideas of the great thinkers in the Western world from the time of the Golden Age of Greece until the rise of modern political thought in the 16th century.
- 5335. Modern Political Theory (3:3:0).** Major political thinkers beginning with the 16th century and ending with Fascism.
- 5336. Contemporary Political Theory (3:3:0).** An examination and criticism of the main concepts, movements, and thinkers in political theory in the contemporary world.
- 5339. Seminar in Political Theory (3:3:0).** Examination of ideas and concepts such as liberty, authority, justice, equality, and nationalism.
- 5341. Public Policy Theory and Process (3:3:0).** Introduction to competing theoretic explanations of U.S. public policy making. Course will explore interactions between institutional actors, logic of administrative structure and delegated authority, and bureaucratic discretion.
- 5356. Judicial Behavior (3:3:0).** Political analysis of actors in the judicial decision-making arena.
- 5360. International Relations Theory (3:3:0).** Survey of contending theories of world politics, focusing on those that emphasize the role of power and interest in shaping state behavior.
- 5361. Interdependence and World Order (3:3:0).** Survey of contending theories of world politics focusing on those that emphasize interdependence, democratization, transnationalism, nonstage actors, and the potential for system transformation.
- 5363. International Organization (3:3:0).** Theoretical examination of the rise of global, regional, and functional international organizations and their role in the solution of economic, social, environmental, and political problems.
- 5364. State and International Politics (3:3:0).** The course will consider how political scientists theorize about the primary unit, the state, in international relations.
- 5365. Special Topics in International Relations (3:3:0).** Intensive research on topics in international relations. Subjects vary.
- 5367. International Political Economy (3:3:0).** An exploration of the interaction of international politics and international economic trends. The course surveys the theories in the field, particularly as they relate to the political economy of trade, foreign investment, finance, and development.
- 5369. International Security Studies (3:3:0).** This course examines how states maintain their security in a dangerous world.
- 5370. Comparative Politics (3:3:0).** Critical survey of the major theories and literature in comparative politics, the logic of cross-national and cross-cultural inquiry, and the major concepts and approaches.
- 5371. Area Studies in Comparative Politics (3:3:0).** The culture and political system of a major geographical area like Western Europe, Latin America, or Asia. topics vary each semester. May be repeated for credit.
- 5376. Selected Topics in Comparative Government (3:3:0).** Studies in comparative politics, with topics varying from semester to semester.
- 5378. Politics of the Developing Areas (3:3:0).** Substantive and theoretical-methodological issues in the study of

the development process, emphasizing the political aspects of development.

- 5381. Research Design (3:3:0).** Design and execution of political research.
- 5383. Advanced Quantitative Research Methods in Political Science (3:3:0).** Prerequisite: POLS 5382 or equivalent. Extensions of the least squares model to such techniques as regression and diagnostics, structural equations, factor analysis and/or time series, and computer programs applicable to political data.
- 5384. Advanced Political Analysis (3:3:0).** Prerequisite: Consent of the instructor. Examination of contemporary methods for investigating selected political topics. Topics may vary from semester to semester. May be repeated for credit.
- 5482. Data Analysis (4:3:2).** Techniques of analyzing political data, including descriptive and inferential statistics and computer applications. Concurrent registration in 5482 lab required.
- 6000. Master's Thesis (V1-6).**
- 7000. Research (V1-12).**
- 8000. Doctor's Dissertation (V1-12).**

### Courses in Public Administration. (PUAD)

- 5100. Colloquium in Public Administration (1:1:0).** Prerequisite: Consent of instructor. Discussion of current issues in public administration led by department and visiting faculty. Credit-no credit.
- 5320. Program Evaluation and Quantitative Analysis (3:3:0).** Prerequisite: Consent of instructor. Introduction to the design, logic, and politics of research methods appropriate for the evaluation of policies and programs before, during, and after their implementation.
- 5321. Advanced Quantitative Methods in Public Policy and Administration (3:3:0).** Prerequisite: Consent of the instructor. Quantitative methods and approaches for analyzing public policy questions and data, including inferential statistics and the use of computer-based statistical programs.
- 5326. Information Technology in Public Administration (3:3:0).** The role of information and communication systems are examined as well as applications used by public administrators. Emphasis is placed on understanding the systemic issues facing the application of information technology in the public sector.
- 5331. U.S.-Mexico Border Administration (3:3:0).** Discussion of the history, politics, and social problems of the U.S.-Mexico borderlands, with an emphasis on the policy challenges posed by regional integration.
- 5332. Social Policy in the United States (3:3:0).** History, structure, implementation, reforms, and analysis of social policy in the U. S. Considers programs for the poor, elderly, disabled persons, and children. Compares U. S. to other industrialized democracies.
- 5334. Health Care Policy and Administration (3:3:0).** Prerequisite: Consent of instructor. Analysis of the formulation, implementation, and evaluation of health care policy and service delivery, emphasizing skills and knowledge in policy-making, management, and decision-making.
- 5337. Public Organization Theory (3:3:0).** The major political and administrative theories applicable to public sector organizations are examined. Contemporary trends in organization theory and public management are emphasized.
- 5340. Seminar in Public Administration (3:3:0).** Prerequisite: Consent of instructor. Critical survey of the field of public administration.
- 5342. City Management (3:3:0).** The political implications and administrative functions of city government are examined. Contemporary issues of municipal management are emphasized.
- 5343. Public Personnel Administration (3:3:0).** Prerequisite: Consent of instructor. Description and analysis of the personnel function in public agencies.
- 5344. Public Budgeting (3:3:0).** Political aspects of the budgetary process as the central mechanism for public resource allocation and executive planning.



- 5345. Administrative Ethics (3:3:0).** Prerequisite: Consent of instructor. Considers applications of ethical systems and thinking in public organizations. Particular emphasis on the ethical dilemmas caused by administrative discretion and defining the public interest.
- 5346. Public Financial Management (3:3:0).** Prerequisite: PUAD 5344 or consent of instructor. An in-depth study of government finance function with emphasis on fund structure, financial reporting, and related management practices including cash, debt, risk, and inventory management.
- 5347. Internship in Public Administration (3:3:0).** Prerequisite: Consent of instructor. Service assignment in a public agency to enhance professional skills for students in the Masters in Public Administration program. Graded pass-fail and may be repeated for credit.
- 5348. Selected Topics in Public Administration (3:3:0).** Special studies on subjects in public administration. Topics will vary from semester to semester.
- 5352. Public Policy Analysis (3:3:0).** Introduction to analytic tools for evaluating public policies; examines policy choices given resources and informational constraints. Topics include risk assessment, cost-benefit analysis, and market failures.
- 5357. Law for Public Administrators (3:3:0).** Detailed analysis of legal duties and obligations of local government officials to employees and citizens.

## Department of Psychology

Professor Ruth H. Maki, Chairperson.

Horn Professor C. Hendrick; Professors Clopton, Cogan, Durso, S. Hendrick, W. Maki, Marshall, McGlynn, Richards, and Winer; Associate Professors Cook, DeLucia, Epkins, Fireman, S. Harter, Mumma, Robitschek, and Taraban; Assistant Professors Bleckley, Borrego, Cohen, Desmond, Garos, Morgan, and Reich; Adjunct Faculty: Gable, G. Harter, Hilsabeck, Hutton, Kyllonen, Matthews, Randolph, and Shute.

This department offers study in the following graduate degree programs: GENERAL EXPERIMENTAL PSYCHOLOGY, *Master of Arts*; CLINICAL PSYCHOLOGY, COUNSELING PSYCHOLOGY, and GENERAL EXPERIMENTAL PSYCHOLOGY, *Doctor of Philosophy*.

Admission to a graduate program in psychology requires the recommendation of the department as well as the approval of the Graduate Dean. Admission to degree programs is competitive and decisions on admission normally are made each spring for the fall semester. Application instructions may be obtained from the department. Students who are not officially approved for a degree program may not enroll in courses with a practicum component. Students may not take courses with a practicum component toward a minor in psychology without approval of the instructor.

Applicants for the master's degree may specialize in general experimental psychology. Doctoral students may specialize in clinical, counseling, or general experimental psychology. Students in general experimental psychology pursue research in human factors, cognition, applied cognition, or social psychology. Doctoral students who specialize in counseling or clinical psychology are required to complete a year of internship at an approved facility.

### Courses in Psychology. (PSY)

- 5001. Problems in Psychology (V1-6).** Prerequisite: 12 advanced hours of psychology and prior permission of instructor. Independent work under individual guidance of a staff member.

- 5002. Advanced Practicum in Counseling and Clinical Psychology (V1-6).** Prerequisite: PSY 5316 or PSY 5318 and prior permission of instructor. Supervised practice in psychodiagnoses and psychotherapy with selected cases. Emphasis on a wide variety of experience. May be repeated.
- 5003. Practicum in Human Factors (V3-6).** Prerequisite: PSY 5370, 5372, 5380, and prior consent of the human factors program coordinator. Supervised practice in the profession of human factors with selected sites on or off campus. Emphasis is on real-world settings. May be repeated.
- 5004. Doctoral Internship in Counseling and Clinical Psychology (V1-6).** Prerequisite: By arrangement with department chairperson. Full-time supervised internship in an appropriate facility. Enrollment required four times to complete one calendar year.
- 5101. Colloquium in the Teaching of Psychology (1:2:0).** An overview of teaching methods as applied to the teaching of Psychology in the college classroom. Graded pass-fail.
- 5303. Developmental Psychopathology (3:3:0).** Prerequisite: Consent of instructor. An examination of psychopathology in children, with consideration of the developmental course of various psychological disorders through childhood and adolescence.
- 5304. Practicum in Intelligence Testing (3:3:0).** Prerequisite: Consent of instructor. A review of the historical and theoretical bases of intelligence testing in addition to instruction and supervised practice in scoring, interpreting, and reporting results from individual intelligence tests.
- 5306. Seminar in Contemporary Professional Issues (3:3:0).** Prerequisite: Consent of instructor. A survey of the employment practices and prevailing legal and ethical standards in contemporary professional psychology.
- 5308. Vocational Psychology (3:3:0).** Prerequisite: Consent of instructor. Review of theories, assessment tools, and interventions in vocational psychology including the integration of vocational issues into psychotherapy.
- 5309. Clinical Neuropsychology (3:3:0).** Prerequisite: PSY 5304, 5338, and doctoral standing in psychology. Foundational course in brain-behavior relationships, neuropsychology for neuropsychologists, neuropsychological assessment, and other clinical applications.
- 5310. Seminar in Child Assessment (3:3:0).** Prerequisite: PSY 5303 and consent of instructor. A review of the procedures used in a comprehensive child assessment and the integration of this information for diagnosis and report writing.
- 5311. Introduction to Psychotherapeutic Intervention and Management (3:3:0).** Prerequisite: Consent of instructor. Didactic introduction to psychotherapy procedures plus a practicum element.
- 5312. Introduction to Child and Adolescent Psychological Treatment (3:3:0).** Prerequisite: Consent of instructor. Introduction to empirically-based treatment approaches pertaining to children, adolescents, and families, with a focus on case formulation and treatment planning.
- 5313. Practicum in Integrated Assessment Approaches (3:3:0).** Prerequisite: Two graduate assessment courses and consent of instructor. A practicum in comprehensive, broad-spectrum psychodiagnostic evaluation.
- 5314. Projective Testing (3:3:0).** Prerequisite: Second-year graduate status in clinical-counseling psychology or consent of instructor. A survey of projective assessment with emphasis on administration, scoring, and interpretation of the Rorschach.
- 5315. Objective Personality Assessment (3:3:0).** Prerequisite: Graduate standing in the department, permission of instructor, and PSY 5338. Survey of objective personality and psychodiagnostic assessment including supervised practicum experience and methodological, empirical, theoretical, cultural, and ethical issues.
- 5316. Introduction to Counseling Psychology (3:3:0).** Prerequisite: Admission to counseling psychology doctoral program or consent of instructor. Professional identity, research themes and strategies, and ethical standards of counseling psychology. Exploration of theories and techniques of counseling.

- 5318. Introduction to Clinical Psychology (3:3:0).** Prerequisite: Admission to clinical psychology doctoral program. Supervised experience in interviewing. A study of different approaches to psychotherapy with adults.
- 5320. Data Analysis in Psychological Research (3:3:0).** Prerequisite: PSY 3403 or equivalent. Quantitative analyses for describing data distributions, testing hypotheses about experimental effects, and identifying relationships among variables via regression and correlational analyses.
- 5321. Nonparametric Statistical Analysis Techniques for Psychological Research (3:3:0).** Includes one, two, and k sample designs plus measures of association. Some coverage of single case studies.
- 5322. Family Psychology (3:3:0).** Prerequisite: PSY 5002 or 5311. An introduction to the field of family psychology and therapy. Ideas and techniques of the major approaches to family psychology and therapy.
- 5323. Group Counseling and Psychotherapy (3:3:0).** Prerequisite: Prior permission of instructor. Designed to provide theories of approaches to group work and a personal experience with group processes. Various points of view will be studied.
- 5324. Seminar in Personality Theory (3:3:0).** Prerequisite: PSY 3306. A critical review of current theories of personality.
- 5326. Human Motivation: A Social Psychological Approach (3:3:0).** Prerequisite: Consent of instructor. Examination of motivation from a social psychological perspective. Includes consideration of theoretical frameworks of motivation and application to a wide variety of research areas.
- 5327. Seminar in Social Cognition (3:3:0).** An examination of research and theory on the mental activities that underlie social information processing and behavior.
- 5328. Seminar in Social Psychology (3:3:0).** Prerequisite: PSY 3304. Contemporary attitude theory and research; systematic theory in social psychology; social structure and personality; the psychology of social movements and current research trends.
- 5331. Small Group Behavior (3:3:0).** Prerequisite: PSY 3304. Advanced study of the nature and origin of small groups and interaction processes. Emphasis on data obtained from empirical studies rather than theoretical or logical analysis.
- 5332. Stereotypes and Prejudice (3:3:0).** Prerequisite: Undergraduate course in social psychology or consent of instructor. Examines origins of stereotypes and prejudice, factors contributing to the persistence of prejudice, and strategies for promoting change. Modern varieties of prejudice are emphasized.
- 5333. Cognitive Behavioral Therapy (3:3:0).** Prerequisite: PSY 5002 and 5318 or 5316. A critical analysis of the major concepts of psychological intervention approaches derived from contemporary learning and cognitive theory.
- 5334. Theories and Techniques of Psychotherapy (3:3:0).** Prerequisite: PSY 5316. Consideration of theories of vocational development and counseling. Discussion of professional issues and problems related to the area of counseling psychology.
- 5335. Psychology of Trauma and Abuse (3:3:0).** Prerequisite: Graduate standing and consent of instructor. Seminar examining theoretical models, empirical research, and professional issues related to effects of trauma and abuse, recovery processes, and psychotherapy.
- 5336. Child and Adolescent Development (3:3:0).** A survey of the theoretical foundations of modern child psychology; psychoanalytic theories, social learning theories, cognitive-developmental theories, and comparative ecological theories, research strategies and appropriate models of development.
- 5337. Counseling Women (3:3:0).** Prerequisite: Graduate standing in the department or permission of instructor. Seminar focuses on women's mental health, feminist therapy, and issues and strategies for specific problems and types of clients.
- 5338. Seminar in Psychopathology (3:3:0).** Prerequisite: PSY 4305 or equivalent. A survey of theoretical perspectives and research findings concerning the causes, diagnosis, and treatment of psychopathology.
- 5345. Research Seminar in Clinical and Counseling Psychology (3:3:0).** Prerequisite: PSY 5347. Survey of methods and approaches to research in these areas.
- 5347. Advanced Correlational Methods and Factor Analysis (3:3:0).** Prerequisite: Consent of instructor. Comprehensive survey of multivariate analysis including multiple correlation and factor analysis and other correlational techniques. Review of analysis of co-variance.
- 5348. Advanced Multivariate Analysis for Psychologists (3:3:2)** Prerequisite: PSY 5347. Covers topics in multivariate analysis including canonical correlation, multiway frequency tables, MANOVA, profile analysis, discriminant analysis, logistic regression, and time series analysis.
- 5350. History and Systems of Psychology (3:3:0).** The nature of psychological systematics and theory construction, including cultural and other factors influencing system building; consideration of major systems from the Hellenic period to the present.
- 5352. Seminar in Learning Theory (3:3:0).** An examination of the general areas of learning and memory with particular attention on current theory and data.
- 5353. Seminar in Physiological Psychology (3:3:0).** Prerequisite: PSY 3327 or equivalent. Open to graduate students in the biological sciences with credit in PSY 3327 or equivalent. Current trends in psychophysiological research.
- 5354. Seminar in Perception: Theories and Applications (3:3:0).** Theoretical and applied issues in perception. Emphasis on demonstrations of perceptual phenomena (e.g., illusions, motion perception), theories of visual perception, and discussions of human-factors literature.
- 5355. Psychology of Aesthetics (3:3:0).** Prerequisite: Consent of instructor. An examination of the theoretical and empirical approaches for the study of the production and appreciation of art from a psychological perspective.
- 5356. Seminar in Cognition (3:3:0).** A survey of the research and theory on human mental activities such as attention, memory, concepts, language processing, problem solving, and reasoning.
- 5357. Seminar in the Psychology of Reading (3:3:0).** Current models of reading and comprehension. Topics include stages of reading development, reading disabilities, word perception, and syntactic, semantic, and discourse processes.
- 5358. Seminar in Knowledge Representation (3:3:0).** Prerequisite: PSY 5356 or consent of instructor. An examination of research and theory on the acquisition, content, structure, and use of different types of knowledge representation.
- 5370. Human Factors Psychology (3:3:0).** Survey of topics in human factors including human-machine interaction, visual performance, and transportation. Emphasis on presenting solutions to practical design problems and discussing applied literature.
- 5372. Human Factors Methodology (3:3:0).** Overview of human factors methodology including task analysis, usability evaluation and its role in human-computer interaction, assessment of risk, human reliability, and error.
- 5374. Sensory and Physiological Bases of Human Performance (3:3:0).** Discusses the bases of human perceptual performance with attention given to the role of underlying physiological mechanism such as sensory integration, limitations, and capabilities.
- 5376. Stress and Fatigue in Human Performance (3:3:0).** Overview of theory and research concerning the effects of stress and fatigue on human performance including changes in information processing, strategy, and state.
- 5378. Perceptual Issues in Transportation and Locomotion (3:3:0).** A review of perceptual topics related to locomotion including limitations at night, accidents, technological advances, visual-vestibular interaction, and animal perception and locomotion.
- 5379. Human-Computer Interaction (3:3:0).** Fundamentals of human-computer interaction including user interface design, usability and usability methods, cognition and user psychology, user-centered design, and understanding how designers think.
- 5380. Experimental Design (3:3:0).** Prerequisite: Consent of instructor. Logical principles governing sound experimentation: conventional designs using analysis of variance. Introduction to complex analysis of variance designs and trend tests.

- 5382. Psychopharmacology of Psychoactive Drugs (3:3:0).** Prerequisite: PSY 3327 or equivalent. Survey of neurophysiological and psychopharmacological effects of psychoactive drugs, including issues of treatment of mental illness and substance abuse.
- 5384. Psychology and the Law (3:3:0).** Survey of the interface between psychology and law including topics in forensic psychology, expert testimony, and psychologists' influence in policy legislation.
- 5385. Life Span Development: Psychobiological and Cognitive Processes in Aging (3:3:0).** Prerequisite: Consent of instructor. Study in theory and research involving changes in cognitive and physiological processes in adults with emphasis on middle-aged as well as older individuals.
- 5396. Counseling and Psychotherapy with Special Populations (3:3:0).** Prerequisite: Consent of instructor. Gender, ethnic background, physical disabilities, and age-related themes related to the theory and practice of counseling and psychotherapy.
- 6000. Master's Thesis (V1-6).**
- 7000. Research (V1-12).**
- 8000. Doctor's Dissertation (V1-12).**

## Department of Sociology, Anthropology, and Social Work

Professor D. Paul Johnson, Chairperson.  
Emeritus Faculty Chandler, Goss, and Mayer-Oakes; Professors Curry, Dennis, Hickerson, Lowe, Peek, and Tsai; Associate Professors Dunham, Elbow, Hall, Koch, Paine, and Roberts; Assistant Professors Cannon, House, Nisbett, Schneider, and Walter; Adjunct Faculty: Benson and Way.

This department offers the following graduate degree programs: SOCIOLOGY and ANTHROPOLOGY, *Master of Arts*. Both programs are designed to provide broad training for students who wish to enter a Ph.D. program, prepare for undergraduate or community college teaching, or pursue a nonteaching career for which M.A. level training in sociology or anthropology is appropriate and useful. Both programs emphasize training in basic theory and methods. Both degrees may be pursued through either the thesis or nonthesis plan.

Students choosing the thesis plan in sociology are required to take 30 hours of course work (including 2 required courses in theory and 2 required courses in methods) plus 6 hours of thesis credit. They are also required to complete a thesis that is acceptable to the student's departmental thesis committee and demonstrate proficiency in a computer language. Students choosing the nonthesis plan are required to take 36 hours of course work (including 1 course in theory, 2 courses in methods, and 3 hours of SOC 5331). They are also required to complete a paper on a topic related to their professional interests that is acceptable to the student's departmental committee and to take a comprehensive examination on an approved topic in their last semester of study.

The sociology program allows course work specialization in such areas as family, criminology and deviance, social organization and change, minority relations, demography, urban problems, medical sociology, and sociology of religion. Six of the 30 hours required may be

taken as a minor outside the department. Selection of a minor requires approval of the graduate committee. In the sociology program, in lieu of a foreign language, each student is required to demonstrate proficiency in computer analysis of data.

The anthropology core curriculum requires courses in the following four basic subfields: archeology, biological anthropology, linguistics, and cultural anthropology. The minimum requirements are 30 hours of course work plus 6 hours of thesis credit. Students in the anthropology program are encouraged to use the minor to develop an area of emphasis either within the department (such as linguistics or sociology) or outside (such as biology, Latin American and Iberian studies, or museum science).

For both the thesis and the nonthesis plans in anthropology a final examination is required. In the sociology program the final examination in the thesis plan involves at least one of the various areas listed above. In the nonthesis plan the examination includes course work taken, the work experience outside the department, and the topic of the formal paper.

Decisions on the program of study, specific courses, and thesis topics are made through consultation with the graduate advisor in each program and other faculty members as appropriate on the basis of the individual student's background, interests, and objectives. With departmental approval requirements may be amended for individuals with exceptional qualifications, or additional courses may be required for applicants with inadequate undergraduate preparation.

General admission requirements are those established by the Graduate School. The best preparation is an undergraduate major in the same field, either sociology or anthropology, or equivalent. However, students from other fields are also encouraged to apply. More specific information regarding admission procedures or other aspects of the graduate programs may be obtained from either the sociology or the anthropology graduate advisor.

### Courses in Sociology. (SOC)

- 5303. Seminar in Contemporary Sociological Theory (3:3:0).** Study of contemporary approaches to society, including conflict theory, functionalism, symbolic interaction, and ethnomethodology.
- 5308. Seminar in the Origins of Social Theory (3:3:0).** Development of sociological theory in the nineteenth and early twentieth centuries. Topics may vary, but emphasis usually will be on the work of Marx, Durkheim, and Weber.
- 5311. Seminar in Criminology (3:3:0).** Critical review of theory and research on selected topics in criminology.
- 5312. Seminar in Urban Problems (3:3:0).** Extensive analysis of the process and consequences of urbanization, with emphasis upon causation and critiques of proposed solutions.
- 5313. Seminar in Minority Relations (3:3:0).** American and world patterns of interethnic relations are covered with emphasis on recent and current trends.
- 5315. Seminar in Social Change (3:3:0).** Linear and cyclical theories; analysis of the idea of progress, stage theories, dialectical materialism, and the lag hypothesis.
- 5316. Seminar in Social Gerontology (3:3:0).** Theory and research on aging, covering demographic, sociocultural, economic, individual, and societal factors. Interdisciplinary aspects are stressed.



- 5320. Social Psychology: Symbolic Interactionism (3:3:0).** Central ideas of social psychology are analyzed and integrated in a contemporary model of symbolic interactionism, with focus on affect.
- 5325. Seminar in Deviant Behavior (3:3:0).** Critical review of current theory and research in deviance.
- 5327. Seminar in Demography (3:3:0).** Theory and skills of population analysis including use of census data in sociological and social science research.
- 5331. Field Research (3).** Individual research project off campus, covering entire term or longer. Research plans must be approved in advance by the student's major advisor. May be repeated for credit with permission.
- 5332. The Research Organization (3:3:0).** Participation in campus-based organized research project. Required at least once of research assistants; open to other students.
- 5334. Quantitative Methods in Sociology (3:3:0).** Prerequisite: Undergraduate introduction to quantitative methods. Decision making skills (from test selection to inferences from data) for quantitative analysis in sociology.
- 5336. Seminar in Family Change (3:3:0).** Analysis of how the family institution has changed, in relation to other institutions and society in general. Family is treated as both a dependent and independent variable.
- 5381. Seminar in Medical Sociology (3:3:0).** Theory and research on conceptions of health, illness, and medical care from the sociological perspective.
- 5382. Seminar in Psychiatric Sociology (3:3:0).** An examination of theories of mental illness, the commitment process, mental hospitals, mental health professions, and alternative treatment programs.
- 5384. Seminar in the Sociology of Religion (3:3:0).** Examination of the religious institution focusing on its sociological meaning, organizations, presence as a force in western society, and relationship to other social institutions.
- 5394. Seminar in Sociological Research Methods (3:3:0).** An examination of the research process including problem formation, case selection, data collection, and data organization.
- 6000. Master's Thesis (V1-6).**
- 7000. Research (V1-12).**

### **Courses in Anthropology. (ANTH)**

- 5300. History of Anthropological Theory (3:3:0).** The main currents of theory in anthropology (cultural materialism, historical particularism, structuralism) and the influential theorists (Spencer, Tylor, Boas, Freud, Steward, Levi-Strauss).
- 5310. Primate Behavior (3:3:0).** A survey of the biological and behavioral diversity of nonhuman primates. Emphasizes issues concerning evolution, social organization and conservation of prosimians, anthropoids and hominoids.

- 5311. Human Origins (3:2:2).** A comprehensive examination of hominid evolution with emphasis on current discoveries, interpretations, and theories. Seminar on selected topics.
- 5312. Human Diversity (3:2:2).** Survey of biological variation and the processes producing it in human populations and races; seminar in selected topics. Laboratory emphasizing research approaches to current problems.
- 5313. Human Skeletal Biology and Forensic Anthropology (3:3:0).** Prerequisite: Graduate standing in anthropology, biology, museum science, or consent of instructor. Analysis of human skeletal remains for legal purposes. Methods of identification, techniques of recovery and examination, facial reconstruction, report writing, limits of inference, expert testimony.
- 5314. Human Ecology and Adaptation (3:3:0).** Survey of human biological adaptability, the dual inheritance of genes and culture, and human survival.
- 5317. Anthropology, Epidemiology, and Global Health (3:3:0).** Introduction to communicable-disease epidemiology; covers theory and methods, transmission, surveillance and control, emerging infectious diseases.
- 5322. Social Anthropology (3:3:0).** Seminar in contemporary social anthropology. Selected topics in kinship, social, and political organization; warfare and conflict resolution; and ritual and symbolism.
- 5323. Topics in Cultural Anthropology (3:3:0).** May be repeated for credit.
- 5341. Method and Theory in Archeology (3:2:2).** An intensive survey of the development and present status of method and theory in archeology.
- 5343. Topics in Anthropological Archeology (3:3:0).** Examination of either a currently important methodological topic in archeology or the archaeological knowledge extant from a site or geographic unit. May be repeated for credit. Also offered as a summer field course.
- 5345. Paleopathology (3:3:0).** Prerequisite: Consent of instructor. This course offers students an appreciation of the dynamic nature of human bone as it relates to the health of prehistoric populations.
- 5347. Evolution Medicine (3:3:0).** Examines human evolutionary biology; biocultural context of health, illness, and medicine; and reservoir-vector studies of human infectious diseases.
- 5349. Field Studies on Infectious Disease Ecology, Surveillance, and Control (3:3:0).** Prerequisite: Consent of instructor. Summer session field school providing instruction and experience in the field of epidemiology of infectious diseases, emphasizing original research in the developing world.
- 5352. Ethnolinguistics (3:3:0).** Survey of the nature of the interrelationships between language and culture.
- 6000. Master's Thesis (V1-6).**
- 7000. Research (V1-12).**

# Jerry S. Rawls

## College of Business Administration

*Professor Allen T. McInnes, Dean*

Horn Professors Conover, J. Hunt, and S. Hunt; Professors Anderson, Blair, Boal, Bowlin, Buchheit, Burns, Clancy, Dowell, Duhan, Dukes, Freeman, Goebel, Hein, Hennessey, Hoffman, Howell, Lampe, Macy, Mann, Nichols, Pasewark, Randolph, Ricketts, Sears, Sorenson, Stem, Viator, Westfall, Whitehead, Wilcox, Wilkes, and Yadav; Associate Professors Bravoco, Bremer, Browne, Dunne, Jones, Krefting, Laverie, Malone, Phillips, and Ritchey; Assistant Professors Antony, Arnett, Brigham, Durrett, English, Giambatista, Kuipers, Lin, Mansi, Masselli, Maxwell, Moore, Robinson, Sherif, Song, Szyliowicz, and Washington; Visiting Associate Professor Sellers; Visiting Assistant Professor Nix; Adjunct Faculty: Cochran, McComb, McWhorter, and Wheeler.

Admission to graduate degree programs offered through the Jerry S. Rawls College of Business Administration is based on grade-point average on the last 60 hours of undergraduate work, test scores (e.g., GMAT) and individual profile. No thesis is required in any of our master's degree programs. As part of the comprehensive evaluation process for graduation, a master's student must successfully complete one of the following as approved by their specific area of concentration: A final comprehensive examination; a capstone course; or a project. These requirements must be completed in one of the last two semesters preceding graduation with a grade of B or better. Students may be directed to enroll in a specific section. The following graduate degree programs are available:

**Master of Business Administration.** The college's M.B.A. program is designed to provide a broad background for multiple careers in business, government, and related activities with particular emphasis on developing managerial perspective, analytical tools, and skills. The program is sufficiently flexible to permit more depth in at least one academic area.

A joint venture of the School of Medicine and the college offers a concentration in health organization management. This program is accredited by the Accrediting Commission for Education in Health Services Administration (ACEHSA) and includes a certificate in addition to the M.B.A. degree. The M.B.A. health organization management program prepares master's students with varying levels and types of work experience, for post-graduate managerial roles within the health care industry, especially within medical group practices and other ambulatory care organizations.

Generally, the M.B.A. student may expect to complete the program in 16 months. Students possessing any undergraduate degree are invited to apply. M.B.A. students are expected to complete their tool course requirements first.

**Master of Science in Accounting.** This program is especially suited to the practicing accountant and the recent undergraduate major in accounting. Concentrations are available in accounting information systems-assurance or design and control, auditing-financial reporting, controllership, health organization management controllership, and taxation.

**Master of Science with a Major in Business Administration.** This degree is designed to produce a specialist in one of the following areas of business: finance, marketing, management information systems, telecommunication technology and network management, operations management, or business statistics. The student will take from 18 to 21 semester hours of course work in a specialty area, up to 6 semester hours of tool and quantitative courses, and 9 to 12 semester hours of electives usually in a concentration from one of the other specialty areas. Normally the student may expect to complete the program within one to two years depending on prior preparation.

**Doctor of Jurisprudence—Master of Business Administration.** The college, in association with the School of Law, offers a program that enables the student to earn both the Doctor of Jurisprudence and Master of Business Administration degrees in roughly four years of full-time academic work. A student with an undergraduate business background may complete both degrees with 102 hours of law and business courses respectively, a net saving of 24 credit hours from the total hours necessary if the degree programs were pursued separately. A student without a business background may complete both degrees with 124 hours of law and business courses. The first two years of study are taken mostly in the School of Law. Application must be made to and approved by both the School of Law and the College of Business Administration.

**Doctor of Jurisprudence—Master of Science in Accounting.** The college, in association with the School of Law, offers a program that enables students to earn simultaneously both the Doctor of Jurisprudence and Master of Science in Accounting degrees. In many cases, the student in this program will be able to save numerous semester credit hours in comparison to those needed to complete both degrees separately. Application must be made to and approved by both the School of Law and the College of Business Administration.

**Joint Bachelor of Business Administration—Master's Programs in Business Administration.** This program includes a 150-hour track leading to a B.B.A. and an M.B.A., B.B.A. and a M.S., or a B.B.A. and a M.S.A.; 114 semester hours of undergraduate credit and 36 semester hours of graduate credit. The program is designed for academically outstanding undergraduate students who wish to complete a master's degree while at Texas Tech.

Students should apply and be accepted to the graduate component of the program before the first semester of their senior year. Undergraduate students who are within the last 12 hours of undergraduate work may take graduate courses with approval of the Graduate Dean.

Application materials are available in the Graduate Services Center (BA 252) of the college. Upon successful completion of the required undergraduate courses plus six hours of designated graduate work, the B.B.A. degree will be granted (except for the B.B.A. and M.S.A. program which grants both degrees simultaneously). The final portion of graduate work will be completed during the student's fifth year.

**Master of Science in Nursing—Master of Business Administration.** The college in association with the Texas Tech Health Sciences Center School of Nursing, offers a program that enables the student to obtain both the M.S.N. and M.B.A. degrees with a health organization management concentration.

Students should have a Bachelor of Science in Nursing degree and apply for admission to both the M.S.N. program (in the School of Nursing) and the M.B.A. program. Because of collaborative arrangements between the School of Nursing and the college, 21 hours of course credit can be applied to both degree programs. Applications should be made to and approved by the Texas Tech Health Sciences Center School of Nursing and the college through the Graduate School.

**Master of Arts in Architecture—Master of Business Administration.** Students pursuing a M.Arch. degree may begin taking selected business courses in the sophomore year. These courses become part of the Master of Architecture degree and are prerequisites for the Master of Business Administration degree.

Students should apply and be accepted to the graduate component of this program *before* the first semester of their senior year. Graduate course work begins in the final semester of their undergraduate work. Application for this program is made through the college and the Graduate School.

**Master of Arts in Foreign Language—Master of Business Administration.** The college in association with the College of Arts and Sciences offers a joint program in French, German, and Spanish. This program is designed to save numerous semester credit hours in comparison to the total credit hours if degrees were pursued separately. Application must be made to and approved by both the College of Arts and Sciences and the Jerry S. Rawls College of Business Administration.

**Bachelor of Arts in One of the Following: French, German, Spanish, or Russian Language and Area Studies—Master of Business Administration.** Students pursuing a B.A. in a foreign language may take selected courses in this program for a minor in business. Students successfully completing the minor with a 3.0 GPA in the business courses will need only 36 hours of graduate courses to obtain a Master of Business Administration (M.B.A.) degree.

The program is intended for students with strong academic potential. The GMAT is required for admission to the M.B.A. program and students should apply through the college and the Graduate School.

**Doctor of Philosophy with a Major in Business Administration.** This degree is offered with first-field and

second-field specializations in accounting and taxation, finance, management, marketing, management information systems, operations management, and business statistics. The program has three emphases for the student: to provide a broad, integrated knowledge of business, to develop specialized knowledge in at least two fields, and to develop research skills. Examinations must be passed to show competency in the following subjects as soon after commencement of the program as possible: linear algebra and calculus. Early in the program each student must satisfy requirements—through course work with a minimum grade of B—in advanced statistics and micro- and macro-economics. There is no requirement for a foreign language. The student who is successful continuously at each step in progress should complete degree requirements in four years of full-time study beyond the master's degree.

The Jerry S. Rawls College of Business Administration requires that its master's program students maintain at least a 3.00 cumulative grade-point average. Doctoral students must maintain a 3.20 cumulative average. The grade-point average is computed on all graduate courses included on the degree program. Students falling below these averages will be subject to probationary action. In order to graduate, master's students must make at least three hours credit with a grade of A above a 3.00 cumulative grade-point average on all graduate courses in the program.

### Courses in Business Administration. (B A)

- 5380. Directed Experience (3:3:0).** Prerequisite: Admission to the MBA program. Students enhance their classroom knowledge through the rigorous analysis of internships, global field experiences, mentoring experiences, and other approved experiences.
- 5382. Internship in Business Administration (3:3:0).** Minimum standards determined by area. Written approval form required. This course permits students to enhance their knowledge within their field of specialization through application of concepts, principles, and techniques learned in the classroom.
- 5395. Practicum in Higher Education for Business (3).** Prerequisite: Consent of instructor. Supervised practice in teaching of business and administrative subjects.
- 6000. Master's Thesis (V1-12).**
- 7000. Research (V1-12).**
- 8000. Doctor's Dissertation (V1-12).**

### Courses in Accounting. (ACCT)

- 5300. Principles of Accounting (3:3:0).** Financial and managerial accounting principles and procedures, accounting data recording and analysis, and use and interpretation of accounting information for managerial decisions and control purposes.
- 5301. Managerial Accounting I (3:3:0).** Prerequisite: ACCT 5300. Limited to nonaccounting majors. Uses of accounting in business, including the interpretation of financial statements and accounting reports.
- 5302. Current Accounting Theory (3:3:0).** Prerequisite: ACCT 3305. Examination of current accounting literature, such as pronouncements of the Financial Accounting Standards Board, S.E.C. accounting releases, etc.
- 5303. Accounting Systems Management and Control (3:3:1).** Prerequisite: ACCT 4301 or 4305. A study of control implications and control integration into the systems analysis, design, and implementation process, emphasizing information technology.



- 5304. Federal Income Taxation of Corporations and Shareholders (3:3:1).** Prerequisite: ACCT 4307 or equivalent. Study of corporate tax problem areas, including liquidations, formations, collapsibility, dividends, and "Subchapter S" treatments.
- 5305. Accounting Research and Communication (3:3:1).** Prerequisite: Student must be enrolled in M.B.A., M.S., or Ph.D. accounting program. Written and oral communication of the results of individual studies of selected accounting topics.
- 5306. International Taxation (3:3:1).** Prerequisite: ACCT 4307 or 5304. Study of taxation of individual and business entities operating outside the States and foreign entities operating in the States.
- 5308. Federal Income Tax Law for Partnerships (3:3:1).** Includes study of withdrawals by partners, sale of partnership interests, adjustments to basis upon withdrawal of partner, transfers of unrealized receivables and appreciated inventories.
- 5309. Special Entity-Ownership Accounting Issues (3:3:0).** Prerequisite: ACCT 3305 or equivalent. A study of the accounting and reporting problems associated with selected entities or types of ownership, including partnerships and consolidated financial statements.
- 5310. Seminar in Public Sector Accounting (3:3:0).** Prerequisite: A grade of C or higher in ACCT 3304. An advanced seminar in accounting-related problems of public sector entities such as federal, state, and local governments, hospitals, universities, and other public institutions.
- 5311. Individual Study in Accounting (3).** Prerequisite: Consent of instructor. Directed individual study of advanced accounting problems varying with the need of each student. May be repeated for up to 9 hours credit if subject matter differs.
- 5312. Development of Financial Accounting Thought (3:3:0).** Prerequisite: ACCT 5302 or equivalent. Advanced financial accounting theory. Trace historical thinking to current thought and examine potential future developments.
- 5314. Issues in Cost and Managerial Accounting (3:3:1).** Prerequisite: ACCT 3306 or equivalent. Current issues in cost and managerial accounting.
- 5315. Estate and Gift Taxation (3:3:1).** Intensive study of federal taxation of the estate and trust entities and the transfer of property rights through gifts.
- 5317. Seminar in Controllershship (3:3:0).** Prerequisite: ACCT 5314 or consent of instructor. Seminar in controllershship and accounting policy.
- 5318. Income Tax Research and Planning (3:3:1).** Fundamental procedures in research of income tax subject areas, such as depreciation, inventories, etc. Principles involved in necessary planning of actions for a desired tax result.
- 5319. Auditing Theory and Practice (3:3:1).** Prerequisite: ACCT 4301 or 4305 or 5320. A study of advanced concepts, theories, and techniques applied to external financial, governmental, and internal audit engagements.
- 5320. Internal Audit Theory and Practice (3:3:1).** Prerequisite: ACCT 3305 and 3315. Extension and utilization of audit concepts and techniques with emphasis on application in internal audit departments.
- 5323. Advanced Topics in Financial Reporting (3:3:0).** Prerequisite: ACCT 3305. Advanced study of selected topics in financial reporting.
- 5324. Issues in International Accounting (3:3:0).** Prerequisite: ACCT 3304 and 5401 or consent of instructor. Current issues in international accounting.
- 5327. Advanced Income Taxation Accounting (3:3:0).** Prerequisite: A grade of A or B in ACCT 3304 and 3307. Study of advanced income tax effecting business and investment.
- 5330. Electronic Commerce Systems Control and Assurance (3:3:0).** Prerequisite: ACCT 5303. Issues surrounding strategic accounting information systems with a focus on electronic commerce systems.
- 5331. Management and Control of Integrated Business Processes (3:3:0).** Prerequisite: ACCT 5401. Management and control of activities that support business operations and controlled integration of e-business applications with ERP systems. Nonaccounting majors only.
- 5335. Advanced Integrated Accounting Systems (3:3:0).** Prerequisite: ACCT 5303. Advanced integrated accounting systems with a focus on enterprise resource planning systems and their application.
- 5401. Financial and Managerial Accounting (4:4:0).** This course examines financial accounting: The objectives, structure, and substance of financial reports; and management accounting: The use of accounting in the management of an organization.
- 6300. Colloquium in Accounting Research (3).** Prerequisite: Admission to doctoral program. Studies in selected areas of accounting research. Topics vary by semester.
- 6301. Contemporary Approaches to the Development of Accounting Theory (3:3:0).** Prerequisite: ACCT 5302 or equivalent. Recent contributions in the development of accounting theory and hypotheses including scientific methods, measurement theory, communication theory, operationalism, and other disciplines.
- 6303. Seminar in Accounting Information Systems (3:3:0).** Prerequisite: ACCT 5330 and 5335 or consent of instructor. Seminar in accounting information systems.
- 6314. Contemporary Issues in Cost and Managerial Accounting (3:3:0).** Prerequisite: ACCT 3306, 5314. Graduate seminar introducing contemporary issues such as human asset accounting, social accounting, international management accounting issues, and behavioral science and accounting.
- 6318. Seminar in Tax Research Methodology (3).** Graduate seminar in tax research method.
- 6319. Seminar in Auditing (3:3:0).** Prerequisite: Either ACCT 5319 or 5320, or consent of instructor. A study of the historical, theoretical, and conceptual framework of auditing extended to current societal and professional issues.

### Courses in Finance. (FIN)

- 5320. Financial Management I (3:3:0).** Prerequisite: ACCT 5300 or equivalent. Survey of financial management covering financial mathematics, capital budgeting, sources of capital, and financial analysis. Emphasis on working capital management.
- 5321. Financial Management II (3:3:1).** Prerequisite: FIN 5320 or equivalent. In-depth analysis of financial decision-making in areas of capital budgeting, risk, capital structure, financial analysis, dividend policy, mergers, financial failure. Case studies and computer financial models are used.
- 5325. Seminar in Security Analysis and Investments (3:3:1).** Prerequisite: FIN 5320 or equivalent. Evaluation of various investment media (stocks, bonds), investment analysis (both fundamental and technical analysis), and the concept of efficient markets and market risk.
- 5326. Seminar in Portfolio Theory and Management (3:3:1).** Prerequisite: FIN 5321. New developments in portfolio theory. Efficient markets and capital asset pricing model. Evaluation and management of portfolios.
- 5327. Student-Managed Fund (3:3:0).** Prerequisite: FIN 5325 or equivalent and consent of instructor. Advanced application of the process of selecting securities, and forming and managing a portfolio involving real money. Focus is on managing risk and return.
- 5328. Options and Futures (3:3:1).** Prerequisite: FIN 5321. Role of financial options and futures in hedging of financial risk. Develops relationships between options, futures, interest rates, and underlying assets.
- 5329. The Money and Capital Markets (3:3:1).** Prerequisite: FIN 5320 and 5333 or equivalent. Determination of saving-investment, demand for funds, theory of interest rates, portfolio selection, security pricing. Examination of money markets, bond markets, mortgage markets, tax-exempt markets.
- 5330. Current Financial Problems (3).** Prerequisite: Consent of instructor. Solution and presentation of approved problems involving individual research in the field of finance.
- 5331. Seminar in Management of Financial Institutions (3:3:1).** Prerequisite: FIN 5321, 5333, or equivalent. Economic role of financial institutions; development of financial institutions. Emphasis on operations, regulation, and

structure of the commercial banking system. Coverage of other financial institutions.

- 5333. The U.S. Financial System in a Global Environment (3:3:0).** Introduction to operations, mechanics, and structure of the financial system. Financial institutions, money and capital markets, financial instruments, regulations, monetary policy, international financial system.
- 5336. Individual Study in Finance (3).** Prerequisite: Consent of instructor. Directed individual study of advanced finance problems.
- 5338. Multinational Financial Management (3:3:0).** Prerequisite: FIN 5320 or equivalent. This course investigates issues in corporate financial management for multinational firms; including foreign exchange forecasting and risk management, multinational capital budgeting, multinational capital structure, and international financial markets.
- 5345. Real Estate Analysis (3:3:0).** A survey of the law, valuation, and financing of real estate, including secondary market analysis. Also, investigation into investment property ownership, feasibility, cash flow, and return calculations.
- 5421. Financial Management Concepts (4:4:0).** Prerequisite: ACCT 5401, ISQS 5345. Essential financial management concepts with applications to financial decision making in organizations. Special emphasis on cases and computer financial models.
- 6122. Research Seminar in Finance (1:1:0).** Seminar in current research topics and methodology in finance. Should be taken by doctoral students each semester of the program.
- 6331. Foundations of Finance (3:3:0).** Prerequisite: Consent of instructor. Doctoral seminar focusing on the foundations of finance theory.
- 6332. Seminar in Financial Engineering (3:3:0).** Prerequisite: Consent of instructor. Doctoral seminar covering theoretical and empirical elements of security returns and derivatives.
- 6333. Seminar in Investment Theory (3:3:0).** Prerequisite: Consent of instructor. Doctoral seminar covering the major theories and empirical studies that have been developed in the investment area of finance.
- 6334. Seminar on Financial Institutions and Regulations (3:3:0).** Prerequisite: Consent of instructor. Develops the Theory of Financial Institutions. Examines how, both theoretically and empirically, financial institutions and financial regulations have evolved over time.
- 6335. Seminar in Financial Institutions and Markets (3:3:0).** Prerequisite: Consent of instructor. Doctoral seminar on theories and empirical evidence in the area of financial institutions and markets.
- 6336. Empirical Research in Corporate Finance (3:3:0).** Prerequisite: Consent of instructor. Survey of corporate finance empirical research including capital structure, agency theory and corporate governance, dividend policy, information asymmetry and signaling, corporate restructuring, and research methodology.

### **Courses in Information Systems and Quantitative Sciences. (ISQS)**

- 5137. Information Technology for Managers (1:1:0).** Prerequisite: Proficiency in computer skills. The course examines information technology in organizations and the strategic use of information systems.
- 5237. Computer Skills for Business and Management (2:1:2).** This course develops basic personal computer skills needed in business management using selected packages of spreadsheets, word processing, database, Internet e-mail, World Wide Web, and groupware.
- 5242. Decision Theory and Management Science (2:2:0).** Prerequisite: ISQS 5137, ISQS 5345. Role of management science in decision making; deterministic optimization models; modeling with networks; stochastic decision models as paradigms for management risk; models for coping with uncertainty; and applications.
- 5243. Production and Operations Management (2:2:0).** Prerequisite: ISQS 5137, ISQS 5345. This course examines the

fundamentals of production and operations management in manufacturing and service organizations from a problem and quantitative models perspective.

- 5337. Information Systems for Managers (3:3:0).** Concepts of information systems and the integrating role such systems play in the efficient and effective use of organizational resources.
- 5338. Information Technology for Managers (3:3:0).** Prerequisite: ISQS 5137. E-commerce technology and business environment. E-commerce planning and implementation. Internet technologies. Multimedia on the Web. Web-based databases. Designing and building e-commerce site.
- 5341. Business Problem Solving and Information Technology (3).** Prerequisite: ISQS 5137. This course develops business problem solving skills using logic information technology. A programming language will be used to reinforce skills to solve business problems.
- 5342. Decision Theory and Management Science (3:3:0).** Prerequisite: ISQS 5337 and 5346. Introduction to decision making using management science models. Deterministic optimization models. Stochastic decision models as paradigms for management risk. Models for coping with uncertainty and complexity. Applications.
- 5343. Production and Operations Management (3:3:0).** Prerequisite: ISQS 5337 and 5346. Fundamentals of the production and operations function from a problems and quantitative models approach.
- 5345. Statistical Concepts for Business and Management (3:3:0).** Statistical applications using the personal computer, with emphasis on proper presentation and interpretation of statistics in managerial settings. Topics include descriptive statistics, graphical methods, estimation, testing, regression, forecasting, and quality control.
- 5346. Statistical Methods in Business (3:3:0).** Prerequisite: MATH 1330 and 1331 or equivalent or consent of instructor. A survey course covering basic statistical concepts and methods useful in the business environment. Use of statistical computer packages.
- 5347. Advanced Statistical Methods (3:3:0).** Prerequisite: ISQS 5345. Emphasis on application and interpretation of statistical methods. Design of experiments, analysis of variance, multiple regression, and nonparametric procedures. Use of statistical computer packages.
- 5348. Applied Distribution-Free Statistics in Business (3:3:0).** Prerequisite: ISQS 5345 or consent of instructor. Distribution-free statistical techniques of inference from non-normal populations and tests of nonparametric hypotheses applied to business problems.
- 5349. Regression Analysis (3:3:0).** Prerequisite: ISQS 5347 or equivalent. Foundations of regression analysis using least squares procedures; model formulation, stepwise regression, transformations; the major topics in regression from the business applications viewpoint.
- 6337. Business Programming Languages (3:3:0).** Prerequisite: ISQS 5341. Concepts of data structures and file processing as they relate to information systems. Emphasis on structured and object-oriented program design using C++.
- 6338. Systems and Information Concepts in Organizations (3:3:0).** Prerequisite: ISQS 5341 and ACCT 5401. Advanced study of systems and information concepts in organizations. Models for representing systems, information models, enterprise architecture, general systems theory, and decision making processes.
- 6339. Data Base Management Systems (3:3:0).** Prerequisite: ISQS 6338; prerequisite or corequisite: ISQS 6337. Treatment of data as an organizational resource, objectives of data management, survey of commercial systems, data models, data base design, client-server data bases, object-oriented data base design, and administration.
- 6340. Decision Support Systems (3:3:0).** Prerequisite: 6338. Theories of decision making, DSS software and design, artificial intelligence in DSS, executive information systems, and institutionalization and behavioral factors.

- 6341. Data Communications and Network Management (3:3:0).** Prerequisite: ISQS 5137 and a programming language. Concepts and terminology of data communications, network design, client-server architecture, distributed information systems with focus on communications architecture, and management.
- 6342. Strategic Uses of Telecom Technology (3:3:0).** Prerequisite: ISQS 6341. This course focuses on state-of-the-art Telecom technologies as well as their applications to solve business problems and/or create strategic advantage.
- 6343. Advanced Telecom Network Design and Management (3:3:0).** Prerequisite: ISQS 6341. Advanced technical and managerial aspects of designing an integrated communications network. An in-depth treatment of integrating voice, video, and other data in a network.
- 6347. Advanced Experimental Statistics (3:3:0).** Prerequisite: ISQS 5347 or consent of instructor. Foundations of experimental design; factorial structures; nesting structures; fixed, mixed, and random effects; ANACOVA; and business applications.
- 6348. Applied Multivariate Analysis (3:3:0).** Prerequisite: ISQS 5347 or consent of instructor. The use of multivariate analysis for solving business problems. MANOVA, factor, cluster, and discriminant analysis techniques. Computer-assisted analysis and graphic techniques.
- 6349. Advanced Business Forecasting (3:3:0).** Prerequisite: ISQS 5347 or consent of instructor. Forecasting methods for business and econometrics. Smoothing; autocorrelations; spectra autoregressive, MA, and ARMA models; Box-Jenkins and REGARMA models.
- 7338. Advanced Systems Analysis (3:3:0).** Prerequisite: ISQS 6338, MGT 5371, FIN 5320 or 5421. Methods for analyzing information needs and specifying application system requirements. Included are applications development strategies, business process reengineering, object-oriented analysis, and CASE tools.
- 7339. Advanced Information Systems Design (3:3:0).** Prerequisite: ISQS 7338. Technological and managerial aspects of system design and implementation. Explores state-of-the-art systems design techniques including object-oriented and event-oriented design.
- 7340. Management of Information Systems (3:3:0).** Prerequisite: ISQS 7338 or 7339 as a corequisite. Study of information systems; their design, implementation, and contribution to management planning, decision-making and control. Capstone course for M.S.B.A.-MIS and Telecom-net; grade of A or B required.
- 7341. Methodologies for Management Information Systems Research (3:3:0).** Prerequisite: Doctoral standing or consent of instructor. In-depth examination of MIS research methods and issues. First of three doctoral seminars in MIS research.
- 7342. Advanced Topics in MIS (3:3:0).** Prerequisite: ISQS 6337 and 6338. Topics include system construction, system maintenance, artificial intelligence, expert systems, enterprise integration, international issues in MIS, and other contemporary topics.
- 7346. Human and Organizational Issues in MIS Research (3:3:0).** An exhaustive review of the human and organizational MIS research. Particular attention is given to synthesis and conceptual development of these topics.
- 7347. Structural and Process-Oriented Issues in MIS Research (3:3:0).** An exhaustive review of structural and process-oriented paradigms in MIS research. Particular attention is given to synthesis and conceptual development of the topics.

### Courses in Management. (MGT)

- 5192. Global Management Strategies (1:1:0).** Corequisite: MGT 5391. Global aspects of strategy formulation and implementation.
- 5306. HOM I: Medical Aspects (3:3:0).** Prerequisite: Consent of instructor. Focuses on the implications for the management of health care organizations of medical issues such as the natural history of disease, epidemiology and health policies. (HOM 5306)
- 5307. HOM II: Managed Care Organizations (3:3:0).** Prerequisite: MGT 5306 or consent of instructor. Examines fundamental and contemporary issues in the organization and management of managed health care organizations.
- 5308. HOM III: Medical Groups and Ambulatory Care (3:3:0).** Prerequisite: MGT 5307 or consent of instructor. An organization-based view of the health care system emphasizing the provision of health care to populations via medical group practices and ambulatory care organization.
- 5309. HOM IV: Hospitals and Integrated Delivery Systems(3:3:0).** Prerequisite: MGT 5308 or consent of instructor. Analyzes and evaluates selected contemporary problems, issues, and trends in hospitals and integrated delivery systems.
- 5370. Organization and Management (3).** An introduction to basic concepts and practices in the operations of the modern organization.
- 5371. Managing Organizational Behavior and Organizational Design (3).** Examines management of individual, interpersonal, group and intergroup relations, organizational design, and the organization's role in a rapidly changing environmental and global context.
- 5372. Leadership and Team-Building Skills (3:3:1).** Prerequisite: Consent of the instructor. Emphasizes cognitive, skill, and experiential-practicum learning applied to ongoing leadership and organizational problems.
- 5373. Entrepreneurship (3:3:0).** Prerequisite: 12 graduate credit hours. Introduces concepts and skills associated with wealth creation. Examines managerial processes and strategies in emerging, growing, and revitalizing firms.
- 5374. Negotiation and Conflict Management Skills (3:3:1).** Prerequisite: Consent of instructor. Emphasizes negotiation skills and strategy development for managing organizational stakeholders.
- 5375. Organization Theory (3:3:0).** Prerequisite: Consent of instructor. A study of basic organization theory concepts and application of these concepts to the analysis and structure of organizations.
- 5376. Executive Skills (3:3:1).** Prerequisite: Admission to the MBA program. Develop self-awareness of personal attributes and goals, enhance personal development, and impart skills needed to function as future executives.
- 5377. Human Resource Management (3:3:0).** Prerequisite: Consent of instructor. Examination of the principles and methodology of personnel administration with emphasis on manpower planning, selection, development, and evaluation.
- 5378. Managing the Entrepreneurial Family Business (3:3:0).** Management and business issues involved in running family firms. Emphasis is on entrepreneurial family firms.
- 5379. Global Entrepreneurship (3:3:0).** Exploration of organization and management issues in global enterprise.
- 5381. Managing Innovation and Change (3:3:0).** This course focuses on understanding organization innovation and change and applying this knowledge to managing innovation and change processes.
- 5384. International Management (3:3:0).** Prerequisite: Consent of instructor. Comparative analysis of domestic, international, and multinational business operations, and the significance for organization and management.
- 5391. Strategic Management (3:3:0).** Prerequisite: Completion of program core requirements or consent of advisor or instructor. Total enterprise integrative perspective based on general management consulting experience. For MSA or MBA entrepreneurial studies students.
- 5491. Strategic and Global Management (4:4:0).** Prerequisite: Completion of tool and intermediate core courses in MBA program. Global and local strategy formulation and implementation of corporate, business, and functional strategies. MBA capstone course.
- 6375. Advanced Organization Behavior (3:3:0).** Prerequisite: Doctoral student status or consent of instructor. A seminar which explores research and conceptual foundations of behavioral



science and the role and contributions of microorganizational concepts in organization design and functioning.

- 6380. Colloquium in Management Research (3:3:0).** Prerequisite: Doctoral standing. Study of problems related to management for the individual student. Studies in selected areas of management research. May be repeated for credit.
- 6381. Seminar in Advanced Management Topics (3).** Organized seminar on specific advanced management topics in the areas of management of strategy, organizational studies, personnel and human resources management, or international business. May be repeated for credit.
- 6392. Advanced Organization Theory (3:3:0).** Prerequisite: Doctoral student status or consent of instructor. A seminar which explores the fundamental macro theories and concepts of organization design and functioning.
- 6395. Advanced Strategic Management (3:3:0).** Prerequisite: Doctoral student status or consent of instructor. A seminar which systematically examines the theoretical and empirical research literature on strategic management content and process.

### Courses in Marketing. (MKT)

- 5350. Marketing Foundations (3:3:0).** An examination of marketing functions and the institutions which perform them, choice of criteria for marketing strategy decisions, marketing structural relationships, and the role of marketing.
- 5355. Research Methods I (3:3:0).** Prerequisite: Consent of instructor. A survey of quantitative methods for and issues in the analysis of marketing data.
- 5356. Marketing Research for Decision Makers (3:3:1).** Prerequisite: ISQS 5345, MKT 5350 or 5360. Marketing research methods with emphasis on data collection and analysis for solving marketing problems.
- 5358. Business-to-Business Marketing (3:3:0).** Prerequisite: MKT 5350 or 5360. Designed to provide an overview of the many diverse facets of business-to-business marketing. Specific topics include selling to large businesses, buyer-seller relationships, supply-chain management, strategic alliances, and the effect of the Internet on business-to-business marketing.
- 5359. Individual Study in Marketing I (3:3:2).** Prerequisite: Consent of instructor. Directed individual study of advanced marketing problems varying with the need of the particular student. Can be repeated for credit if subject matter is different.
- 5360. Marketing Concepts and Strategies (3:3:0).** Prerequisite: ECO 5310. This course examines marketing functions, the institutions which perform them, and the study of marketing planning, strategy, and tactics. Includes the organization, execution, and control of the marketing effort.

- 5361. Marketing Administration (3:3:0).** Prerequisite: MKT 5350 or 5360 or equivalent. A study of marketing planning and strategic issues related to the marketing effort.
- 5362. Multinational Marketing (3:3:0).** Prerequisite: MKT 5350 or 5360. A survey of international marketing principles, cultural differences, world markets, and political restraints.
- 5363. E-Marketing (3:3:0).** Prerequisite: MKT 5360. Use of the Internet and related technologies to enhance marketing functions and processes so that organizations can function more effectively in a digital, networked economy.
- 5367. Behavior in Markets (3:3:0).** Prerequisite: MKT 5350 or 5360. A study of marketing management's use of a broad range of behavioral information in establishing marketing policy and strategy.
- 5368. Macromarketing (3:3:0).** Prerequisite: MKT 5350 or equivalent. An examination of the various macro-environments within which the marketing manager works: the institutional environment, the social environment, the political-legal environment, and the cultural-behavioral environment.
- 6352. Marketing Thought (3:3:0).** Prerequisite: Advanced graduate standing and consent of instructor. Evaluation of the contribution of marketing scholars to marketing thought, including the development of problems, theory, and principles.
- 6353. Marketing Theory (3:3:0).** Prerequisite: Advanced graduate standing and consent of instructor. A philosophy of science approach to the study of marketing theory and the components of marketing theory: hypotheses, law-like generalizations, empirical regularities, laws, models, and scientific explanations.
- 6355. Research Methods II (3:3:0).** Prerequisite: Advanced graduate standing and MKT 5355 or consent of instructor. An in-depth examination of measurement issues, including latent constructs and data-gathering procedures in marketing.

### Courses in Business Law. (BLAW)

- 5290. Legal, Regulatory, and Ethical Environment of Business (2:2:0).** Prerequisite or corequisite: MBA tool core. This course examines the legal, regulatory, and ethical issues that arise in the conduct of business to develop a capacity for recognizing and dealing with such issues.
- 5330. E-Business Law (3:3:0).** Prerequisite: BLAW 5290 or 3391. Study of the legal issues surrounding electronic commerce.
- 5390. Legal Environment of Business (3:3:0).** The meaning, nature, and sources of the law, the factors which shape it, and substantive fields of law which affect business organizations.
- 5392. Advanced Business Law (3:3:0).** Second course in business law. Emphasis on subject matter appearing frequently in the CPA law examination.

# College of Education

*Professor Greg Bowes, Dean*

Programs are available through the College of Education leading to the following graduate degrees: *Master of Education* and *Doctor of Education*. Students may select from a number of majors or support areas while working toward these degrees. The Office of Graduate Education and Research in the College of Education should be consulted for general information and referral to appropriate program advisors.

The Doctor of Education degree is offered in these areas: Counselor education, curriculum and instruction, educational leadership, educational psychology, higher education, instructional technology, and special education. The Doctor of Philosophy degree is offered in Higher Education. See the Division of Educational Psychology and Leadership for more information on this degree. Master of Education degrees are offered in bilingual education, counselor education, curriculum and instruction, educational leadership, educational psychology, elementary education, higher education, instructional technology, language literacy education, secondary education, and special education.

**Initial and Professional Certification (Public Schools).** Post baccalaureate programs designed to meet initial certification requirements for teaching in early childhood, middle level, and secondary schools are available. Although the professional certification programs require work at the graduate level, it should be noted that these programs are not coincidental with degree programs. The state-mandated ExCET test is required for persons who complete certification programs. For guidance concerning professional certification, the student should consult with an advisor or the university certification officer and the chairpersons of the various programs. Professional certification programs are offered in these areas: principal, superintendent, counselor, educational diagnostician, master reading teacher, reading specialist, and special education counselor. Professional teacher's certificates are awarded in approved fields in early childhood, middle level, and secondary education. Graduate program endorsements are available for bilingual education, early childhood, English as a second language, gifted and talented, information processing technologies, generic special education, and visual impairment.

**The Doctor of Education Degree.** Doctoral study consists of the mastery of a field of knowledge and successful pursuit of research. Consequently, doctoral programs are more flexible and varied than those leading to other graduate degrees. The Graduate School does not specify a course of study for the Doctor of Education degree. The general requirement is that the program should be unified in relation to a clear objective, that it should have the considered approval of the student's advisory committee, and that it should have a strong research component. The Doctor of Education degree is not granted for a program of miscellaneous study. The

program as a whole must be rationally unified, and all courses must contribute to an organized program of study and research. The major field must be from one of the following doctoral programs in the College of Education: (1) counselor education, (2) curriculum and instruction, (3) educational leadership, (4) educational psychology, (5) higher education, (6) instructional technology, or (7) special education. If a minor is taken, it must include at least 15 graduate hours in a program outside the student's major. Students majoring in curriculum and instruction may select a support area, such as bilingual, elementary, language literacy, or secondary education.

In addition to the major, every Doctor of Education degree program must include a foundations core (9 semester-hours minimum) and a research core (12 semester-hours minimum). The doctoral degree is never conferred solely as a result of any prescribed period of study. Rather, it is granted on evidence of general proficiency and distinctive attainment in a special field. The distinguishing feature of the degree is its focus on the student's mastery of independent investigation as demonstrated in a dissertation presenting original research or creative scholarship with a high degree of literary skill.

A period of residency is required for doctoral candidates to ensure that each has a time of concentrated study as a full-time student with minimal outside distractions. Such a period of course work, reading, reflection, study, research, and interaction with peers and faculty without the distractions of major outside responsibilities is necessary and no one should contemplate doctoral candidacy who is unable or unwilling to spend a substantial portion of time as a full-time student. During the residency, the student should be free of other employment responsibilities, except as specified below.

A candidate may satisfy the residency requirement in one of the following patterns:

- Two consecutive semesters of at least 12 semester hours each;
- Three consecutive full summer sessions of at least nine weeks each while earning at least 9 hours of graduate credit during each session;
- A full summer session of twelve weeks, earning 12 hours of graduate credit plus the completion of at least 12 hours of graduate credit during the adjacent spring or fall semester;
- A combination of 21 hours of graduate credit completed during a 12-month period plus at least 3 additional hours of graduate credit completed in an immediately preceding or subsequent full semester or summer session; or
- For students holding half-time graduate assistantships, or students involved for no more than half-time in other work closely related to doctoral study, 9 semester hours in each of the regular semesters and at least 6 hours in the preceding or subsequent summer.

The proposal for doctoral study, including the plan for meeting the residency requirements, should be submitted to the Graduate School well in advance of the proposed residency period.

## Division of Curriculum and Instruction

Professor Billy Askins, Chairperson.

Horn Professor Skoog; Professor Baines; Associate Professors Button, Cooper, Geer, P. Johnson, and Thomas; Assistant Professors Bush, Halsey, Janisch, H. Johnson, Morgan-Fleming, Morris, Price, Tyler, White, and Xu; Visiting Assistant Professor Thatcher.

The division offers study in the following graduate degree programs: BILINGUAL EDUCATION, ELEMENTARY EDUCATION, LANGUAGE LITERACY EDUCATION, and SECONDARY EDUCATION, *Master of Education*; CURRICULUM AND INSTRUCTION, *Master of Education* and *Doctor of Education*. Within the curriculum and instruction major several support areas are possible including bilingual, elementary, language literacy, and secondary education.

Programs leading to alternative teacher certification and associated endorsements are available.

Individuals seeking initial certification to teach in elementary or secondary schools must complete specified courses in education and meet other general education and teaching field requirements. Information on the post baccalaureate program is available in the division office. Information on teacher certification is included in the *Undergraduate Catalog* and the division office.

Information on admission standards, program requirements, and other matters concerning graduate programs in the division may be obtained from the division office or the Office of Graduate Education and Research in the College of Education.

### Courses in Bilingual Education. (EDBL)

- 5332. Foundations of Bilingual Education (3:3:0).** Overview of curriculum, assessment process, teaching strategies, research, and legislation related to bilingual education.
- 5333. Teaching the Multicultural-Multilingual Student (3:3:0).** Strategies and techniques for teaching and working with the multicultural-multilingual student.
- 5334. First and Second Language Acquisition (3:3:0).** First and second language acquisition and development as related to bilingual education and the teaching of English as a second language.
- 5336. Instructional and Management Issues in Bilingual Education—ESL (3:3:0).** A survey of issues relating to classroom instruction and management for language minority students.
- 5337. Teaching Strategies for ESL and Content-Area Teachers of Limited English Proficient Students (3:3:0).** Provides an instructional framework for material development and teaching approaches to limited English proficient students.
- 5338. Methods of Teaching English as a Second Language to PreK-12 Students. (3:3:0).** Study of rationale, theories, and goals of a comprehensive ESL curriculum program in compliance with public school needs and standards of the State of Texas.
- 5340. Language Minority Students With Exceptionalities (3:3:0).** Identification, learning characteristics, and instructional adaptations for language minority students with exceptionalities.
- 5393. Internship in Bilingual Education (3).** Experience in various roles in bilingual education.
- 6000. Master's Thesis (V1-6).**
- 7000. Research (V1-12).**
- 8000. Doctor's Dissertation (V1-12).**

### Courses in Educational Curriculum and Instruction. (EDCI)

- 5001. Advanced Education Workshops in Curriculum and Instruction (V1-6).** Advanced workshop activities in curriculum and instruction. Topics may vary.
- 5306. Seminar in Curriculum and Instruction (3:3:0).** Recent research, trends, and issues in curriculum and instruction. May be repeated for credit.
- 5310. Instructional Theory and Design (3:3:0).** Applications of contemporary educational theory and design procedures to secondary education, including models of teaching, enhancement of self-concept, and adolescent needs and interests.
- 5320. Curriculum Theory: Foundations (3:3:0).** Fundamental bases for curriculum development.
- 5321. Curriculum Theory: Design and Development (3:3:0).** Principles of curriculum needs assessment, design, implementation, and evaluation.
- 5333. Improving the Teaching of Thinking (3:3:0).** Provides an instructional framework for teaching specific thinking skills and for developing and nurturing the teaching of skillful and reflective thinking in all content areas (K-12).
- 5335. Models of Teaching (3:3:0).** Selected models of or approaches to teaching are described, demonstrated, and practiced. Emphasis is placed on expanding the repertoire of teaching skills.
- 6000. Master's Thesis (V1-12).**
- 6306. Advanced Seminar in Curriculum and Instruction (3:3:0).** Critical analysis and design of research in selected curriculum areas. May be repeated for credit.
- 6320. Curriculum Theory: Inquiry (3:3:0).** Antecedents of contemporary curriculum paradigms; relationships among curriculum, instruction, and society; tactics and models of curriculum analysis and criticism.
- 6393. Advanced Practicum in Curriculum and Instruction (3:3:0).** A supervised laboratory or field experience in a curricular area; includes assessment, planning, instruction, and evaluation. May be repeated for credit.
- 7000. Research (V1-12).**
- 8000. Doctor's Dissertation (V1-12).**

### Courses in Elementary Education. (EDEL)

- 5002. Advanced Education Workshops in Elementary Education (V1-6).** A maximum total of 6 hours of credit may be earned either simultaneously or in different semesters.
- 5360. Developing Social Studies Programs in Elementary Education (3:3:0).** Objectives, patterns, and principles of organization of social studies in the elementary schools.
- 5370. Developing Mathematics Programs in Elementary Education (3:3:0).** The development of arithmetic and its educative function in the elementary school curriculum.
- 5375. Developing Science Programs in the Elementary School (3:3:0).** Methods and materials for helping children develop an understanding of their natural and physical environments.
- 6306. Studies in Elementary Education (3:3:0).** Trends in modern elementary education.
- 6360. Studies in Social Studies Education (3:3:0).** Prerequisite: EDEL 3360 or 5360. In-depth studies of research and instructional practices pertaining to social studies education. May be repeated for credit.
- 6370. Studies in Mathematics Education (3:3:0).** Prerequisite: EDEL 4370 or 5370. In-depth studies of research and instructional practices pertaining to mathematics education. May be repeated for credit.
- 6375. Studies in Science Education (3:3:0).** Prerequisite: EDEL 4375 or 5375. In-depth studies of research and instructional practices pertaining to science education. May be repeated for credit.
- 7000. Research (V1-12).**
- 8000. Doctor's Dissertation (V1-12).**



**Courses in Language Literacy Education. (EDLL)**

- 5340. Foundations of Reading Instruction (3:3:0).** Prerequisite: EDLL 5351 or concurrent enrollment. Psychological and research bases of reading instruction. A foundations course.
- 5342. Assessment in Reading (3:3:0).** Prerequisite: EDLL 5340, 5344, 5351, or consent of instructor. Examines the use of both formal and informal assessment measures as a means to provide information useful for evaluating student performance and planning instruction.
- 5343. Practicum in Language Literacy (3:3:0).** Prerequisite: EDLL 5340, 5344 and 5351 or consent of instructor. Must be taken concurrently with EDLL 5342. Provides an opportunity to work in instructional settings to assist children in their reading development. Student achievement is considered through instructional strategies and assessment procedures.
- 5344. Content Area Literacy (3:3:0).** Prerequisite: EDLL 5340, undergraduate equivalent, or consent of instructor. Theoretical and research bases, issues, strategies, and methods related to learning from print in all content fields.
- 5345. Early Literacy (3:3:0).** Theoretical bases, procedures, techniques, and materials for early literacy instruction.
- 5346. Understanding, Valuing, and Assessing Language Learners (3:3:0).** Examines a constructivist framework as a foundation for understanding language and literacy development in elementary classrooms.
- 5348. Applied Linguistics and the Teaching of Literacy (3:3:0).** Prerequisite: Previous reading courses or consent of instructor. A study of reading as communication with applications of linguistics to the reading classroom.
- 5349. Adolescent Literature (3:3:0).** Study of current literature for middle and secondary level students (grades 7-12); selection of material and strategies appropriate for adolescents.
- 5350. Developing Language Arts Programs in Elementary Education (3:3:0).** Applications of research findings and modern theory to teaching and organizing the language arts in the elementary school.
- 5351. Children's Literature for Teachers and Librarians (3:3:0).** Literature for children in elementary and middle school; selection, use and organization. Includes nonprint media. Appropriate for English or language arts majors.
- 5352. Portfolio Assessment in Reflective Teaching (3:3:0).** Theory and technique for student portfolio assessment (observation, anecdotes, tests, reading and writing samples). Must have access to classroom students K-12.
- 5355. Developing Writing Programs in K-12 Classrooms (3:3:0).** Application of in-depth studies of research and instructional practices in the teaching of writing to guide development of effective writing programs.
- 5356. Problems, Trends, and Issues in Teaching Adolescent Reading (3:3:0).** Investigation of current problems, trends, and issues in the teaching adolescent readers in middle and secondary schools. May be repeated for credit.
- 5357. Early Detection in Reading (3:3:0).** Assessment of and intervention with children during daily literacy lessons. (First of two courses).
- 5358. Early Literacy Intervention (3:3:0).** Assessment of young children and initial intervention based on ongoing reading and writing assessment.
- 5393. Internship in Language Literacy Education (3).** Prerequisite: Advanced graduate classification in education. Experiences in the various roles of language literacy education.
- 6000. Master's Thesis (V1-6).**
- 6341. Problems, Trends, and Issues in Literacy Teaching and Learning (3:3:0).** Study of selected problems, trends, and issues related to literacy teaching and learning. Topics will vary. May be repeated for credit as topic varies.
- 6344. Trends and Issues in Content Area Literacy (3:3:0).** An in-depth study of trends and issues in content area literacy instruction in elementary and secondary schools. Designed especially for in-service teachers.
- 6347. Research Seminar in Literacy (3:3:0).** In-depth analysis and synthesis of contemporary research in literacy development and instruction.

**6350. Studies in Language Arts (3:3:0).** Prerequisite: EDRD 3352 or EDLL 5350. In-depth studies of research and instructional practices pertaining to elementary language arts. May be repeated for credit.

**6351. Studies in Literature for Children or Adolescents (3:3:0).** Prerequisite: EDRD 3350 or EDLL 5351. In-depth studies of research and instructional practices pertaining to children's literature. May be repeated for credit.

**6353. Investigations in Literacy (3:3:0).** Theoretical bases and research perspectives on literacy learning and instruction. An in-depth analysis of historically important research.

**7000. Research (V1-12).**

**8000. Doctor's Dissertation (V1-12).**

**Courses in Secondary Education. (EDSE)**

**5305. Issues and Reform in American Secondary Schooling (3:3:0).** Purpose, role, contemporary issues, and reform trends in American secondary schooling. Historical, philosophical, sociological, and ideological foundations of education. Examination of multiple contexts that influence schooling and roles of teaching.

**5307. Seminar in Secondary Education (3:3:0).** Trends and issues in modern secondary education.

**5320. Developing Curricula in Secondary Schools (3:3:0).** Foundations, principles, and issues of curriculum in secondary level schools.

**5322. Managing Secondary School Learning Environments (3:3:0).** Planning, organization, and implementation of social and academic systems in the classroom. The course is designed to examine critically research-based perspectives on conditions that must be created in order to develop a culturally responsive classroom learning environment.

**5331. Improvement of Instruction in the Secondary School (3:3:0).** A study of teaching behaviors, styles, and strategies. Instructional theories and various models of teaching are examined.

**5377. Science Curriculum and Instruction (3:3:0).** A study of evolving science curriculum with emphasis on innovative practices, methodology, organization for instruction, and evaluation.

**6000. Master's Thesis (V1-6).**

**7000. Research (V1-12).**

**8000. Doctor's Dissertation (V1-12).**

## Division of Educational Psychology and Leadership

Professor Jerry Parr, Chairperson.

Professors Bradley, Bowes, Koenig, and Reavis; Associate Professors Ahern, Burley, Claudet, Hartmeister, Lan, Murray, Olivarez, Price, and Tallent-Runnels; Assistant Professors Butner, Cejda, Crooks, Duemer, Eckert, Griffin-Shirley, Layton, Lock, Marbley, Maushak, Mendez-Morse, and Shen; Research Associate Professors Davidson and Kelley.

The division offers study in the following graduate degree programs: COUNSELOR EDUCATION, EDUCATIONAL LEADERSHIP, EDUCATIONAL PSYCHOLOGY, INSTRUCTIONAL TECHNOLOGY, SPECIAL EDUCATION, *Master of Education* and *Doctor of Education*; HIGHER EDUCATION, *Master of Education*, *Doctor of Education*, and *Doctor of Philosophy*.

Programs leading to the professional certificates and associated endorsements are available.

Information on admission standards, program requirements, and other matters concerning graduate programs in the division may be obtained from the division office

or the Office of Graduate Education and Research in the College of Education.

### **Counselor Education**

The college offers both a master's and doctoral level program in counselor education. The master's program consists of 48 semester hours and offers two tracks or majors: School counseling and agency counseling. The doctoral program offers one major in counselor education. Applicants must complete the Counselor Education Application Packet available in 214 Education.

The professional certificate in school counseling is available. Students desiring to obtain the school counseling certification only must have a master's degree in education from an accredited university and be admitted to the Graduate School and the counselor education program. A maximum of 18 graduate semester hours may be accepted for transfer credit toward certification provided the courses are no more than 6 years old and they are equivalent to courses taught at Texas Tech. No transfer hours will be allowed for practica (EPCE 5360, 5362, or 5363) or techniques (EPCE 5357). In addition to successfully completing the program, the applicant must have 3 years teaching experience, a valid teaching certificate, and pass an ExCet examination administered by the Texas Education Agency. Additional information and application forms are available in 214 Education.

### **Courses in Counselor Education. (EPCE)**

- 5001. Advanced Workshop in Counseling (V1-6).** Prerequisite: Consent of instructor. Workshop and field experience assignments in counseling-related activities. A maximum of 6 hours of credit may be earned.
- 5094. Internship in Counseling (V1-3).** Prerequisite: Admission to counselor education program; EPCE 5360.
- 5350. Ethical, Legal, and Professional Issues in Counseling (3:3:0).** Prerequisite: EPCE 5353 or 5358. Survey of objectives, principles, and practices in counseling in the educational and community setting. Must be taken during the first 12 hours of counseling classes.
- 5352. Child Counseling (3:3:0).** Prerequisite: Admission to the counselor education program or consent of instructor. Philosophy, principles, and practices of counseling children and young adolescents in school and community settings.
- 5353. Introduction to Community Counseling (3:3:0).** Overview of the activities of community counseling, nature of specific populations, program development and evaluation, planning for client services, and public policy issues.
- 5354. Group Counseling (3:3:0).** An overview of the principles, practices, and approaches to group counseling in school and community settings.
- 5355. Introduction to Career Counseling (3:3:0).** Overview of career theories, assessment procedures, techniques, and counseling processes used with adolescents and adults in school and community settings.
- 5357. Techniques of Counseling (3:3:0).** Prerequisite: EPCE 5350, 5364. Theory, simulation, and practice of counseling techniques used in school and community agency settings.
- 5358. Comprehensive School Counseling Programs (3:3:0).** Prerequisite: Admission to the counselor education program or consent of instructor. This course is designed to equip participants with skills and knowledge to develop, implement, manage, and assess components of a comprehensive developmental school counseling program.
- 5360. Practicum in Counseling (3).** Prerequisite: Admission to Graduate School, admission to the counseling program, and completion of 12 hours of counseling courses including EPCE 5350, 5354, 5357, 5364, 5366, 5370, 5371, and EPSY 5356. Assignment in a school or community agency setting for supervised experiences in counseling. May be repeated for credit.
- 5361. Practicum in Consulting Techniques (3).** Prerequisite: Admission to Graduate School, full status admission to the counseling program, completion of EPSY 5350, 5357, and 5364 or consent of instructor. Examination of consultation approaches with parents and professionals on behalf of children and adolescents. Demonstrations and practice.
- 5362. Practicum in Group Counseling (3).** Prerequisite: Admission to Graduate School, full status admission to the counseling program, EPCE 5354, and consent of instructor. Application and demonstration of small group counseling techniques under supervision. Emphasis on the integration of theory and practice in schools and community agencies.
- 5363. Practicum in Counseling with School Families (3).** Prerequisite: Admission to Graduate School, admission to the counseling program, EPCE 5350, 5354, 5357, 5360, and 5364. Assignment in schools and community agencies for supervised experiences counseling with families. Application of theoretical principles and case analyses.
- 5364. Theories of Counseling (3:3:0).** Overview of theories and paradigms of counseling.
- 5366. Dysfunctional Behavior (3:3:0).** Prerequisite: EPCE 5350 and 5364, or consent of instructor. Overview of dysfunctional behavior, analysis of dysfunctional behavior in educational and counseling settings.
- 5367. Family Counseling Applied to School Settings (3:3:0).** Prerequisite: EPCE 5350, 5364, or consent of instructor. Family counseling applied to school settings. Theory, simulation, and practice of techniques used in family counseling applied to school and community agencies.
- 5369. Seminar in Counseling (3:3:0).** Prerequisite: Departmental approval required. A critical investigation of counseling topics related to school and community agencies. May be repeated as topic varies.
- 5370. Ethical and Legal Issues in Counseling (3:3:0).** Prerequisite: EPCE 5350 and 5364. An investigation of legal and ethical issues in the counseling profession. Focus on schools and community agencies.
- 5371. Counseling Diverse Populations for Licensed Professional Counselor (3:3:0).** Prerequisite: EPCE 5350, 5364. The course provides an overview of counseling theory as it applies to diverse groups including gender, geriatric, racial, ethnic, and exceptionality issues.
- 5372. Addictions: An Overview for School and Community Counselors (3:3:0).** This basic course provides an overview of addictions theory, issues, and practice. The course's focus is on community and school counseling.
- 5374. Applied Principles and Practices of Play Therapy-Counseling I (3:3:0).** This course includes an overview of essential elements and principles of play therapy including theories, techniques, modalities, and environments. The course features a practicum element during which students conduct play therapy sessions under supervision of the instructor.
- 5375. Applied Principles and Practices of Play Therapy-Counseling II (3:3:0).** Prerequisite: EPCE 5374 or consent of instructor. Advanced theories, techniques, modalities, and environments of play therapy amplified by supervised experience with children in playrooms.
- 6000. Master's Thesis (V1-6).**
- 6001. Advanced Study of Special Topics in Counselor Education (V1-6).** Prerequisite: Consent of instructor and admission to doctoral program in counselor education. An organized course to foster in-depth study of a current topic in counselor education. Course work will focus on one major current topic. May be repeated for credit.
- 6094. Doctoral Internship in Counseling (V1-3).** Prerequisite: Admission to Ed.D. program in counseling, completion of all course work including practica and supervision, and consent of instructor. Supervised employment or field experience in a school or community agency setting. May be repeated for credit.

- 6335. Advanced Counseling Theory and Techniques (3:3:0).** Prerequisite: EPCE 5357, 5364, and admission to doctoral program in counseling. Analysis of major approaches to counseling with integration of the techniques in clinical practice.
- 6350. Doctoral Seminar in Counseling (3:3:0).** Prerequisite: Admission to doctoral counseling, consent of instructor, EPSY 5381 or equivalent. Special topics in counseling covering both research and practice. May be repeated for credit.
- 6354. Advanced Theory and Practice of Group Leadership (3:3:0).** Prerequisite: EPCE 5354, 5364, and consent of instructor. Survey of major theoretical paradigms and their application in leading small groups. Supervised practice to integrate theory and application.
- 6360. Advanced Practicum in Counseling (3).** Prerequisite: Admission to the Graduate School, admission to the counseling program, completion of all EPCE 5000 level practica, and consent of instructor. Supervised laboratory and field experience in schools and community agencies. Emphasis on integration of theory and practice. May be repeated for credit with the instructor's consent.
- 6366. Advanced Practicum in Counselor Education and Supervision (3).** Prerequisite: Admission to the Graduate School, full status admission to the counseling program, completion of all EPCE 5000 level practica, EPCE 6360 and 6335, and consent of instructor. Emphasis on supervision theory, training, and experience in the supervision of counselors.
- 7000. Research (V1-12).**
- 8000. Doctor's Dissertation (V1-12).**

### **Educational Leadership**

Students in this program may choose to emphasize educational leadership or supervision at the elementary, secondary, or system level in the public schools. Work in related fields outside of the College of Education is encouraged.

Graduate work is offered in preparation for these professional certificate programs: Principal and superintendent.

Degree programs and certification programs have different requirements, but many courses will apply to both.

### **Courses in Educational Leadership. (EDLD)**

- 5001. Advanced Education Workshops in Teaching and Administration (V1-6).** Prerequisite: Consent of instructor. Advanced workshop activities and experiences in administration. A maximum total of 6 hours of credit may be earned either simultaneously or in different semesters.
- 5306. School-Based Leadership (3:3:0).** This course examines the major theories, concepts, and empirical findings related to school-based leadership.
- 5310. Instructional Supervision (3:3:0).** Principles, planning, organizations, and processes of supervision in both elementary and secondary schools.
- 5330. Staff Development (3:3:0).** Principles and procedures of organizing programs of school improvement through comprehensive and ongoing staff development.
- 5340. Educational Law (3:3:0).** Introduction to the legal aspects of educational organizations, focusing on the school building level and emphasizing the rights and responsibilities of students, teachers, and administrators.
- 5350. School Personnel and Fiscal Management (3:3:0).** Introduction to the concepts of fiscal and human resource management with an emphasis on site-based decision making.
- 5351. Communication for School Leaders (3:3:0).** The study and application of interpersonal communication theory and research as related to organizational, social, and environmental contexts. Individual conferencing, informational and employment interviewing, and group dynamics, are included.
- 5361. Process of Educational Change (3:3:0).** A study of the knowledge base of change management in education. Application of the cognitive understandings to national change models and local settings.

- 5380. The School Superintendent and Educational Governance (3:3:0).** Prerequisite: Admission to superintendent certification program. Prepare educational leaders for the national, state, and local aspects of school district governance in the 21st century.
- 5381. School District Resource Management (3:3:0).** Prerequisite: Admission to superintendent certification program. Critical analysis of the business services of school districts, emphasizing planning, budgeting, resource management, fiscal operations, and accountability.
- 5382. The Superintendency, Organizational Politics, and Legal Issues (3:3:0).** Prerequisite: Admission to superintendent certification program. Emphasis on political and legal knowledge, skill and competencies; also board and superintendent relationships, conflict resolution, communications, and community relations.
- 5391. School and Community (3:3:0).** Explores the development of collaborative culture at school, enlist community support, and form partnerships with businesses, universities, and parents. Addresses improved communication among increasingly diverse members of the school staff, parents, students, community members, and media.
- 5392. Mid-Management Internship in Education (3:3:0).** Prerequisite: The internship can only be taken as the final course in the mid-management certification program. Guided experience in mid-management administration and under the supervision and direction of a mid-management administrator and a University professor.
- 5394. Superintendent Internship in Education (3).** Prerequisite: Admission to superintendent certification program. Guided experiences in central office administration under the supervision and direction of a central office administrator and a University professor. The internship can only be taken as the final course in the superintendent's certification program.
- 6000. Master's Thesis (V1-6).**
- 6001. Advanced Study of Special Topics in Educational Administration (V1-6).** Prerequisite: Consent of instructor and admission to doctoral program. An organized course to foster in-depth study of a current topic in Educational Leadership. Course work will focus on one major current topic. May be repeated for credit.
- 6300. Organizational Theory in Education (3:3:0).** Prerequisite: Admission to doctoral program. Theories and paradigms to determine implications for theory development, for research activities, and for practical applications.
- 6321. Educational Finance (3:3:0).** Prerequisite: Admission to doctoral program. The development and content of public school finance policy in the United States focusing on the fiscal, political, legal, and economic and normative dimensions.
- 6340. Educational Policy and the Law (3:3:0).** Prerequisite: Admission to doctoral program. The interplay of the law and public policy emphasizing the relationship between legal decisions and educational practices from the perspectives of the governing board and central administration.
- 6341. Legal Issues With Special Populations (3:3:0).** Prerequisite: EDLD 5340 or consent of instructor. Prepare educational leaders for legislative and litigating aspects of working with special populations.
- 6351. Organizational Communication in Education (3:3:0).** Prerequisite: Admission to doctoral program. The study of organizational communication theory and research as related to theoretical issues, environments, and patterns in education. Organizational communication methodology and process are included.
- 6361. Doctoral Seminar in Educational Administration (3:3:0).** Prerequisite: Admission to doctoral program. Advanced analysis and synthesis of research and practice concerning problems and issues in educational leadership. May be repeated for credit.
- 6385. Research in Educational Administration (3:3:0).** Prerequisite: Admission to doctoral program. Survey of educational leadership research focusing on contemporary issues, techniques in research design and methodology (qualitative and quantitative), and grantsmanship.



**6392. Doctoral Internship in Educational Leadership (3:3:0).** Prerequisite: Admission to doctoral program and consent of instructor. The application of reflective practice to problems of leadership in a school setting. Expert practitioners and University professors coach students through a process of thinking about the definition and solution of problems as they develop and test plans for action.

**7000. Research (V1-12).**

**8000. Doctor's Dissertation (V1-12).**

### **Courses in Early Childhood Education. (EDEC)**

**5310. Application of Studies in Maturation and Learning to Early Childhood Education (3:3:0).** Study of the influence of environmental factors on the physical, emotional, social, and intellectual growth of young children.

**5311. Analysis and Design of Programs in Early Childhood Education (3:3:0).** Research study and laboratory observations to determine nature and need of school experiences for young children.

**5312. Environmental Systems and Teaching Strategies in Early Childhood Education (3:3:0).** Prerequisite: EDEC 5310 and 5311 or consent of instructor. Study of facilities, equipment, materials, and methods designed for maximum development of the individual child.

**5314. Early Education for Culturally Diverse Children (3:3:0).** Prerequisite: EDEC 5310 and 5311 or consent of instructor. Study of cultural differences, values, concepts, and language development of young children. Emphasis upon English as a second language and/or a second dialect and parent involvement.

**5393. Internship in Early Childhood Education (3).** Prerequisite: Advanced graduate classification in education.

### **Educational Psychology**

Students enrolled in the educational psychology program earn a master's and/or doctoral degree with a variety of areas of emphasis (e.g. history and/or philosophy of education, learning and motivation, human development, multicultural education, and research, measurement, and statistics). A minimum of 36 semester credit hours is required for the Master of Education degree. Students pursuing a master's degree can do so with or without a thesis. A minimum of 93 semester credit hours is required for the Doctor of Education degree. Applicants to either program must first apply to and be cleared by the Graduate School before being reviewed and approved by the educational psychology faculty. Admission to a master's program does not constitute admission to a doctoral program later. Applicants without a strong background in psychology may be required to complete leveling courses before unconditional admission to the program. Additional information and applications forms are available in 214 Education.

### **Courses in Educational Psychology. (EPSY)**

**5310. Philosophy of Education (3:3:0).** Major western social philosophies and their application to the field of education in the United States.

**5314. History of Education (3:3:0).** A study of the development of Western education with emphasis on pedagogical leaders and reformers.

**5323. Cultural Foundations of Education (3:3:0).** Analysis of linkages between school and community with special reference to the impact of the selection and allocation functions of schooling on minority groups.

**5331. Human Development in Education (3:3:0).** Interrelationships of social and psychological development through the lifecycle and implications for teaching and learning.

**5332. Educational Psychology (3:3:0).** Emphasis on the application of educational psychological principles to teaching at all levels.

**5333. Adolescent Learners (3:3:0).** Environmental, social, developmental, and cognitive factors influencing learning in adolescence; application of learning theory to classroom environment and instructional design for adolescent learners.

**5349. Seminar in Educational Psychology (3:3:0).** Research analysis and synthesis in the field of educational psychology. May be repeated for credit.

**5356. Principles of Educational and Psychological Measurement (3:3:0).** Analysis and techniques of tests and measurements in educational settings—achievement tests, tests used in counseling and assessment of students.

**5379. Introduction to Educational Research (3:3:0).** Introduction to the nature of research and its relationship to educational thought and practice. Focus on preparing research consumer.

**5380. Introduction to Educational Statistics (3:3:0).** An introductory course in statistics with major emphasis on univariate measures for analyzing educational data.

**5381. Intermediate Educational Statistics (3:3:0).** Prerequisite: EPSY 5380 or STAT 5302. Topics include multiple regression, analysis of variance and covariance, multiple comparison tests, and additional non-parametric tests.

**5382. Qualitative Research in Education (3:3:0).** Study in theoretical perspectives informing qualitative research in education including relevant issues and methodological criteria.

**5385. Foundations of Educational Research (3:3:0).** Methods of educational research; methods of obtaining, processing, interpreting, and using significant educational data.

**5389. Individual Intelligence Testing (3:3:0).** Use of individual appraisal instruments and techniques in educational evaluation of children, youth, and adults—WISCIII, Stanford-Binet, K-ABC.

**5393. Internship in Education (3).** Prerequisite: For counseling students, admission to counseling program and completion of practicum requirements. Supervised employment or field experience in an educational setting. May be repeated for credit.

**6000. Master's Thesis (V1-6).**

**6301. Advanced Data Analysis (3:3:0).** Prerequisite: EPSY 5381 or STAT 5303 or consent of instructor. Study of multivariate techniques for analyzing educational data, including such topics as multivariate regression, manova, discriminate analysis, and factor analysis.

**6302. Survey Research in Education (3:3:0).** Prerequisite: EPSY 5381, 5385, or consent of instructor. The design and implementation of survey methodology in educational settings. Coverage of sampling techniques. Questionnaire design, analysis of data, and strategies for dissemination of findings to specific audiences.

**6303. Educational Measurement (3:3:0).** Prerequisite: 3 hours of statistics. Study of psychometric theory, test and instrument development, and use of standardized instruments in educational research.

**6304. Qualitative Research Methods (3:3:0).** Prerequisite: EPSY 5382. Study of qualitative methods used in educational research. Includes application and problems.

**6305. Qualitative Data Analysis in Education (3:3:0).** Prerequisite: EPSY 6304. Study of methods used in the analysis of data gathered through qualitative research methods and of ways of reporting these research findings.

**6310. Seminar in Early Childhood Education (3:3:0).** Prerequisite: 12 hours of graduate credit in early childhood education or consent of instructor. Trends in modern early childhood education.

**6314. Sociocultural Foundations of Early Childhood Education (3:3:0).** Prerequisite: 9 hours of graduate credit in early childhood education and EDEC 5314 or consent of instructor. An analysis of societal influences on the child and the cultural milieu in which the child functions. A study of the impact of these factors on the early childhood learning environment.

**6316. Facilitating Divergent Thinking in Early Childhood (3:3:0).** Prerequisite: 12 hours of graduate credit in early childhood education or consent of instructor. An analysis of

research in divergent thinking as a process for cognitive development. A study of early childhood learning environments which encourage creativity.

- 6332. Advanced Educational Psychology (3:3:0).** Emphasis on the research and theories of educational psychology and the evaluation and synthesis of psychology theories.
- 6349. Doctoral Seminar in Educational Psychology (3:3:0).** Prerequisite: Admission to doctoral program. Several topics in research and analysis in educational psychology. May be repeated for credit.
- 7000. Research (V1-12).**
- 8000. Doctor's Dissertation (V1-12).**

### Higher Education

The Higher Education program is committed to excellence in preparing and supporting instructional and administrative leaders for higher education, generating and supporting research, and delivering public service to the field of higher education.

Higher education students come from a variety of fields and types of higher education institutions. Our primary role is to prepare leaders for the higher education enterprise. The program delivers teaching, research, and professional development services to students, institutions of higher education, and other academic disciplines.

Students working on a master's degree may pursue either nonthesis or thesis options. The master's program consists of two tracks or majors: Higher education administration (36 semester hours) and student affairs (48 semester hours).

The Higher Education program offers two doctoral degrees. The Doctor of Education (Ed.D.) is designed for the advanced student who wishes to achieve a superior level of competency in his or her professional field with emphasis on practice and leadership. There are three tracks or majors in the Ed.D.: University administration, community college leadership and teaching, and student affairs. The Doctor of Philosophy (Ph.D.) is designed for the advanced student who wants to acquire the ability to contribute to the knowledge base of teaching, education, and leadership through a thorough grounding in the conduct of research. The Ph.D. will prepare students for professional careers as: Institutional researchers and planners; administrators with an orientation towards research, sponsored programs, or grant proposal writing; and program assessment-evaluation specialists, research associates, and faculty members.

Both doctoral degrees require the completion of 93 credit hours beyond the baccalaureate. As part of the credit hour requirements, candidates for both the Ed.D. and the Ph.D. are required to demonstrate proficiency in independent research in higher education, culminating in the completion of a dissertation.

For further information, see the program Web site at <[www.educ.ttu.edu/edhe](http://www.educ.ttu.edu/edhe)>.

### Courses in Higher Education. (EDHE)

- 5001. Seminar in Higher Education (V1-6).** A special topics course designed to acquaint students with current research, theory, policies, and/or practices in higher education. May be repeated for credit.
- 5300. The History of Higher Education in the United States (3:3:0).** An examination of the development of the American system of higher education—its origin, major characteristics, trends, and distinctive features.
- 5301. American Higher Education (3:3:0).** A comprehensive introduction to the basics of American higher education including facts and fundamental theoretical concepts on which to build future understandings and research.
- 5302. Comparative Higher Education (3:3:0).** A comparative study of systems of higher education throughout the world and their counterparts in the United States.
- 5303. Critical Issues in Higher Education (3:3:0).** An examination of perspectives on equity and access, excellence, and efficiency concerns in higher education.
- 5304. Higher Education Institutions (3:3:0).** An examination of institutional and disciplinary differences in faculty work, belief, and authority in universities, four-year colleges, and two-year colleges.
- 5305. Organization and Governance in Higher Education (3:3:0).** An examination of organization theory, models, and policies; governance and management processes; and leadership perspectives and theory. A review of research and new conceptual perspectives.
- 5308. Introduction to Andragogy (3:3:0).** Aspects and conditions of adulthood, determining teaching strategies and techniques to facilitate effective learning and possible institutional adaptation to adult learners and students.
- 5313. The Community Junior College (3:3:0).** An introductory course to acquaint students with the purposes, programs, people, organization, control, and resources of these colleges.
- 5314. Community College Curriculum (3:3:0).** An examination of the various curricular functions of the American community college: occupational education, remedial education, community services, liberal arts, and general education.
- 5315. Community College Leadership (3:3:0).** A study of different leadership styles, strategies, and theories applicable to the community college sector.
- 5321. The Administration of Higher Education (3:3:0).** Examines administration of higher education at institution and unit level. Addresses organizational culture and behavior, as well as management and leadership studies.
- 5322. Institutional Planning in Higher Education (3:3:0).** An examination of the current models and theories used to develop strategies for organizational planning, including an analysis of internal assumptions and the external environment.
- 5323. Development and Finance in Higher Education (3:3:0).** A study of the requirements for a sound institutional development program, including mission and objectives, budgeting, organization and planning. Relationships with constituencies and proposal preparation is analyzed.
- 5324. Higher Education and the Law (3:3:0).** A study of constitutional, statutory, and case law concerning public and private college and university boards, administrators, faculty, and students.
- 5332. Student Services in Higher Education (3:3:0).** Focuses on the theoretical bases of the profession, roles and models for practice and competencies, and techniques of student services.
- 5333. Issues in Student Affairs (3:3:0).** Prerequisite: EDHE 5332 or consent of instructor. Current issues in the administration of student affairs programs and activities on college and university campuses in the United States.
- 5335. The American College Student (3:3:0).** This course will examine the changing demographics and characteristics of college students. Research on college students will be reviewed to determine the impact of college on students.
- 5341. Assessment of Student Outcomes in Higher Education (3:3:0).** An examination of the philosophy and practice of assessment and evaluation in higher education.
- 5342. College Teaching (3:3:0).** An exploration of the nature of college teaching and the teaching-learning process, including a review of major issues and problems.
- 5343. College and University Curriculum (3:3:0).** Issues, problems, and basic considerations in curriculum development. The structure of knowledge. Developments and trends in liberal education, the disciplines, and professional education.
- 5393, 5394. Internship in Higher Education (3 each).**
- 6000. Master's Thesis (V1-6).**

- 6310. Higher Education Research Seminar (3:3:0).** A series of seminars dedicated to the development of student research proposals, Manuscripts, and grant applications. The seminars bridge the gap between theory and practice. May be repeated for credit.
- 6325. Policy Analysis and Issues in Higher Education (3:3:0).** Examines the relationship between colleges and universities and policies developed by boards and governments. Explores prevalent issues facing higher education from a policy perspective.
- 6370. Capstone Seminar (3:3:0).** Integrates the Ph.D. experience and prepares graduates for entry into the profession. Students will develop a portfolio, conference research paper, and a reflection paper.
- 7000. Research (V1-12).**
- 8000. Doctor's Dissertation (V1-12).**

### ***Instructional Technology***

The instructional technology program offers both master's and doctoral degrees. the goal of the program is to prepare specialists in the field of instructional design and technology. Instructional technology students come from a variety of backgrounds including public school education, higher education, and the private sector. Graduate programs include a foundation of educational research and educational psychology as well as an in-depth study of instructional design and educational technology applications. Several courses are offered via the World Wide Web.

The doctoral program requires 83 credit hours plus a dissertation beyond a bachelor's degree. Doctoral program graduates often enter the field of higher education as professors, instructional designers, and technology specialists.

The master's program requires 40 credit hour beyond a bachelor's degree. Two areas of emphasis are available, educational computing and distance education. Graduates often accept positions as technology specialists in public education, as consultants or developers of instructional materials in the private sector, or as community college instructors or technology specialists.

A cooperative program in library information systems is also offered in conjunction with the University of North Texas. This program prepares library and information specialists for public schools and for public and academic libraries.

The instructional technology program offers three certification programs which may be taken in conjunction with a graduate degree program or independently. Information processing technology (IPT) is a state teaching certificate endorsement, which certifies the holder to teach certain technology related courses in public schools. Computer information systems is a secondary school teaching field program for teachers of computer science. A distance education certificate program is a university issued certificate, which certifies competency in distance education teaching and instructional design.

For more information, see the program Web site at <[www.educ.ttu.edu/edit](http://www.educ.ttu.edu/edit)>.

### **Courses in Educational Instructional Technology. (EDIT)**

- 5000. Special Topics in Instructional Technology (V1-3).** Covers special designated topics in instructional technology. May be repeated for credit.

- 5301. Selection, Evaluation, and Acquisition of Instructional Materials (3:3:0).** Selection, evaluation, and acquisition of commercially prepared materials in all formats. Special emphasis on selecting multicultural and multiethnic materials and on selection aids and evaluation criteria.
- 5302. Administration and Organization of Learning Resources Centers (3:3:0).** State, regional, system-wide, and building learning resource centers; budgeting, procurement, distribution systems for all formats, facilities, personnel, public relations, and research.
- 5316. Foundations of Instructional Technology (3:3:0).** Overview of the field of instructional technology including the design, development, utilization, management, and evaluation of instructional systems.
- 5317. Instructional Design Foundations (3:3:0).** Technological advances in instruction with emphasis in instructional systems design; and a broad overview of the field of instructional technology.
- 5318. Introduction to Small Computers in Education (3:3:0).** Introduction to computers for educators. Includes computer terminology, operations, overview of applications, hardware, and software. Hands-on experience with small computers included.
- 5319. Technology Applications for School and Classroom Management (3:3:0).** Explores methods of using technology, computers, and networks for classroom instruction and school administration. Emphasizes use of computers in planning, managing, decision making, and leadership.
- 5320. Educational Network Applications (3).** Computer applications for school-based networks. Issues of instructional support, design, and administration will be discussed.
- 5321. Computer Programming for Educators (3:3:0).** Prerequisite: EDIT 5318 or consent of instructor. Overview of instructional programming using a high level object oriented language to develop educational software. Best practice and design will be modeled.
- 5322. Authoring Systems for Computer-Assisted Instruction (3:3:0).** Explores computer authoring languages and systems, including hypermedia systems, and their application to the design of instructional programs.
- 5325. Planning and Developing Instructional Media (3:3:0).** Production and use of visual instructional media. Includes visual design, photographic techniques, video production, and computer graphic presentations.
- 5326. Computer-Assisted Instruction (3:3:0).** Prerequisite: EDIT 5318 or consent of instructor. An in-depth study of instructional software design and development. Principles and procedures for creating sound instructional software will be investigated. Evaluation and usability methodologies will be explored.
- 5327. Learning Resources Cataloging and Classification (3).** Cataloging print and nonprint materials for the school learning resources center. Includes study of classification systems.
- 5328. Reference and Bibliography of Instructional Materials (3:3:0).** Survey of basic reference tools and services with emphasis on those particularly appropriate for elementary and secondary teachers. Emphasis given to major reference sources including alternative forms and sources, information needs of users and methods for determining needs, and communication processes and relationship concepts for providing effective services in the elementary and secondary learning resources center.
- 5330. Computers, Critical Thinking, and Problem Solving in the Content Areas (3:3:0).** Prerequisite: EDIT 5317 or 5318 or consent of instructor. Surveys research and strategies for using computers to promote higher order thinking and problem solving in all content areas. Includes software identification, use, and evaluation.
- 5341. Curriculum Applications of the Internet (3:3:0).** Prerequisite: EDIT 5340 or consent of instructor. Integration of the Internet and World Wide Web into the K-12 curriculum, focusing on the use of the resource for communication, information access, and instructional delivery.
- 5342. Authoring Systems for Network-based Instruction (3:3:0).** Explores network based authoring languages with



an emphasis on proper instructional design to deliver effective and appropriate network based instructional applications.

- 5370. Foundations of Distance Education (3:3:0).** Overview of the field of distance education including history, research, technologies, and related design models.
- 5380. Principles and Practice for Video Based Distance Learning (3:3:0).** Prerequisite: EDIT 5318 or consent of instructor. Evaluation, selection, and administration of video based distance learning systems, emphasizing legal, ethical, and access issues. Strategies for creating effective distance learning environments.
- 5390. On-line Distance Learning (3:3:0).** Web-based teaching in K-12, adult, and higher education. Includes instructional design, instructional management, and related issues.
- 5395. Administration of the Educational Technology Program (3:3:0).** Prerequisite: EDIT 5318 and 5319 or consent of instructor. Covers organization and management of computer resources; selection and acquisition of computer hardware and software.
- 5396. Practicum in Learning Resources Centers (3).** Prerequisite: EDIT 5325, 5327, 5328. The application of basic competencies in a real learning resource center setting; selection, evaluation, acquisition, processing, and organizing materials in all formats; instructional design, assisting learners with selection and use.
- 5397. Practicum in Educational Technology (3:3:0).** Prerequisite: EDIT 5318, 5319, or consent of instructor. Supervised experience in an educational setting which requires the application of competencies such as teaching, management, supervision, and administration.
- 6000. Master's Thesis (V1-6).**
- 6317. Advanced Instructional Design: Theory and Practice (3:3:0).** Prerequisite: EDIT 5317 or EDCI 5310. This seminar explores the theory and practice of instructional design in-depth. Product development, research, and evaluation of instructional design models are included.
- 6322. Research in Instructional Technology (3:3:0).** Prerequisite: EDIT 5318 and EPSY 5380 or consent of instructor. Review of research on instructional technology, use of computers for research data analysis, and designing research on instructional technology.
- 6324. Seminar in Instructional Technology (3:3:0).** Prerequisite: EDIT 2318 or 5318 or consent of instructor. A study of specialized aspects of educational computing and instructional technology. Specific topics will vary. May be repeated for credit.
- 6325. Multimedia Production for Instruction (3:3:0).** Explores design and delivery of individualized instruction and information retrieval via modern multimedia systems.
- 6380. Distance Education: Trends, Issues, Research (3:3:0).** Prerequisite: EDIT 5370, 5380, or consent of instructor. Students will identify and evaluate relevant literature to synthesize theories, trends, issues, and concerns related to the field of distance education.
- 7000. Research (V1-12).**
- 8000. Doctor's Dissertation (V1-12).**

### **Special Education**

The special education program emphasizes generic special education at both the master's and the doctor's level. Graduate work at the master's level may include sufficient course work in one area of exceptionality to produce an endorsement on the basic provisional elementary or secondary certificate. The course offerings also apply to preparing the special education teacher, educational diagnosticians, teachers of students with visual impairments, teachers of students with deaf-blindness, and orientation and mobility specialists.

For specific information and advisement, students should consult appropriate program advisors.

### **Courses in Special Education. (EDSP)**

- 5093. Internship in Special Education (V1-3).** Prerequisite: Consent of instructor.
- 5094. Advanced Internship in Special Education (V1-3).** The arranged internship gives students practical experience in an area of specialization.
- 5095. Internship for Diagnosticians (V1-3).** This arranged internship provides experiences in educational diagnostics.
- 5300. Exceptional Children and Youth (3:3:0).** Major categories of exceptional children and youth; psychological, sociological, and educational implications of exceptionality.
- 5301. Educational Appraisal of Exceptional Children (3:3:0).** Appraisal instruments and techniques employed by relevant disciplines in determining appropriate educational placement and programming for exceptional children.
- 5303. Applied Behavior Analysis in Special Education (3:3:0).** Use of applied behavior analysis in special education programs. Included are techniques for observing and recording behavior testing intervention, effects, and use in learning environment.
- 5304. Instructional Strategies for Teaching Students with High Incidence Disabilities (3:3:0).** Provision of knowledge of various models of instruction and strategies related to education of learners with varying disabilities, including materials development and evaluation.
- 5306. Instructional Strategies for Teaching Students with Low Incidence Disabilities (3:3:0).** Strategies for teaching students with severe disabilities utilizing a critical skills model curriculum aimed at teaching appropriate functional skills across the domains.
- 5307. Problems and Trends in Special Education (3:3:0).** Current problems and future trends in the field of special education.
- 5308. Authentic Assessment for Students with Exceptionalities (3:3:0).** Authentic appraisal strategies and techniques to document the strengths and needs of students with exceptionalities in a naturalistic setting.
- 5310. Gifted and Talented Children and Youth (3:3:0).** Psychological, sociological, and educational implications of higher level intelligence and intellectual ability as well as various talents.
- 5312. Creativity and the Gifted and Talented (3:3:0).** Psychological foundations of creativity especially as they apply to gifted children, how to assess and nurture creativity, and establish an environment conducive to creativity.
- 5320. Children and Youth with Low Incidence Disabilities (3:3:0).** The characteristics and psychological, sociological, and educational implications of severe disabilities including mental retardation, autism, serious emotional disturbance, dual sensory impairment, and multiple disabilities.
- 5330. Children and Youth with High Incidence Disabilities (3:3:0).** The characteristics and psychological, sociological, and educational implications of mild disabilities including learning disabilities, behavior disorders, and mild mental retardation.
- 5380. Programs and Services for Individuals with Visual Impairments (3:3:0).** Introduction to educational programs and services for students with visual impairments, including history, developmental characteristics, psychological needs, and legislation.
- 5381. Instructional Strategies for Individuals with Visual Impairments (3:3:0).** Strategies for teaching and adapting instruction in content areas, independent living, career-vocational, P.E., and leisure. Includes a theoretical framework, assessment strategies, and research applications.
- 5382. Communication Skills for Individuals with Visual Impairments (3:3:0).** Knowledge and skills in reading and writing the literary Braille code, Nemeth mathematics code, and format. Overview of other codes and basic signing skills for nonverbal communication.
- 5383. Anatomy and Functions of the Visual System (3:3:0).** Structure and function of the eye, causes and implications of eye conditions, clinical and functional vision assessments, relationship to other disabilities, and neurological aspects of visual impairment.

- 5384. Basic Orientation and Mobility Skills (3:3:0).** Prerequisite: EDSP 5300. Exploration of space in the home and school environment and the wider community according to individual needs; appreciation and understanding of professional mobility instruction programs.
- 5386. Intermediate Orientation and Mobility Training for Multihandicapped and Blind (3:3:0).** Prerequisite: EDSP 5384. Development of teaching skills in orientation and mobility in semi-independent settings with multihandicapped and blind students.
- 5387. Advanced Orientation and Mobility Training for Multihandicapped and Blind (3:3:0).** Prerequisite: EDSP 5386. Advanced orientation and mobility teaching techniques for travel in independent settings for multihandicapped and blind students.
- 5388. Programs and Services for Students with Dual Sensory Impairments (3:3:0).** Psychological, sociological, and educational implications of dual sensory impairments in children and youth, including appropriate community, educational, and social services.
- 5389. Methods and Materials for Teaching Students with Dual Sensory Impairments (3:3:0).** Curricular adaptation and additions for students with dual sensory impairments. Emphasis on functional communication, behavior management, and training for independent living and employment.
- 5390. Seminar in Special Education (3:3:0).** Recent research practices and problem areas in special education. May be repeated for credit.
- 6000. Master's Thesis (V1-6).**
- 6301. Leadership Issues with Special Populations (3:3:0).** Prerequisite: Admission to doctoral program. Preparation of leaders in Special Education through analysis of research and critical issues, professional writing and speaking, and grant preparation. May be repeated for credit.
- 6303. Physical and Psychological Aspects of Special Populations (3:3:0).** Preparation of graduate students to understand physical and psychological backgrounds of people with disabilities.
- 6304. Preparing Leadership Personnel for Special Populations (3:3:0).** Course will prepare doctoral level students to develop a leadership and managerial style and to effectively develop, implement, and evaluate preservice and inservice programs for adults.
- 7000. Research (V1-12).**
- 8000. Doctor's Dissertation (V1-12).**



# College of Engineering

Professor William M. Marcy, Dean

The College of Engineering offers programs of instruction and research leading to the *Master of Science* and the *Doctor of Philosophy* degrees with majors in Chemical, Civil, Computer Science, Electrical, Industrial, Mechanical, and Petroleum (master's only) Engineering. A *Master of Science in Environmental Technology Management* degree and a *Master of Environmental Engineering* degree are offered in the Department of Civil Engineering. The Department of Industrial Engineering offers a *Master of Science in Systems and Engineering Management*. The general regulations governing the graduate programs at Texas Tech University apply to these degrees.

In addition to the above degree programs, work leading to the *Master of Engineering* degree is offered with the entire graduate faculty of the college participating.

The program leading to the Master of Engineering degree does not specify an area of specialization and does not require a thesis. The program is designed primarily for practicing engineers. For such practicing engineers credit for graduate course work completed in residence at another accredited graduate school may be accepted for as much as one-half of the 36 semester hour requirement for the Master of Engineering degree. All work credited toward the degree must be completed within nine calendar years. Under certain circumstances, regular on-campus students may be admitted to the undifferentiated Master of Engineering degree program. (In such cases, the regular six-year time limit will apply.) In addition to the regulations governing admission to the Graduate School, a baccalaureate degree in engineering, or its equivalent, is required for entrance to the Master of Engineering program. The student may be required to take (without graduate credit) such undergraduate leveling courses as may be designated by the college.

## Courses in Engineering. (ENGR)

- 5000. Special Topics in Engineering (V1-12).** Prerequisite: Graduate standing in engineering. Individual study of advanced interdisciplinary topics in engineering under the guidance of one or more members of the engineering faculty.
- 5001. Curricular Practical Training in Engineering (V1-6).** Prerequisite: Approval of the Dean of engineering. Curricular practical training permits students to apply concepts, principles, and techniques of engineering courses during an internship in industry. Internship will be jointly supervised by industrial sponsors and university faculty. Up to 6 hours may be applied to the major.
- 5333. Advanced Methods of Engineering Project Management (3:3:0).** Application of advanced numerical optimization techniques to interdisciplinary engineering project schedules. Resource allocation and cost control in total quality management environment.
- 5340. Turbomachinery (3:3:0).** Working of a typical power plant. Components making up steam and gas turbines. Cycle performance and internal flow in turbines and forces generated.
- 5354. Creativity in Problem Solving (3:3:0).** The basic concept of creativity and means by which individuals and groups can develop more effective creative skills. Exercises to increase creative thinking and problem solving in individual and group settings.
- 5360. Fundamentals of Engineering Science (3:3:0).** An overview of physical, mathematical, and engineering concepts; including electronics, materials, statistics, C programming, digital logic, microprocessors, and project management.
- 5361. Device Characterization and Failure Analysis (3:2:3).** Characterization techniques for materials and devices. Failure analysis of analog and digital devices and systems. Reliability analysis and testing. Diagnostic instrumentation and data analysis techniques.
- 5362. Advanced Semiconductor Processing and Process Characterization (3:2:3).** Prerequisite: E E 5381. This course stresses process flow, yield management, specific device processing steps, and process control. Packaging and back-end processing.
- 5363. Advanced Topics in Semiconductor Product Engineering I (3:1:6).** Prerequisite: Consent of instructor. Advanced industry-related project in the area of semiconductor product engineering.
- 5364. Advanced Topics in Semiconductor Product Engineering II (3:1:6).** Prerequisite: Consent of instructor. Advanced industry-related project in the area of semiconductor product engineering. A continuation of Advanced Topics I.
- 5365. Parametric and Functional Device Testing (3:2:3).** Prerequisite: E E 5384 and 5393. Fundamentals of semiconductor device chip and wafer testing. Parametric and functional tests, test philosophy, C programming for testing, and commercial wafer level testers.
- 6330. Master's Report (3).** Prerequisite: Graduate standing. Formal technical report on an interdisciplinary topic under guidance of faculty from one or more departments.
- 7000. Research (V1-12).**
- 8000. Doctor's Dissertation (V1-12).**

## Department of Chemical Engineering

Professor Gregory B. McKenna, Chairperson.  
Emeritus Professors Bethea and Heichelheim; Professors Graham, Mann, Parker, Riggs, and Tock; Associate Professors Abbott, Hoo, and Simon; Assistant Professors Leggoe, Vaughn, and Wiesner; Adjunct Faculty: Ramkumar.

This department offers study in the following graduate degree programs: CHEMICAL ENGINEERING, *Master of Science in Chemical Engineering* and *Doctor of Philosophy*.

The master's program is a structured program requiring the five core courses denoted below by asterisks. The graduate student will be required to take one additional chemical engineering course and at least two other courses as specified by his or her advisory committee. A written thesis and a minimum of 24 hours of graduate-level course work, exclusive of thesis and seminar, are required for the master's degree. In addition, a final oral exam in defense of the completed thesis will be administered by the candidate's thesis committee.

The master's program may also be completed without a thesis. Entry into the nonthesis option must be approved by the departmental graduate committee. This program is intended for graduate students in the college-sponsored International Exchange program and for new students with more than five years industrial experience. Graduate students in this nonthesis option are required to take



36 credit hours of graduate course work, exclusive of seminars. The course work for each student must meet the approval of the department's graduate committee.

In addition to regulations established by the Graduate School, applicants for candidacy for the doctor's degree are required to demonstrate high proficiency in a single research area. Certification of the research proficiency will be based on a record of accomplished research which demonstrates the required level of competence in the research area. The record must be substantiated by published articles, final research reports, or papers presented at meetings of learned societies.

All master's students are required to register for CH E 5121, and all doctoral candidates are required to register for CH E 7121, each long semester unless exempted by the chairperson. Seminar courses do not count toward fulfilling credit hour requirements for the master's and doctoral programs.

### Courses in Chemical Engineering. (CH E)

- 5000. Advanced Topics in Chemical Engineering (V1-6).** Prerequisite: Approval of department chairperson. Individual study of topics of current interest under the guidance of a member of the staff. May be repeated for credit on different topics.
- 5121. Graduate Seminar (1:1:0).** Discussions of chemical engineering research and its relationship to the philosophy and art of chemical engineering. Required of all chemical engineering graduate students. May be repeated for credit.
- \*5310. Advanced Chemical Engineering Techniques (3:3:0).** Application of ordinary and partial differential equations for solution of mass, momentum, and/or energy transfer and transport problems. Primary emphasis is on the mathematical analysis of unsteady state systems and chemical-reaction systems: models, solutions, and model validation.
- \*5312. Fluid Transport Principles and Analysis (3:3:0).** Fundamental relations governing mass, momentum, and energy transfer within fluids, with special emphasis on simultaneous transport, process applications, and numerical methods of analysis.
- 5314. Process Dynamics and Automatic Control (3:3:0).** Study of the transient behavior of process systems: methods of analysis; synthesis and simulation of digital control systems; introduction to process model-based control, optimization, and statistical process control.
- 5315. Advanced Process Control (3:3:0).** Prerequisite: CH E 5310, 5314, and 5323. Analysis methods, control principles, and synthesis of control strategies for Laplace-, sampled data-, time series-, and nonlinear-model based controllers.
- 5316. Linear Chemical Process Control Theory (3:3:0).** Prerequisite: CH E 4353, 5310, or equivalent. Linear systems theory is employed to analyze models of chemical and chemical-related processes and to design stable controllers.
- 5317. Chemical Process Model-Based Control (3:3:0).** Prerequisite: CH E 5316 or equivalent. Different model descriptions of chemical and related processes are identified and analyzed for the synthesis of predictive, stable, and optimal control systems.
- \*5321. Advanced Chemical Engineering Thermodynamics (3:3:0).** In-depth study of fundamental laws of thermodynamics, property relations for pure material and mixtures, and phase and chemical equilibrium principles.
- \*5323. Digital Computation for Chemical Engineers (3:3:0).** The development of current numerical methods for application to modeling of chemical engineering systems. Primary emphasis is placed upon steady state and unsteady state chemical reaction systems.
- 5335. Advanced Transport Phenomena (3:3:0).** Prerequisite: CH E 5312 and 5310 or consent of instructor. Tensor analysis; partial differential equations for multicomponent fluid mixtures; two phase flow problems; and interfacial transport.

- 5340. Polymer Processing (3:3:0).** Polymer processing and fabrication technology for thermoplastic and thermoset polymers: The science and art of manufacturing with plastic materials.
- 5341. Polymer Chemistry and Processing (3:3:0).** Polymerization reactions, mechanisms, and kinetics, large-scale synthesis, scope of polymer processing, and fabrication technology.
- 5342. Polymer Physics and Engineering (3:3:0).** Fundamentals of polymer science and engineering. Solution properties, chain conformation and molecular mass characterization. Rubber elasticity and viscoelastic behavior. Crystalline polymers and morphology.
- \*5343. Reaction Kinetics (3:3:0).** Analysis and design of chemical reactor operations with multiple reactions; semibatch operations and other complex reactor configurations. Determination of kinetic parameters from operating data. Economic-based optimization, characterization and modeling of non-ideal reactors.
- 5345. Dynamics of Polymeric and Nonlinear Fluids (3:3:0).** Observed phenomena in polymeric and multicomponent flow systems; viscometry and viscoelastic measurements for nonlinear fluids; rheological models; analytical solutions to flow problems; and dimensional analysis.
- 5346. Polymer Viscoelasticity (3:3:0).** Linear viscoelasticity, Boltzmann superposition, experimental methods, molecular theory, and mechanical properties of solid polymers.
- 5360. Advanced Industrial Waste Treatment (3:3:0).** Advanced methods for treating industrial wastes and remediating previously contaminated sites are of increasing importance to industry and to society. This course will detail the ways to evaluate the many proposed treatment methods. They will be evaluated in terms of science, engineering science, operability, costs, and credentials of the developer. Actual proposed processes will be used as examples.
- 6000. Master's Thesis (V1-12).**
- 7000. Research (V1-12).**
- 7121. Doctoral Seminar (1).** Open discussions of recent advanced findings in any field of endeavor, with special attention to their relationship to the philosophy of chemical engineering. May be repeated for credit.
- 8000. Doctor's Dissertation (V1-12).**

## Department of Civil Engineering

Professor James McDonald, Chairperson.

Horn Professor Mehta; Professors Borrelli, Fedler, Gregory, Kiesling, Letchford, Norville, J. Smith, Sweazy, Urban, and Vallabhan; Associate Professors Burkett, Rainwater, Ramsey, Thompson, and Vann; Assistant Professors Akram, Darwish, Hossain, Jackson, Jayawickrama, Mollhagen, Phelan, Senadheera, and D. Smith; Lecturer Elms; Adjunct Faculty: Minor.

This department offers study in the following graduate degree programs: CIVIL ENGINEERING, *Master of Science in Civil Engineering* and *Doctor of Philosophy*; ENVIRONMENTAL ENGINEERING, *Master of Environmental Engineering*; ENVIRONMENTAL TECHNOLOGY MANAGEMENT, *Master of Science in Environmental Technology Management*.

For master's and doctoral degrees in civil engineering, students may choose one or more of several areas of specialization including environmental engineering, water resources engineering, structural engineering, wind engineering, engineering mechanics, geoenvironmental engineering, geotechnical engineering, and highway engineering.

Students with a baccalaureate degree in engineering may enter the graduate program by having their entrance credentials evaluated by both the Graduate Dean and the

department. For applicants with a baccalaureate degree in science or mathematics, certain leveling courses in engineering normally are required. Persons desiring to enter the graduate program in civil engineering should consult with a graduate advisor.

Two general plans of study are available for the Master of Science degree: a 30-hour plan (which includes 6 hours credit for the master's thesis) and a 36-hour plan (which includes 3 hours credit for the master's report). The decision on which plan to follow is made jointly by the student and faculty advisor.

The master's degree in environmental engineering is an ABET accredited freshman-to-master's degree program specializing in environmental engineering. It is a design-oriented program that culminates in a comprehensive design problem rather than a research-oriented thesis.

Students choosing the master's program in environmental technology management may choose one or more of six areas of specialization: environmental technology management, land quality, water quality, hazardous and toxic waste, solid waste, and air quality. Course selection will be from several engineering and science disciplines. Certain leveling courses may be required for students entering the environmental technology and management program with a baccalaureate degree in science, mathematics, or technology. For acceptance into the degree program, students must have their entrance credentials evaluated by both the Graduate Dean and the department. The required undergraduate course prerequisites are MATH 1351, 2350, BIOL 1403, CHEM 1307 & 1107, 1308 & 1108, and ECO 2301 or their equivalents. In addition, students should have the computer skills necessary to do the analytical work required in the program.

All graduate students are required to register for C E 5101, each long semester unless exempted by the chairperson. Seminar courses do not count toward fulfilling credit hour requirements for the master's and doctoral programs.

### Courses in Civil Engineering. (C E)

- 5101. Civil Engineering Seminar (1:1:0).** Individual study of engineering problems of special interest and value to the student.
- 5310. Numerical Methods in Engineering (3:3:0).** Prerequisite: MATH 3350 or consent of instructor. Numerical techniques for the formulation and solution of discrete and continuous systems of equilibrium, eigenvalue and propagation problems.
- 5311. Advanced Mechanics of Solids (3:3:0).** Stress and strain at a point; theories of failure; unsymmetrical bending; curved flexural members; beams on continuous support; experimental and energy methods.
- 5313. Theory of Elastic Stability (3:3:0).** Theory of the conditions governing the stability of structural members and determination of critical loads for various types of members and structural systems.
- 5314. Theory of Plates and Shells (3:3:0).** Stress analysis of plates and shells of various shapes; small and large deflection theory of plates; membrane analysis of shells; general theory of shells.
- 5316. Theory of Elasticity (3:3:0).** Analysis of stress and strain; equilibrium and compatibility equations; plane stress, plane strain, and axisymmetric problems; torsion of noncircular shafts; finite difference and finite element models; energy principles.
- 5317. Boundary Element Method (3:3:0).** Integral transformations. Potential problems in two and three dimensions, two and three dimensional problems in elastostatics, coupling of boundary and finite element methods.
- 5318. Finite Element Methods in Continuum Mechanics (3:3:0).** Prerequisite: C E 5310 and 5311 or consent of instructor. Theory of the finite element method-constant strain elements; plane stress or strain for axisymmetric problems; application to plates and shells, torsion, heat transfer and seepage problems.
- 5319. Nonlinear Finite Element Analysis (3:3:0).** Nonlinear behavior of solids, geometric and material nonlinearities, Lagrangian and updated Lagrangian methods, Prandtl Reuss equations, and incremental elastic plastic analysis.
- 5321. Advanced Soil Engineering I (3:3:0).** Prerequisite: C E 3321 or equivalent, or consent of instructor. Introduction to physio-chemical properties of soils; soil structure; soil classification; permeability; principle of effective stress; stress-deformation; stress paths and strength characteristics; partly saturated soils; advanced consolidation theory; secondary consolidation; field instrumentation.
- 5323. Advanced Foundation Engineering (3:3:0).** Prerequisite: Computer programming skills and consent of instructor. Advanced foundation engineering theory and practice, bearing capacity, settlement analysis, piles and pile groups, drilled piers, wave equation analysis.
- 5324. Foundation Structures (3:2:3).** Prerequisite: Computer programming and consent of instructor. Application of soil mechanics theory and structural design principles to the design of typical civil engineering foundation structures-footings, retaining walls, basement walls, slabs-on-ground, braced excavations, piles, and pile caps.
- 5325. Soil-Structure Interaction (3:3:0).** Prerequisite: C E 5310 and 5311 or consent of instructor. Numerical methods for beam on elastic foundation; piles and pile groups; laterally-loaded piers; slab on elastic foundation.
- 5326. Analysis and Design of Earth Structures (3:3:0).** Prerequisite: C E 5321 or consent of instructor. Principles of stability analysis and design as applied to earth dams, embankments, fills, cuts, and natural slopes; pore pressure considerations; initial and long-term stability.
- 5327. Geotechnical Practice for Waste Disposal (3:3:0).** Review of government regulations; risk assessment; site investigation techniques; design and installation of land fills; land treatment; toxic waste handling.
- 5331. Advanced Work in Specific Fields (3).** Nature of course depends on the student's interest and needs. May be repeated for credit.
- 5333. Advanced Work in Water Resources (3).** Individual studies in advanced water resources. May be repeated for credit.
- 5340. Advanced Structural Analysis I (3:3:0).** Prerequisite: Proficiency in basic structural analysis techniques and computer programming. Fundamentals and applications of modern methods of structural analyses using computers.
- 5342. Advanced Design of Steel Structures (3:3:0).** Prerequisite: C E 4342 or consent of instructor. Advanced design of structures, utilizing LRFD design concepts.
- 5343. Advanced Reinforced Concrete Design (3:3:0).** Prerequisite: C E 4343 or consent of instructor. Understanding advanced concrete design concepts and discussion of new concrete material technology.
- 5344. Advanced Design of Timber Structures (3:3:0).** Prerequisite: Consent of instructor. Advanced design of timber components and systems by ASD methods and introduction to LRFD design concepts.
- 5346. Structural Dynamics I (3:3:0).** Dynamic response of single and multidegree of freedom systems; modal analysis of lumped and continuous mass systems.
- 5347. Structural Dynamics II (3:3:0).** Prerequisite: C E 5346 or consent of instructor. Design consideration for structures subjected to time-varying forces including earthquake, wind, and blast loads.
- 5348. Wind Engineering (3:3:0).** Prerequisite: Consent of instructor. Understanding the nature of wind related to wind-

- structure interaction, and wind loads on structures. Design loads for extreme winds, tornadoes, and hurricanes.
- 5351. Advanced Pavement Materials (3:3:0).** Materials science, characterization, test methods, mix design, specifications and performance of pavement materials including aggregates, bituminous materials, and portland cement concrete.
- 5352. Advanced Pavement Design (3:3:0).** Analysis and design of flexible and rigid pavements; pavement type selection; loading; failure criteria and reliability; mechanistic pavement design; design exercises using existing methods.
- 5353. Pavement Management Systems (3:3:0).** Pavement distresses and evaluation, nondestructive testing, back-calculation of layer moduli, pavement performance models, pavement maintenance, rehabilitation, pavement management concepts, existing pavement management systems.
- 5360. Open Channel Hydraulics (3:3:0).** Channel geometry and parameters. Uniform and varied flow.
- 5361. Surface Water Hydrology (3:3:0).** Prerequisite: Consent of instructor. Advanced study of hydrologic cycle: hydrologic abstractions (evaporation and detention storage), surface runoff mechanisms, data analysis, hydrographs, separation, runoff routing, and frequency analysis.
- 5362. Surface Water Modeling (3:3:0).** Prerequisite: C E 5361 and consent of instructor. Theory and application of one-dimensional hydrodynamics models. Theory and application of watershed models.
- 5363. Groundwater Hydrology (3:3:0).** Prerequisite: Consent of instructor and computer programming skills. Study of sources and fates of contamination in groundwater. Mathematical modeling of reactive and nonreactive pollutant movement. Aquifer restoration strategy.
- 5364. Groundwater Transport Phenomena (3:3:0).** Prerequisite: Consent of instructor, computer programming skills. Study of sources and fates of contamination in groundwater. Mathematical modeling of reactive and nonreactive pollutant movement. Aquifer restoration strategies.
- 5365. Storm Water Management and Erosion Control Theory (3:3:0).** Theory and concepts of soil erosion are studied to develop predictive models related to storm runoff, including development of plans to reduce damage from storm events.
- 5366. Water Resources Management (3:3:0).** Prerequisite: Consent of instructor. Models and other technical elements of water resources systems in context of the political, social, and other environments in which they exist.
- 5383. Bioremediation of Wastes in Soil Systems (3:3:0).** Factors impacting microbiological treatment of organic wastes in surface and subsurface soil environments will be examined for implications in system design and operation.
- 5390. Water and Wastewater Analysis (3:1:6).** Prerequisite: Consent of instructor. Laboratory procedures for the physical, chemical, and biological examination of water, wastewater, and hazardous wastes. Interpretation of water quality data.
- 5391. Advanced Water Treatment (3:3:0).** Prerequisite: C E or ENVE 3309 or consent of instructor. Water chemistry and microbiology; design procedures for municipal water treatment; advanced methods for quality control, renovation, and reuse.
- 5392. Conventional Wastewater Treatment Systems (3:3:0).** Prerequisite: C E or ENVE 4309 or consent of instructor. Municipal wastewater treatment methods including suspended and attached growth biological systems, nitrification and denitrification, sludge stabilization, treated effluent and sludge disposal.
- 5393. Unit Processes Laboratory (3:0:9).** Prerequisite: C E 5392. Operation and evaluation of water and wastewater treatment units for water quality control.
- 5394. Natural Systems for Wastewater Treatment (3:3:0).** Examination of tertiary systems for municipal wastewater; natural systems (land application, wetlands, and aquaculture) and modular facilities incorporating unit operations, biological, and chemical processes.
- 5395. Solid and Hazardous Waste Treatment (3:3:0).** Prerequisite: Consent of instructor. Treatment and disposal of municipal and industrial solid and hazardous wastes.
- 5396. Environmental Impact Analysis (3:3:0).** Interdisciplinary approach to environmental analysis stemming from the National Environmental Policy Act; elements of impact-analysis and assessment methodologies.
- 5397. Limnological Aspects of Environmental Engineering (3:2:3).** Study of the biological phenomena and physical, chemical interactions that occur in fresh and marine surface waters with emphasis on water pollution control including water quality hazard assessment techniques.
- 5398. Risk Management and Public Policy (3:3:0).** Methods and principles of risk assessment will be examined. Incorporation of these findings into practical risk management programs meeting current policy requirements will be discussed.
- 6000. Master's Thesis (V1-6).**
- 6330. Master's Report (3).**
- 7000. Research (V1-12).**
- 8000. Doctor's Dissertation (V1-12).**
- Courses in Environmental Engineering. (ENVE)**
- 5302. Environmental Hygiene Engineering and Control (3:3:0).** Human physiology and toxicology with relationships to epidemiology and occupational diseases. Emphasis placed on engineering control to assure compliance with control regulations.
- 5303. Design of Air Pollution Control Systems (3:3:0).** Engineering analysis procedures techniques for the selection, application, and operation of air pollution control methods in various operational situations.
- 5304. Environmental Law and Policies (3:3:0).** The legal structure (laws impacting water and air quality and solid-hazardous waste management) to control and manage the use of the environment is examined.
- 5305, 5306. Environmental Systems Design I, II (3:2:3 each).** Student teams evaluate a waste problem, select and develop a treatment alternative in a feasibility study, and then finalize their design selections in technical memorandums.
- 5310. Principles of Environmental Technology and Management (3:3:0).** The magnitude and impacts of the different waste streams produced by man and his activities on the various components of the environment will be examined.
- 5311. Environmental Systems Models and Information Reporting (3:3:0).** Research report will be prepared on the modeling of an environmental system of process. Course stresses the research report as well as modeling techniques.
- 5314. Advanced Chemodynamics I (3:3:0).** Prerequisite: Consent of instructor. Application of thermodynamic and kinetic principles to modeling and design of environmental engineering processes.
- 5315. Advanced Chemodynamics II (3:3:0).** Prerequisite: Consent of instructor. Course is a continuation of ENVE 5314, application of thermodynamic and kinetic principles to modeling and design of environmental engineering processes.
- 5399. Advanced Municipal Wastewater Treatment (3:3:0).** Prerequisite: Consent of instructor. Municipal wastewater quality parameters, effluent discharge requirements and applications of design procedures, facilities to treat waste water and process the removed solids.
- Department of Computer Science**
- Professor Daniel E. Cooke, Chairperson.  
Professors Bagert, Gelfond, Marcy, and Oldham; Associate Professors Desrosiers, Hernandez, Lakhani, and Lopez-Benitez; Assistant Professors Mengel, Pyeatt, Sinzinger, Temkin, and Watson.
- This department offers study in the following graduate degree programs: **COMPUTER SCIENCE**, **Master of Science** and **Doctor of Philosophy** and **SOFTWARE ENGINEERING**, **Master of Science**. Admission



requirements and details of programs are posted on the departmental Web site at <www.cs.ttu.edu>.

For the Doctor of Philosophy degree, students are required to demonstrate general knowledge in several areas of computer science and proficiency in a single research area. Certification of research proficiency will be based on a record of accomplished research. The record must be substantiated by published articles, technical reports, and papers presented at meetings, workshops, and conferences. These requirements are additional to regulations established by the Graduate School.

Two general plans are available for the Master of Science degree: A 30 hour plan (which includes 6 hours credit for the master's thesis), and a 36 hour plan which is based solely on course work. The 36 hour plan is intended for graduate students in the college-sponsored International Exchange program and for new students with more than five years industrial experience who are maintaining a full-time career while working towards their graduate degree. Students who wish to use the 36 hour plan must obtain approval from the departmental Graduate Committee within their first semester of study.

The degree plan for students pursuing a Master of Science degree in computer science must include two theory courses (C S 5381, 5383, 5384) and two systems courses (C S 5352, 5375, 5368). Students choosing the 30 hour thesis plan must apply 6 hours C S 6000 and may apply 3 hours of C S 7000 credit toward their degree. Students choosing the 36 hour nonthesis option may not use C S 6000 or 7000 for credit towards their degree. Aside from these requirements and limitations, master's students may use any graduate level computer science course for credit towards their degree.

The degree plan for students pursuing a Master of Science in software engineering must include C S 5358, 5359, 5360, 5362, 5363, and 5366 as well as two software engineering elective courses (C S 5355, 5364, 5369). Students choosing the 30 hour thesis option must apply 6 hours of C S 6000 credit toward their degree and may substitute 3 hours of C S 7000 credit as one of their software engineering elective courses. Students choosing the 36 hour nonthesis option must also take two theory courses (C S 5381, 5383, 5384) and two systems courses (C S 5352, 5375, 53668) and may not use C S 6000 or 7000 for credit towards their degree.

Students who do not have a background in computer science are required to take a short series of undergraduate courses to provide the necessary background knowledge for graduate study in computer science. These courses are required for leveling only; they cannot be counted in satisfying the required hours for graduation. Students in other departments at Texas Tech who wish to transfer to computer science must first complete all leveling courses, or show that they have taken the equivalent courses at another university, before their application will be considered.

### Courses in Computer Science. (C S)

**5000. Practicum of Computing (V1-3).** Industrial training in an approved field of graduate studies. Can be used only as an additional requirement on degree program.

### **5301, 5302. Foundations of Computer Science I, II (3:3:0 each).**

Prerequisite: Programming proficiency. An accelerated survey of computer science. Computer organization, high level and assembler languages, job control, software design, data structures, file organization, machines, and formal languages.

**5303. Foundations of Computer Engineering (3:3:0).** An accelerated introduction to the fundamentals of computer engineering for students without a computer hardware background. Boolean algebra, digital logic, digital devices and functions, digital system design, computer architecture.

**5320. Principles of Computer Graphics (3:3:0).** Techniques and methods for creating realistic images using graphic programming languages. Topics include visible surface determination rendering, surface modeling, and particle systems.

**5321. Virtual Reality Fundamentals (3:3:0).** The course will cover fundamental principles of virtual reality and development of future virtual reality applications.

**5323. Computer Haptics (3:3:0).** This course will provide a unified and complete background for the novel force-tactile feedback technology and its use in virtual reality simulations.

**5331. Special Problems in Computer Science (3).** Individual studies in advanced computer science and technology.

**5341. Pattern Recognition (3:3:0).** Traditional and current approaches to the general problem of recognizing patterns in images, signals, and other domains. Includes Bayes decision theory, supervised learning, and nonparametric techniques.

**5352. Advanced Operating Systems Design (3:3:0).** Prerequisite: C S 3352 and 3364, equivalent, or consent of instructor. Topics on distributed operating systems, such as synchronization, communication, file systems, and memory sharing are discussed. Several programming projects are implemented.

**5353. Compiler Construction (3:3:0).** Prerequisite: C S 3364, equivalent, or instructor consent. Implementation aspects of compiler construction, automata for formal grammar, semantics of procedural languages, automatic generation of parser, and assembly code generation. A prototype of a compiler is developed.

**5355. Real Time and Time Sharing Systems (3:3:0).** Prerequisite: C S 2365, 3352, equivalent, or consent of instructor. Study of the functional needs in real time and time sharing systems. Basic techniques and display concepts, random-access fields, computer networks, simultaneous operations, multiprogramming, and multiprocessing.

**5356. Advanced Database Management Systems (3:3:0).** Prerequisite: C S 3364, equivalent, or consent of instructor. Systems aspects of relational databases are emphasized. Topics include relational database design, index and access structures implementation and performance evaluation, query processing and optimization, transaction management, and concurrency control.

**5357. Multimedia Systems (3:3:0).** Prerequisite: C S 3364, equivalent or consent of instructor. Multimedia digital audio processing; image and video data compression; and processing for multimedia presentations. Time-based media representation and synchronization; multimedia communication systems; and hypertext and programming.

**5358. Software Studio I (3:3:0).** Prerequisite: C S 5362 and 5363, equivalent, or consent of instructor. Capstone design and implementation experience of a major software project applying comprehensive software engineering techniques.

**5359. Software Studio II (3:3:0).** Prerequisite: C S 5358. A continuation of software engineering projects begun in C S 5358.

**5360. Software Construction and Evolution (3:3:0).** Prerequisite: C S 5362 and 5363, equivalent, or consent of instructor. Theory and practice of the construction, testing, and maintenance of software. Emphasis placed on techniques to evolve software over time to meet the changing needs of users during the life of the software.

**5361. Theory of Computing Languages (3:3:0).** Prerequisite: C S 3461 and 3383, equivalent, or consent of instructor. General language theory with emphasis on computing languages, Chomsky typology, syntactical and semantic specifications. Standard and experimental methods for specification of languages. Current research on translation of natural language instructions to machine instructions.

- 5362. Software Specification and Design (3:3:0).** Prerequisite: C S 2365, equivalent, or consent of instructor. Examination of the development of the specifications, architecture, and design of software. Analysis, software architecture, design patterns, architectural design and detailed design.
- 5363. Software Project Management (3:3:0).** Prerequisite: C S 2365, equivalent, or consent of instructor. Methodologies for the management of projects involving software components. The larger context of systems development is studied, along with business management and engineering principles. Technical as well as people issues are explored.
- 5364. Software Quality Assurance and Testing (3:3:0).** Prerequisite: C S 2365, equivalent, or consent of instructor. In-depth study of methods and techniques in software quality assurance and testing. Topics include software total quality management, software metrics, unit testing, and integration testing.
- 5365. Principles of Multiple-Processor Systems (3:3:0).** Prerequisite: C S 3375, equivalent, or consent of instructor. Comprehensive introduction to the field of parallel and distributed computing systems. Algorithms, architectures, networks, systems. Theory and applications.
- 5366. Software Process Improvement (3:3:0).** Corequisite: C S 5363, equivalent, or consent of instructor. Theory and practice for software process improvement and certification at the organizational, project team, and individual level.
- 5368. Intelligent Systems (3:3:0).** Prerequisite: C S 3364 or consent of instructor. Comprehensive introduction to the field of artificially intelligent computer based systems. Theory and applications in artificial intelligence.
- 5369. Web-based Software Systems (3:3:0).** Prerequisite: C S 2365, equivalent, or consent of instructor. In-depth study of how to engineer Web-based software systems. Topics include process, development, testing, and performance issues.
- 5372. Digital Computer Design (3:3:0).** Prerequisite: E E 2372 and consent of instructor. Computer systems are discussed in terms of functional blocks consisting of both hardware and software. The logical organization of the machines is stressed in terms of usage and capability.
- 5375. Computer Systems Organization and Architecture (3:3:0).** Prerequisite: C S 3375 or consent of instructor. Introduction to the architecture, organization, and design of computer systems. Topics include processor, control and memory design, computer arithmetic, I/O, and a brief introduction to multiprocessors.
- 5376. Communication Networks (3:3:0).** Networks in the context of parallel and distributed systems. Information theory applied to networks. Network topology. Problems and approaches in design, development, and management of communications networks.
- 5377. Distributed Computing (3:3:0).** Prerequisite: C S 4352, equivalent, or consent of instructor. Introduction to distributed systems. Topics include communications, distributed operating systems, fault-tolerance, and performance issues. Case studies and term projects supplement this course.
- 5379. Parallel Processors and Processing (3:3:0).** Prerequisite: C S 3364 and 3375, equivalent, or consent of instructor. Theory, architectures, and algorithms for the design and implementation of parallel computing systems. Operating system and programming language requirements for parallel computing; approaches and applications.
- 5380. Fault-Tolerant Computer Systems (3:3:0).** Prerequisite: C S 3375 and I E 3341, equivalent, or consent of instructor. Introductory course to methodologies for specifying, designing, and modeling fault-tolerant computer systems. Includes fault classification, design techniques for fault detection and recovery, and reliability modeling techniques.
- 5381. Analysis of Algorithms (3:3:0).** Prerequisite: C S 3364 or equivalent. Theoretical analysis of algorithms for sorting, searching, sets, matrices, etc.; designing efficient algorithms for data structures, recursion, divide-and-conquer, dynamic programming; nondeterminism, NP-completeness and approximation algorithms.
- 5382. Theory of Graphs (3:3:0).** Basic concepts in graphs. Fundamental algorithms for path traversal and searching; networks; trees; matchings and planarity testing; NP-completeness in graph theory.
- 5383. Theory of Automata (3:3:0).** Prerequisite: C S 3383, equivalent, or consent of instructor. Structured grammars, relation between grammars and automata, deterministic, and nondeterministic finite automata, push-down store, and linear-bounded automata, and Turing machines.
- 5384. Logic for Computer Scientists (3:3:0).** An introduction to mathematical logic. The course includes proofs of several basic theorems and discusses the application of logic to different areas of computer science.
- 5388. Neural Networks (3:3:0).** Neural network theory, models, and implementation. Applications to real-time systems, robotics, pattern recognition, computer vision, and event driven systems.
- 5389. Advanced Neural Networks (3:3:0).** Prerequisite: C S 5388 or consent of instructor. Recurrent neural networks, information processing, dissipative systems, applications to time series analysis and chaotic systems.
- 5393. Small Computing Systems (3:3:0).** Prerequisite: C S 2350, equivalent, or consent of instructor. Microcomputers and minicomputers are programmed, evaluated, interfaced, and used in practical applications. Applications are determined by research and development interests of faculty members.
- 6000. Master's Thesis (V1-6).**
- 6396. VLSI Algorithm Design (3:3:0).** Prerequisite: C S 3364, equivalent, or consent of instructor. Theory and algorithms related to computer-aided design of very large scale integrated circuits. Covers heuristics such as min-cut and branch and bound.
- 7000. Research (V1-12).**
- 8000. Doctor's Dissertation (V1-12).**

## Department of Electrical and Computer Engineering

Professor Jon Bredeson, Chairperson.

Horn and Thornton Professor Kristiansen; Horn Professor Temkin; Professors Chao, Krile, Krompholz, Mitra, Parten, and Trost; Associate Professors Baker, Dickens, Giesselmann, Nikishin, Saed, and Zieher; Assistant Professors Dallas, Karp, Neuber, and Sari-Sarraf; Adjunct Faculty: Cox, Feldkamp, Ishihara, Jones, Llamas, Lu, O'Hair, Petrosian, Shkuratov, Storrs, Vian, and Woolverton.

This department offers study in the following graduate degree programs: **ELECTRICAL ENGINEERING**, *Master of Science in Electrical Engineering* and *Doctor of Philosophy*.

Before being recommended for admission to a degree program, the student may be required to take (without graduate credit) such undergraduate leveling courses as may be designated by the department.

Both master's and doctoral students must develop proficiency over the entire range of electrical engineering activities by taking courses in a variety of subjects determined by the department. Minor subjects are taken outside the department.

### Courses in Electrical Engineering. (E E)

- 5120. Electrical Engineering Graduate Seminar (1:1:0).** Discussion will concern present research conducted in electrical engineering and other topics of interest to electrical engineers.
- 5301. Topics in Electrical Engineering (3:3:0).** Prerequisite: Consent of instructor. Introduction and application of a wide

range of electrical engineering topics; includes such subjects as circuit analysis, electronics, digital systems, communications, and related systems.

- 5310. Introduction to VLSI Design (3:2:3).** A basic introduction to very large-scale integrated (VLSI) design of circuits and devices. Geometrical patterns of semiconductor devices on a chip, MOS circuits, masking and patterning, and automation tools.
- 5312. Power Semiconductors (3:3:0).** Principles and properties of semiconductor devices, thyristors and other switches, integrated circuit devices, and device modeling.
- 5314. Solid State Devices (3:2:3).** Semiconductor materials and band theory of solids. Physics of semiconductor devices, charge transport, pn junctions, diodes, bipolar junction transistors, optoelectronic devices, and MOS devices.
- 5316. Power Electronics (3:3:0).** Switch mode power conversion, converters and inverters, power supplies and regulators, and power semiconductor circuits.
- 5321. Design and Analysis of Analog Integrated Circuits (3:3:0).** Principles involved in designing analog integrated circuits. Device physics, small signal, and large signal models. Biasing and basic circuit building blocks. Applications.
- 5324. Computer-Aided Circuit Analysis (3:3:0).** Development, implementation, and application of advanced circuit models for the design of integrated circuits. Designed to enhance design skills through direct application of computer-aided analysis tools.
- 5325. Telecommunication Networks (3:3:0).** Networking and standards. Data and voice network architectures, cellular, satellite and telephone networks. Open network architecture, ISDN, transport and network layer protocols. Network modeling and optimization. Queuing theory.
- 5328. Statistical Theory of Communications (3:3:0).** Probability review, functions of random variables, density and distribution functions, random processes, correlations, power spectral density, linear systems with random inputs, mean square estimation, matched filters.
- 5331. Theoretical Investigations in Engineering Applications (3).** Prerequisite: Graduate standing in engineering. An individual study course involving a rigorous theoretical investigation of some aspect of an engineering problem of current interest. A formal report is required.
- 5343. Power Systems Engineering (3:3:0).** Electrical power transmission and distribution systems; power generation systems; system modeling, planning, management and protection.
- 5344. Antennas and Radiating Systems (3:3:0).** Prerequisite: Consent of instructor. Antenna fundamentals, calculation of impedance, reciprocity, uniformly spaced arrays, aperture radiation, Huygen's principle, Babinet's principle, parabolic and spherical reflectors, aperture synthesis, multipole radiation.
- 5345. Pulsed Power (3:3:0).** Fundamentals of pulsed power circuits, components, and systems. Pulse forming lines, energy storage, voltage multipliers, switching, materials, grounding and shielding, measurements, and applications.
- 5352. Quantum Electronics (3:3:0).** Prerequisite: Consent of instructor. Introduction to lasers and laser-related problems. Quantum theory applied to laser devices, applications and engineering of lasers.
- 5353. Gaseous Electronics (3:3:0).** Kinetic theory of gases. Collisions. Emission processes. Self sustained discharge. Paschen law. Glow discharge. Arc discharge. Streamers. Spark discharge. Corona discharge. Gas lasers.
- 5355. Plasma Theory (3:3:0).** Vector mechanics of many particle systems. Kinetic gas theory. Orbit theory. Particle collisions, ionization phenomena. Radiation, Boltzmann-Vlasov equation, oscillations. Plasma turbulence and instabilities. Applications and devices.
- 5360. Fiber Optic Systems (3:3:0).** Optical fibers, couplers, sources, and detectors; applications to communications and sensing. Integrated optics.
- 5362. Modern Optics (3:3:0).** Modern concepts in optics related to engineering applications. Geometrical, physical, and quantum optics; Fourier optics, holography, and image processing.
- 5364. Digital Signal Processing (3:3:0).** An introduction to digital signal processing. Sampling, z-transform, discrete and fast Fourier transforms, flowgraphs, design techniques for digital filters, effects of finite word length and applications.
- 5365. Parametric and Functional Device Testing (3:3:0).** Fundamentals of semiconductor device chip and wafer testing. Parametric and functional tests, test philosophy, C programming for testing, and commercial wafer level testers.
- 5367. Image Processing (3:3:0).** Imaging fundamentals. Linear operators in spatial and spatial-frequency domains. Image enhancement and restoration techniques. Analysis and coding of images.
- 5368. Advanced Control Systems (3:3:0).** An introduction to advanced control systems. Optimal, adaptive, and robust control of linear and nonlinear systems. Fuzzy logic and neural network applications to control systems.
- 5371. Engineering Analysis (3:3:0).** Prerequisite: MATH 3351 or its equivalent. Application of modern mathematical methods to engineering problems (review of elements of measure and integration). Vector spaces and operators. Introduction to spectral theory. Elementary distribution theory.
- 5375. Computer Architecture (3:3:0).** An introduction to the architecture, organization and design of microprocessors. Hardware design related to various microprocessors. Analysis of current microprocessors and applications.
- 5381. Introduction to Semiconductor Processing (3:2:3).** Introduction to the physical principles, techniques, and technologies involved with the fabrication of very large scale integrated circuits (VLSI).
- 5382. Advanced Digital System Design (3:3:0).** Advanced VLSI design. Computer arithmetic. High speed computation. Digital hardware design. CAD tools for VLSI design.
- 5385. Introduction to Microsystems I (3:3:0).** Fundamentals of microelectromechanical (MEMS) and microfluidic systems. Project-based course introduces basic microsystem design, analysis, simulation, and manufacture through several case studies using representative devices.
- 5386. Introduction to Microsystems II (3:3:0).** Prerequisite: E E 5385. Application of microfabrication to create microsensor systems. Integration of optics, optoelectronics and microfluids. Includes other MEMS projects.
- 5391. Electric Machines and Drives (3:3:0).** Analysis and control of DC machines and induction machines. Space vector theory. Field oriented control. Modeling of machine and controller dynamics.
- 5393. Plasma and Materials Processing Techniques (3:3:0).** Plasma enhanced methods of materials deposition and processing, chemical vapor deposition methods, overview of low pressure plasma properties.
- 6000. Master's Thesis (V1-6).**
- 6351. Physical Electronics (3:3:0).** Prerequisite: E E 5352 or consent of instructor. Fundamentals of solid state physics relevant to device applications. Semiconductors, dielectrics, ferroelectricity, ferromagnetics, and superconductors. Laser devices, applications, and engineering of lasers.
- 6360. Computer Vision and Image Reconstruction (3:3:0).** Theories of image formation and reconstruction. Reconstruction problems in tomography, magnetic resonance imaging, synthetic aperture radar, and other modalities of imaging.
- 6363. Adaptive Pattern Recognition (3:3:0).** Prerequisite: E E 5328. Adaptive approaches to the design of discriminant functions for pattern classification and recognition. Statistical, syntactic, neural networks and fuzzy-set based optimization constraints for discriminants.
- 6365. Topics in Advanced Communications (3:3:0).** Applications of detection and estimation theory in the design of optimum communication systems.
- 6366. Optical Information Processing (3:3:0).** Prerequisite: E E 5362 or consent of instructor. Analog and digital optical signal-image processing architectures and systems; includes properties and applications of spatial light modulators and nonlinear optical materials in data storage, pattern recognition, and neural networks.
- 7000. Research (V1-12).**
- 8000. Doctor's Dissertation (V1-12).**



**Courses in System Engineering. (S E)**

- 5301. System Engineering Processes (3:3:0).** An introduction to the system engineering process and practice required in response to federal government procurements. The topics are applicable to the development and marketing of electro-mechanical products and associated supporting software.
- 5302. System Engineering Applications and Practices (3:3:0).** Reviews various engineering principles and applies them to practical problems with emphasis on those functions and activities developed in S E 5301.

## Department of Industrial Engineering

Professor Milton L. Smith, Chairperson.

Horn Professor Emeritus Dudek; Horn Professor Ayoub; Professors Ramsey, J. Smith, and Zhang; Associate Professors Beruvides, Hsiang, Kobza, and Liman; Assistant Professor Yang.

The department offers programs of study and research leading to the following degrees: INDUSTRIAL ENGINEERING, *Master of Science in Industrial Engineering* and *Doctor of Philosophy*; SYSTEMS AND ENGINEERING MANAGEMENT, *Master of Science in Systems and Engineering Management* and MANUFACTURING SYSTEMS AND ENGINEERING, *Master of Science in Manufacturing Systems and Engineering*.

The Master of Science in Systems Engineering and Management program is offered both on campus and by distance education and is designed to prepare its graduates for positions in technical management.

Specialty areas available include:

**I. Ergonomics and Human Factors Engineering**—occupational biomechanics, work physiology, industrial ergonomics, environmental hygiene, cognitive engineering, human performance, human computer interaction, and occupational safety.

**II. Manufacturing and Quality Assurance**—manufacturing engineering and design, computer integrated manufacturing/CAD/CAM, process analysis and economics, automated manufacturing and process planning, programmable control systems, reliability and maintainability, on-line and off-line quality assurance, and total quality assurance.

**III. Operations Research and Engineering Management**—simulation modeling, scheduling and sequencing, just-in-time production systems, inventory and production control, linear and nonlinear programming, network analysis, artificial intelligence and expert systems, and productivity management.

With the counsel of a graduate advisor, students are expected to design individualized academic programs. Programs will incorporate courses taken in each of the three areas listed above. The course selection may include a minor in an area outside industrial engineering. The master's level program consists of two options: (1) a 30-hour thesis option, including 6 credit hours of thesis research, and (2) a 36-hour nonthesis option. Details regarding admission and degree requirements are available from the department.

**Courses in Industrial Engineering. (I E)**

- 5301. Ergonomics and Design (3:2:3).** Prerequisite: Consent of instructor. Functional anatomy and physiology of the musculoskeletal system and their applications in work design. Introduction to work physiology, kinesiology, and anthropometry and their applications.
- 5302. Environmental Ergonomics (3:2:3).** Prerequisite: Consent of instructor. Evaluation, measurement, and control of the physical environment. Environments considered include: heat, cold, noise, vibration, light, radiation, and air contaminants.
- 5303. Work Physiology (3:2:3).** Prerequisite: Consent of instructor. Study of cardiovascular, pulmonary, and muscular responses to work, including energy costs of work endurance, fatigue, physical work capacity, and physiological modeling.
- 5304. Occupational Biomechanics (3:2:3).** Prerequisite: Consent of instructor. Historical development and theoretical fundamentals of body mechanics. The body link system and kinematic and kinetic aspects of body movement. Applications to work systems.
- 5305. Cognitive Engineering (3:3:0).** Prerequisite: Consent of instructor. Implications of human perceptual, cognitive, and psycho-motor capabilities for the design of systems for effective human use and control.
- 5306. Safety Engineering (3:3:0).** Prerequisite: Consent of instructor. Loss prevention principles, practice, and regulations; accident factors, models, costs, and analysis; systems safety; product safety; safety and health related workplace hazards.
- 5307. Loss Assessment and Control (3:3:0).** Prerequisite: I E 4363 or I E 5306 or consent of instructor. Advanced topics in worker safety and health; hazard recognition and analysis; system safety techniques and applications; loss assessment and control.
- 5309. Human Factors in Engineering and Design (3:3:0).** Introduction to human factors issues in the design of human-machine systems. Design of workstations, controls, and displays, human-computer interfaces, and the environment in industrial systems.
- 5311. Principles of Optimization (3:3:0).** Prerequisite: Consent of instructor. Linear optimization models: theory and application. Includes simplex, revised simplex, dual, and primal-dual algorithms, sensitivity and parametric analysis, duality theory, decomposition, linear complementarity problem, assignment and transportation problems, and Karmarkar's algorithm.
- 5312. Queueing Theory (3:3:0).** Prerequisite: Consent of instructor. Modeling and analysis of simple and complex service systems. Includes single and multiple server Markov queues, queues with general arrival processes and service times, bulk and batch queues, priority queues, and queueing networks.
- 5314. Multistage Decision Processes (3:3:0).** Prerequisite: I E 3311 or 5311 or consent of instructor. Discrete dynamic programming: Knapsack problem, path problems, equipment replacement, capacity expansion, inventory, partitioning problems, sequencing problems; introduction to continuous dynamic programming; Markov decision processes.
- 5316. Simulation Models for Operations Analysis (3:3:0).** Prerequisite: Any scientific programming language. Application of simulation techniques to analysis of large scale operations. Production-distribution models; model construction; validation of simulation models; limitations of simulation techniques; programming with simulation languages.
- 5317. Statistical Analysis for Digital Simulation (3:3:0).** Prerequisite: I E 5366 or proficiency in a current discrete event simulation language. Generation of random variants. Statistical tests for randomness in random number streams. Collection and analysis of data for input parameters and distributions. Detection and removal of transients in simulation model data. Computation of variance of simulation model output; variance reduction techniques.
- 5320. Systems Theory (3:3:0).** Examines theoretical foundations of general systems theory applied to engineering and organizational enterprises addressing issues of systems efficiency, effectiveness, productivity, economics, innovation, quality, and QWL.

- 5321. Decision Theory (3:3:0).** Prerequisite: Consent of instructor. Philosophy, theory, and practice of management; decision theory and social responsibility.
- 5322. Industrial Cost Analysis (3:3:0).** Cost analysis and/or control of industrial enterprises. Economic budgeting, planning, decision making, and financial analysis for engineering and engineering management.
- 5323. The Engineering Management Environment (3:3:0).** Management of research and development; the legal, financial, and professional interrelationships of engineers and their environment in relation to the modern production organization.
- 5324. Advanced Economics of Systems (3:3:0).** Prerequisite: I E 3301, equivalent, or consent of instructor. Design analysis and sensitivity of complex economic systems with evaluation of economic system performance measures and modeling.
- 5325. Productivity and Performance Improvement in Organizations (3:3:0).** Productivity and performance improvement (including efficiency, effectiveness, quality, QWL, innovation, profitability, and budgetability) theories, techniques, analysis, and applications for industrial systems.
- 5327. Inventory Systems (3:3:0).** Prerequisite: I E 3341 or consent of instructor. Deterministic and stochastic systems with static and dynamic models; just-in-time systems. Forecasting techniques, MRP, and case studies in inventory systems management.
- 5328. Activity Scheduling (3:3:0).** Prerequisite: I E 3371 or consent of instructor. Deterministic sequencing of single machine, parallel machines, flow shops, and job shops. Theory of complexity. Optimization and heuristic algorithms for combinatorial sequence generation.
- 5331. Theoretical Studies in Advanced Industrial Engineering Topics (3).** Prerequisite: Consent of instructor and departmental approval. Individual theoretical study of advanced topic selected on the basis of departmental recommendation. May be repeated.
- 5332. Experimental Investigation in Advanced Industrial Engineering Topics (3).** Prerequisite: Consent of instructor and departmental approval. Individual experimental study of an advanced topic selected on the basis of departmental recommendation. May be repeated.
- 5340. Robust Design and Optimization for Systems (3:3:0).** Prerequisite: Consent of instructor. Experimental, analytical, and optimization approaches for the design and operation of integrated systems emphasizing quality and resource allocation concepts, strategies, and tools.
- 5342. Design of Experiments (3:3:0).** Prerequisite: I E 3341 or 5381 or equivalent. Single factor, factorial, blocked, split plot designs. Means comparisons, contrasts, estimates of variation. Confounding and fractional factorials.
- 5344. Statistical Data Analysis (3:3:0).** Prerequisite: I E 3341 or 5381 or equivalent. Exploratory data analysis, graphical displays and analysis. Linear and nonlinear regression, response surfaces. Selected mainframe and microcomputer packages.
- 5345. Reliability Theory (3:3:0).** Prerequisite: I E 3341 or 5381 or equivalent. System level reliability, redundancy, maintainability, and availability analysis and modeling. Life testing, acceleration, parametric, and nonparametric models.
- 5346. Total Quality Systems (3:3:0).** Prerequisite: Consent of instructor. Total quality philosophy, customer definition and demands, quality strategies, planning and integration, benchmarking, team structures and interaction, supplier qualification, and quality audits.
- 5351. Advanced Manufacturing Processes (3:2:3).** Prerequisite: Consent of instructor. Advanced topics in manufacturing materials and processes, including metallurgical considerations, nonmetallic materials, deformation processes, metal removal theory, and process economics.
- 5352. Advanced Manufacturing Engineering (3:3:0).** Prerequisite: Consent of instructor. Advanced topics in manufacturing engineering, including manufacturing systems, production integration, cellular manufacturing, group technology, intelligent manufacturing, concurrent engineering, and life-cycle product design engineering.
- 5353. Quality Assurance (3:3:0).** Prerequisite: I E 3343 or 5381 or equivalent. Quality definition and requirements, on-line and off-line quality assurance strategies and tools including quality function deployment, robust design and mistake proofing. Emphasis on experimental methods and quantitative analysis.
- 5354. Computer Control in Manufacturing (3:3:0).** Prerequisite: Consent of instructor. Theory and application of computer control of machines and processes used in manufacturing systems. Relevant issues on the analysis, design, and implementation of computer controlled systems.
- 5355. Computer-Aided Manufacturing (3:3:0).** Prerequisite: Consent of instructor. Computer usage in manufacturing systems, CAD/CAM, numerical control, CNC, DNC, computer-aided process planning, manufacturing engineering database systems, industrial robot applications, flexible manufacturing systems, and integration of CAD and CAM.
- 5382. Design and Control for Production (3:3:0).** Prerequisite: Consent of instructor. Work analysis; process flow, work methods, workplace layout. Economic analysis; discounted cash flow, depreciation, economic justification. Operations research; optimization and linear programming.
- 6000. Master's Thesis (V1-6).**
- 6331. Advanced Industrial Engineering Topics (3).** Prerequisite: Doctoral degree status and departmental approval. Advanced theoretical and/or empirical studies in industrial engineering, ergonomics-human factors, quality or manufacturing engineering, or OR-engineering systems management.
- 6399. Research Methods in Science and Technology (3:3:0).** Prerequisite: Doctoral degree status and design of experiments or equivalent. Examines the research process and differing methodological approaches to research in laboratory, industrial, field work, and case study settings.
- 7000. Research (V1-12).**
- 8000. Doctor's Dissertation (V1-12).**
- ### Courses in Manufacturing Systems and Engineering. (MSE)
- 5101. Graduate Seminar of Advanced Manufacturing Systems and Engineering (1:1:0).** Prerequisite: Advancement to enrollment status of the M.S. in Manufacturing Systems and Engineering program. Discussion of advanced manufacturing systems and engineering.
- 5333. Manufacturing Systems and Engineering Internship (3).** Prerequisite: Consent of instructor and program advisor. Internship carried out under the supervision of the program graduate advisor, the student's major advisor, and/or project manager of the internship provided by industrial companies. The internship must take place at the approved major industrial companies within the state of Texas with careful planning in advance.
- 6000. Master's Thesis (V1-6).** Prerequisite: Advancement to candidacy status. Thesis research carried out under the supervision of the student's major advisor.
- ## Department of Mechanical Engineering
- Professor Thomas D. Burton, Chairperson.  
Professors Anderson, Cardenas-Garcia, Chyu, Ertas, and Pigott;  
Associate Professors Barhorst, Berg, Dunn, Hashemi, James, Levitas, Maxwell, Oler, Parameswaran, and Rasty; Assistant Professors Ekwaro-Osire and Pantoya.
- This department offers study in the following graduate degree programs: MECHANICAL ENGINEERING, *Master of Science in Mechanical Engineering* and *Doctor of Philosophy*.
- Students seeking master's or doctor's degrees should consult the graduate advisor for the department about their

plans of study before enrolling for any courses. The student may wish to emphasize course work and research activities in any one of the following areas: thermal sciences, fluid mechanics, dynamics and controls, design, solid mechanics and materials, or multidisciplinary studies.

Before being recommended for admission to a master's degree program with a major in this department, the student may be requested to take a preliminary examination to determine proficiency in background for graduate work or may be required to take (without graduate credit) such undergraduate leveling courses as may be designated by the department.

Two general plans of study are available for the Master of Science degree: a 30-hour plan (which includes 6 hours credit for the master's thesis) and a 36-hour plan (which includes 3 hours credit for the master's report). The decision on which plan to follow is made jointly by the student and the advisor. Individual degree plans require a selected core of courses basic to mechanical engineering and include additional elective courses chosen by the student and the advisor.

The department has no specific foreign language requirement. Research tools are included as an integral part of the degree program in the leveling, minor, or major courses of each student. All courses are determined by the student's doctoral advisory committee.

Additional information may be obtained from the department.

### Courses in Mechanical Engineering. (M E)

- 5301. Analysis of Engineering Systems (3:3:0).** Prerequisite: MATH 3350 or consent of instructor. Analytical techniques for solving ordinary and partial differential equations frequently occurring in advanced mechanical engineering.
- 5302. Numerical Analysis of Engineering Systems (3:3:0).** Prerequisite: M E 2315, MATH 3350, or consent of instructor. Numerical analysis of ordinary and partial differential equations and other advanced topics as applied to mechanical engineering problems.
- 5311. Advanced Dynamics (3:3:0).** Prerequisite: M E 3331, 3433, or consent of instructor. Newtonian dynamics of particles and rigid bodies, rotating coordinate systems, coordinate and inertia property transformations, Lagrangian and Hamiltonian mechanics, Gibbs-Appell equations, and gyroscopic mechanics.
- 5312. Control Theory I (3:3:0).** Prerequisite: MATH 2360, 3354, 4351, or consent of instructor. Linear dynamical systems, stability, frequency response and Laplace transform, feedback, state space description, and geometric theory of linear systems. (MATH 5312)
- 5313. Control Theory II (3:3:0).** Prerequisite: MATH 5312, 5316, 5318, or consent of instructor. Quadratic regulator for linear systems, Kalman filtering, nonlinear systems, stability, local controllability, and geometric theory of nonlinear systems. (MATH 5313)
- 5314. Nonlinear Dynamics (3:3:0).** Prerequisite: M E 5311, or 5316. Nonlinear oscillations and perturbation methods for periodic response; bifurcations and chaotic dynamics in engineering and other systems.
- 5315. Mechatronics (3:3:0).** Prerequisite: M E 3433 and an ability to program computers. Electro-mechanical device interfacing, real-time programming, data acquisition, signal processing. Applications in automation, robotics, and other electro-mechanical systems.
- 5316. Advanced Vibrations (3:3:0).** Prerequisite: M E 3331, 3433, or consent of instructor. Vibration of single and multiple-degree of freedom systems, continuous systems, FE formulation, computer sided modal analysis, random vibrations.
- 5321. Thermodynamics (3:3:0).** Prerequisite: M E 3322 or consent of instructor. Classical macroscopic theory with an emphasis on availability concepts in nonreacting, reacting, single phase, and multicomponent systems.
- 5322. Conduction Heat Transfer (3:3:0).** Prerequisite: M E 3371 or consent of instructor. Fundamental principles of heat transmission by conduction. Multidimensional steady and transient analysis using various analytical and computational methods.
- 5323. Two-Phase Flow and Heat Transfer (3:3:0).** Prerequisite: M E 3371. Liquid-vapor two-phase flow hydrodynamics, boiling and condensation heat transfer, mechanisms and prediction methods.
- 5324. Radiation Heat Transfer (3:3:0).** Fundamental principles of heat transmission by thermal radiation, radiant properties, radiation exchange, participating media, and combined modes.
- 5325. Convection Heat Transfer (3:3:0).** Prerequisite: M E 3371 or consent of instructor. Fundamental principles of heat transmission by convection; theoretical, numerical, and empirical methods of analysis for internal and external flows.
- 5326. Combustion (3:3:0).** Prerequisite: M E 3322 and 3371. Introduction to combustion kinetics; the theory of premixed flames; turbulent combustion; formation of air pollutants in combustion systems; examples of combustion devices which include internal combustion engines, gas turbines, furnaces and waste incinerators; alternative fuel sources.
- 5330. Boundary Layer Theory (3:3:0).** Prerequisite: M E 3370 or consent of instructor. Fundamental laws of motion for Newtonian viscous fluids in steady laminar and turbulent boundary layers. Utilization of analytical and approximate methods to obtain solutions for viscous flows.
- 5332. Potential Flow (3:3:0).** Prerequisite: M E 3370. The study of inviscid incompressible flows. Topics include stream functions and velocity potential, vorticity dynamics, and applications to aerodynamics.
- 5334. Gas Dynamics (3:3:0).** Prerequisite: M E 3370 or consent of instructor. Development of basic equations for compressible flow, normal and oblique shocks, flow-through nozzles and ducts, external flows.
- 5335. Mathematical Models of Turbulence (3:3:0).** Prerequisite: M E 5330. Nature of turbulence, the Reynold's equations, and the transport equations for Reynold's stresses. Different kinds of closure models and their application to boundary layer flows.
- 5336. Computational Fluid Dynamics (3:3:0).** Prerequisite: M E 5301 or equivalent. Simultaneous solution of momentum, heat, and mass transfer problems by applying various computational techniques.
- 5341. Elasticity and Plasticity (3:3:0).** Prerequisite: Consent of instructor. A tensorial approach to classical theory of elasticity, linear viscoelasticity, and plasticity.
- 5342. Fracture and Failure Analysis (3:3:0).** Prerequisite: M E 5341. Engineering aspects of failure. Failure mechanisms and related environmental factors. Principles of fracture mechanics and fractography. Techniques for failure analysis and prevention.
- 5343. Continuum Mechanics (3:3:0).** Prerequisite: Consent of instructor. Basic balance equation in tensor form, as well as constitutive equations for elastic, viscous, plastic solids and liquids.
- 5344. Advanced Materials (3:3:0).** Prerequisite: M E 5341. Design, processing, and analysis of advanced materials.
- 5345. Finite Element Analysis (3:3:0).** Prerequisite: M E 5301 or equivalent. Galerkin and variational finite element formulations for one, two, and three dimensional problems in solid mechanics, structural dynamics, heat transfer, and fluid dynamics.
- 5351. Advanced Engineering Design (3:2:3).** Prerequisite: Consent of instructor. Design analysis and synthesis of multicomponent systems. Application of fatigue, fracture mechanics, random vibration, acoustic and anisotropic materials to component design.



- 5352. Probabilistic Design (3:3:0).** Application of probabilistic approaches in engineering design. Techniques for the quantification of uncertainty and risk inherent in mechanical systems.
- 5353. Fundamental of Transdisciplinary Design and Process (3:3:0).** The fundamental aspects of design and process which cut across the boundaries of all disciplines and provide a means for solving complex problems.
- 5354. Systems Engineering Principles (3:3:0).** An overview of the systems engineering design process focusing on defining both the business and the technical needs and required functionality early in the development cycle, documenting requirements with design synthesis and system validation is presented.
- 5385. Introduction to Microsystems (MEMS) I (3:3:0).** Fundamentals of microelectromechanical (MEMS) and microfluidic systems. Project-based course introduces basic microsystem design, analysis, simulation, and manufacture through several case studies using representative devices.
- 5386. Introduction to Microsystems (MEMS) II (3:3:0).** Prerequisite: ME 5385. Application of microfabrication to create microsensor systems. Integration of optics, optoelectronics and microfluids. Includes other MEMS projects.
- 6000. Master's Thesis (V1-6).**
- 6301. Master's Report (3).**
- 6331. Theoretical Studies (3:3:0).** Prerequisite: Consent of instructor. Theoretical study of advanced topics selected on the basis of the departmental advisor's recommendation. May be repeated for credit in different areas.
- 7000. Research (V1-12).**
- 8000. Doctor's Dissertation (V1-12).**

## Department of Petroleum Engineering

Roy Butler Professor James F. Lea, Chairperson.  
Emeritus Professors Day and Winkler; Livermore Professor Davis; Sun Associate Professor Frailey; Watford Associate Professor Heinze; Associate Professor Lawal; Assistant Professor Cox.

This department offers study in the following degree program: PETROLEUM ENGINEERING, *Master of Science in Petroleum Engineering* and *Doctor of Philosophy*. Admission requirements and details of the programs are posted on the departmental Web site at <[www.pe.ttu.edu](http://www.pe.ttu.edu)>.

The department is staffed with industry-experienced faculty who has an average of more than 15 years of experience per faculty member. This experience is combined with sound engineering and scientific principles in the classroom and made an integral part of the candidate's educational challenge. Also, the department is located in a geographical area that produces 20 percent of the nation's petroleum resources and 68 percent of Texas' petroleum resources lie within a 175-mile radius. This proximity provides the student with unique opportunities for directly interfacing with industry while still a student as well as first hand observations of oil field operations.

Graduate studies in petroleum engineering prepare the engineer to assume responsibility in technical and managerial areas within the oil and gas industry. Historically, the graduate petroleum engineer can expect to be challenged quickly and in areas of strong potential for personal and professional growth. Candidates with superior

skills and the desire to progress within the industry can expect to be successful. The Petroleum Engineering Department at Texas Tech prepares the advanced student with the technical skills required to meet those challenges.

The master's program requires 33 graduate credit hours above the baccalaureate degree, including 6 credit hours allowed for the thesis and at least 18 credit hours of graduate petroleum engineering courses (excluding seminar). Additional graduate credit hours of other engineering, mathematics, or science will be allowed when approved by the candidate's advisory committee and graduate advisor. A written thesis is required for the master's degree. In addition, the candidate's thesis committee will administer a final oral exam in defense of the completed thesis. The department also offers a nonthesis master's program that requires 36 graduate credit hours approved by the graduate advisor. The graduate program for nonthesis master's candidate is specifically tailored for that candidate's educational background, industry experience, and individual interest. For both the thesis and the nonthesis programs, a final comprehensive examination is required. The policy governing the comprehensive examination is available with the departmental graduate advisor. Comprehensive examinations are given only after the Graduate Dean has admitted the students to candidacy.

The objectives of the Ph.D. program are to provide students opportunities to reach a critical understanding of the basic scientific and engineering principles underlying their fields of interest and to cultivate their ability to apply these principles creatively through advanced methods of analysis, research, and synthesis. The Ph.D. degree is awarded primarily on the basis of research. Applicants for the doctoral degree must have a degree in engineering disciplines and must meet the approval of the department's graduate committee. Students majoring in this department for doctoral degree must pass diagnostic examinations (or preliminary examination) by the end of their second long semester. These examinations are based on the undergraduate curriculum. Each student is required to pass the diagnostic examinations in his or her area of specialization and any three-core areas. The department's graduate committee offers these examinations two times a year. The results of the diagnostic examinations are evaluated in accordance with the Graduate Programs and Policies Guidelines of the Petroleum Engineering Department. Details concerning the preliminary examination are available from the departmental program advisor.

In addition to regulations established by the Graduate School, applicants for candidacy for the doctor's degree are required to demonstrate high proficiency in a single research area. Certification of the research proficiency is to be based on a record of accomplished research that demonstrates the required level of competence in the research area. Published articles, technical reports, or proceeding papers presented at meetings, workshops, and conferences of learned societies must be used to substantiate the record of accomplishments. The course work

for each student must meet the approval of the student's doctoral advisory committee. The department has no specific foreign language requirement (but a foreign language for the Ph.D. degree can be specified at the discretion of the student's dissertation advisor). Research tools are included as an integral part of the degree program in the leveling, minor, or major courses of each student. Additional information may be obtained from the departmental program advisor.

All petroleum-engineering courses can be taken for credit. No more than six hours of PETR 5000 can appear in a master degree plan without approval from the Graduate Dean. The curriculum is organized into four core areas that denote the teaching and research concentration of the faculty. However, the degree plan of a petroleum engineering student should include at least one course from each of the four core areas:

Drilling Engineering—PETR 5303, 5000.

Production Engineering—PETR 5306, 5000.

Reservoir Engineering—PETR 5307, 5309, 5310, 5311, 5313, 5000.

Formation Evaluation—PETR 5304, 5305, 5308, 5000.

Qualified students with a BS or BA degree in any field may enter the MS program in petroleum engineering by completing (without graduate credit) leveling work as needed in physics, chemistry, mathematics, geology, basic engineering courses and undergraduate petroleum engineering courses. The details of the leveling program will be worked out on an individual basis by the graduate advisor, and the length of the program will depend on the student's background. This leveling program must be completed with a minimum grade of B. All graduate students are required to register for PETR 5121 or 7121 each long semester unless exempted by the Department Chair. The graduate seminar course does not count toward fulfilling degree requirements for the master's or doctor's program.

### **Courses in Petroleum Engineering. (PETR)**

**5000. Studies in Advanced Petroleum Engineering Topics (V1-6).** An individual study course. Nature of course depends on student's interests and needs. May be repeated for credit on different topics.

**5121. Graduate Seminar (1:1:0).** Discussions of petroleum engineering research and special industry problems. Required each semester for all graduate students. May be repeated for credit.

**5303. Advanced Drilling Techniques (3:3:0).** Prerequisite: PETR 3307 or consent of instructor. A unified treatment of all aspects of well planning and the optimization of oil and gas drilling processes.

**5304. Advanced Well Log Analysis (3:3:0).** Prerequisite: PETR 3304 or consent of instructor. Methods of analyzing various types of well logs to obtain quantitative hydrocarbon reservoir parameters.

**5305. Advanced Formation Evaluation (3:3:0).** Prerequisite: Must have graduate standing in petroleum engineering. Application of petrophysical core analysis to formation evaluation. Integration of special core analysis with well logs.

**5306. Advanced Artificial Lift Methods (3:3:0).** Prerequisite: Consent of instructor. Study of the design and analysis of current mechanisms for lifting oil from the reservoir to surface facilities including optimization theory.

**5307. Enhanced Oil Recovery (3:3:0).** Prerequisite: Consent of instructor. Fundamental relations governing the displacement of oil in petroleum reservoirs and methods for predicting oil recovery by miscible and immiscible displacement.

**5308. Pressure Transient Analysis (3:3:0).** Prerequisite: MATH 3350, PETR 4308, or consent of instructor. Theory of transient fluid flow in petroleum reservoirs and applications of methods to interpret transient pressure behavior.

**5309. Hydrocarbon Reservoir Simulation (3:3:0).** Prerequisite: MATH 3350 or consent of instructor. The development of unsteady state fluid flow equations for hydrocarbon reservoirs and the application of finite difference methods to obtain solutions to the equations.

**5310. Advanced Simulation Techniques (3:3:0).** Prerequisite: PETR 5309. Treatment of advanced concepts of reservoir simulation for multidimensional, multiphase flow in hydrocarbon reservoirs.

**5311. Thermal Oil Recovery (3:3:0).** Prerequisite: Consent of instructor. Study of the recovery of oil by thermal methods, including steam injection and in situ combustion.

**5313. Numerical Applications in Petroleum Engineering (3:3:0).** Prerequisite: Consent of instructor. Least squares, solving first and second order partial differential equations; backward, central, forward difference solutions, matrix, Gaussian, Adams, Rung-Kutta solutions.

**6000. Master's Thesis (V1-12).**

**6001. Master's Report (V1-6).**

**7000. Research (V1-12).**

**7121. Doctoral Seminar (1).** Open discussion of recent advanced findings in any field of endeavor with special attention to their relationship to the philosophy of petroleum engineering. May be repeated for credit.

**8000. Doctor's Dissertation (V1-12).**

## College of Human Sciences

*Professor Linda C. Hoover, Interim Dean*

The College of Human Sciences offers graduate programs leading to the following degrees:

**Master of Science** with majors in Environmental Design; Food and Nutrition; Family and Consumer Sciences Education; Family Financial Planning; Human Development and Family Studies; Marriage and Family Therapy; and Restaurant, Hotel, and Institutional Management.

**Doctor of Philosophy** with majors in Environmental Design and Consumer Economics; Food and Nutrition; Family and Consumer Sciences Education; Human Development and Family Studies; and Marriage and Family Therapy.

The mission of the College of Human Sciences is to provide multidisciplinary education, research, and service focused on individuals, families, and their environments for the purpose of improving and enhancing the human condition.

The graduate programs in the college are designed to educate scholars and leaders in all areas that affect human development; nutrition; family studies; environmental design; restaurant, hotel, and institutional management; family financial planning; family and consumer sciences education; and consumer behavior. Persons successfully completing graduate work in the college have traditionally been prepared to serve, and currently serve as leaders in the business world, a number of private sector organizations, and in academic settings as educators and administrators.

Persons interested in graduate programs should consult earlier sections of this catalog for information concerning University requirements for master's and doctoral degrees. Information about the graduate minor in risk-taking behavior is provided under the "Opportunities for Interdisciplinary Study" section of this catalog. Admission to master's degree programs requires the recommendation of the department and the approval of the Graduate Dean. Admission to the doctoral program requires the recommendation of the department as well as approval of the Graduate Dean.

Applicants should contact the program director or the chairperson of the department offering the specialization for college and departmental guidelines.

### Courses in Human Sciences. (HUSC)

**5311. Problems in Human Sciences (3:3:0).** May be repeated for credit.

**6000. Master's Thesis (V1-12).**

## Department of Education, Nutrition, and Restaurant-Hotel Management

Professor V. Lynn Huffman, Chairperson.

Professors Brittin, Couch, Felstehausen, and Spallholz; Associate Professors Boylan, Dodd, Hoover, and Stout; Assistant Professors Adams, Blum, Goh, March, Roman-Shriver, Shriver, and Wu; Adjunct Faculty: Griswold, Mumme, and Pence.

This department offers study in the following graduate degree programs: RESTAURANT, HOTEL, AND INSTITUTIONAL MANAGEMENT, **Master of Science**; FAMILY AND CONSUMER SCIENCES EDUCATION and FOOD AND NUTRITION, **Master of Science** and **Doctor of Philosophy**.

The Master of Science degree requires a minimum of 30 semester hours including thesis, or 36 hours for a nonthesis plan, with courses chosen in consultation with the major professor. Students without appropriate background in the chosen specialization will be required to take undergraduate leveling courses designated by the department. The Doctor of Philosophy degree requires a minimum of 50 hours beyond the master's degree, including at least 18 hours in the specialization area.

The department also offers a one year dietetic internship program. Selected credits earned during the program may apply to an optional master's or doctoral degree. Eighteen hours of graduate credit are required in supervised experience in health and food service facilities. Upon completing the internship, the student is eligible to take the written examination to become a Registered Dietitian.

Graduate students may obtain a secondary-level family and consumer sciences teaching certificate by completing course work prescribed in the Texas Standards for Teacher Certification. Selected credits earned for certification may apply toward a graduate degree in family and consumer sciences education.

Applicants should contact the program graduate advisor concerning admission requirements and programs of study. Admission to a graduate degree program requires the recommendation of the department as well as the approval of the Graduate Dean.

### Courses in Food and Nutrition. (F&N)

**5118. Seminar (1:1:0).** May be repeated for credit.

**5301. Sensory Evaluation of Food (3:2:3).** Study of the physical and chemical properties of foods and their interrelations to sensory evaluation of foods.

**5302. Human Metabolism in Nutrition (3:3:0).** Concepts of normal nutrition in relation to the chemistry and physiology of the human body. May not be counted toward a food and nutrition degree.

**5310. Nutrition of the Aged (3:3:0).** Nutrition needs and factors affecting nutrition of the aged.

**5311. Problems in Food and Nutrition (3:3:0).** May be repeated for credit.

**5312. Professional Issues (3:3:0).** Prerequisite: Consent of instructor. Study of current issues related to dietetic practice.

**5320. Resource Management in Dietetics (3:3:0).** Prerequisite: Consent of instructor. Materials and human resources management in administration and clinical aspects of dietetics.



- 5321. Dietetic Counseling Strategies (3:3:0).** Application of interviewing, counseling, and educational techniques in dietetics including individual and group methods.
- 5327. Carbohydrates and Lipids in Nutrition (3:3:0).** Nutritional roles and metabolism of lipids and carbohydrates and metabolic responses to various dietary practices and diseases.
- 5329. Minerals in Nutrition (3:3:0).** Prerequisite: F&N 4320 or consent of instructor. Study of minerals and their interrelationships in nutrition.
- 5330. Introduction to Food and Nutrition Research (3:3:0).** Introduction to and critical review of current research designs and methodology in survey and controlled experiments; proposal writing, reporting, and interpretation of data.
- 5331. Issues in Nutrition (3:3:0).** Prerequisite: F&N 4320. Current issues in human nutrition with emphasis on interrelationships of nutrients in metabolism and their impacts on health.
- 5332. Issues in Food Science (3:3:0).** Current issues in food science with emphasis on the relationship of food science to human nutrition.
- 5333. Vitamins in Nutrition (3:3:0).** Prerequisite: F&N 4320 or consent of instructor. Study of essential vitamins and factors affecting vitamin utilization.
- 5334. Advanced Medical Nutrition Therapy (3:3:0).** Prerequisite: F&N 3340 or 4320 or consent of instructor. Physiological and metabolic bases for dietary modification in disease including assessment of biochemical and anthropometric indicators.
- 5336. Nutritional Assessment and Data Interpretation (3:2:3).** Prerequisite: F&N 4340 or consent of instructor. Techniques of physical and biochemical measurement and interpretation of data as applicable to patient-client nutritional status assessment in health care systems.
- 5350. Nutritional Pathophysiology (3:3:0).** Prerequisite: One semester of college biology or consent of instructor. An introduction to human pathophysiology with emphasis on the impact of nutritional influences.
- 5360. Advanced Community Nutrition (3:3:0).** Prerequisite: Consent of instructor. Study of community nutrition needs, resources, policies, programs, and applications of skills in health promotion.
- 5370. Advanced Nutrition in the Lifecycle (3:3:0).** Prerequisite: F&N 4320 or consent of instructor. Current issues in nutrition as they impact the lifecycle with emphasis on infants, children, and the elderly.
- 5380. Proteins and Amino Acids in Nutrition (3:3:0).** Prerequisite: F&N 4320 or consent of instructor. Nutritional roles, interrelationships, measurement of nutritional value, requirements, and metabolic processes of proteins in health and disease.
- 5601. Internship in Dietetics (6:0:24).** Prerequisite: Admission to the dietetic internship program. Internship experience in the practice of dietetics in clinical health care, food systems management, and community nutrition settings. Enrollment required three semesters.
- 6000. Master's Thesis (V1-6).**
- 7000. Research (V1-12).**
- 8000. Doctor's Dissertation (V1-12).**

### **Courses in Family and Consumer Sciences Education. (FCSE)**

- 5118. Seminar (1:1:0).** May be repeated for credit.
- 5301. Administration in Family and Consumer Sciences Education Professions (3:3:0).** Administration of family and consumer sciences programs with emphasis on leadership development in a variety of settings.
- 5302. Curriculum Development in Family and Consumer Sciences Education (3:3:0).** Philosophy and development of family and consumer sciences programs for secondary schools, junior and senior colleges, and extension programs; survey of legislation, recent curriculum developments, and trends affecting family and consumer sciences programs.
- 5303. Evaluation in Family and Consumer Sciences Education (3:3:0).** Procedures for appraisal of individual growth and achievement in all subject areas in family and consumer

sciences. Development of evaluative instruments for cognitive, affective, and psychomotor learning and interpretation of data in the evaluation of various types of family and consumer sciences programs.

- 5304. Techniques of Research in Family and Consumer Sciences Education (3:3:0).** Methods and techniques of research in family and consumer sciences, interpretation of findings and application to selected situations and problems.
- 5307. Techniques of Supervision in Family and Consumer Sciences Education (3:3:0).** Philosophy, responsibilities, and techniques of supervision in family and consumer sciences and other learning environments.
- 5308. Communication Processes in Family and Consumer Sciences Education (3:3:0).** Techniques of interaction and interpersonal relations in family and consumer sciences education programs. A comprehensive exploration of current communicative processes emphasizing interpersonal relationships with special audiences, i.e., handicapped, disadvantaged, and multicultural.
- 5309. Occupational Family and Consumer Sciences Education I (3:3:0).** Designed for vocational family and consumer sciences teachers seeking occupational certification. Emphasis on teaching methods in occupational family and consumer sciences, including cooperative and laboratory programs.
- 5311. Problems in Family and Consumer Sciences Education (3:3:0).** May be repeated for credit.
- 5312. Occupational Family and Consumer Sciences Education II (3:3:0).** Focus on tasks, skills, and equipment for teaching in family and consumer sciences occupational programs.
- 5341. History and Philosophy of Family and Consumer Sciences Education (3:3:0).** Historical, philosophical, and legislative bases of family and consumer sciences education. Consideration of current and future roles of family and consumer sciences education in secondary, post-secondary, higher education, extension education, and other areas.
- 5342. Contemporary Adult and Continuing Education in Family and Consumer Sciences Education (3:3:0).** A systemic approach to development and administration of adult and continuing education programs in family and consumer sciences. Emphasis on professional development, career redirection, and lifelong learning.
- 5343. University Teaching in Family and Consumer Sciences Education (3:3:0).** Synthesis and analysis of innovative educational strategies, humanistic evaluation, and faculty role in program governance.
- 5344. Internship in Family and Consumer Sciences Education (3:3:0).** Prerequisite: 6 hours in family and consumer sciences education and approval of instructor. Supervised experiences in family and consumer sciences positions in extension, business, secondary schools, or related areas. May be repeated for credit.
- 5345. History and Philosophy of Cooperative Extension (3).** Examination of the philosophical bases for the development of cooperative extension education in home economics, 4-H, and community development.
- 5346. Methods in Cooperative Extension Education (3:3:0).** Theory and practice in developing and implementing educational programs for adults and youth in cooperative extension. Emphasis on teaching methods.
- 5350. Special Topics in Family and Consumer Sciences Education (3:3:0).** Semester-long study of a specific topic pertinent to the family and consumer sciences education profession. May be repeated (different topics) for a maximum of 12 hours credit.
- 6000. Master's Thesis (V1-6).**
- 6307. Professional Issues in Family and Consumer Sciences Education (3:3:0).** Social, economic, and environmental changes impacting society and the response of family and consumer sciences professionals through education, research, and outreach programs in higher education. Focus on administrative leadership skills needed by leaders in the profession.
- 7000. Research (V1-12).**
- 8000. Doctor's Dissertation (V1-12).**

### Courses in Restaurant, Hotel, and Institutional Management. (RHIM)

- 5200. Graduate Colloquium in Hospitality Management (2:2:0).** Introduction to philosophies and processes involved in graduate study in the hospitality sector.
- 5308. Advanced Hotel Management (3:3:0).** An assessment of organizational and operational issues relating to the lodging industry. Students will examine current trends in the hotel industry and determine appropriate strategies for managing change.
- 5311. Problems in Restaurant, Hotel, and Institutional Management (3:3:0).** May be repeated for credit.
- 5316. Hospitality and Service Marketing (3:3:0).** Prerequisite: RHIM 4316 or consent of instructor. Examination of marketing theories and specific applications to the hospitality and service industry. Concentrates on differences of marketing concepts in service vs. products market.
- 5322. Financial Analysis in the Hospitality Industry (3:3:0).** Prerequisite: RHIM 4322 or consent of instructor. A systems approach to the financial decision making process in the hospitality industry.
- 5332. Advanced Hospitality Control (3:3:0).** Managerial concepts that apply to the hospitality industry using the uniform system of accounts for lodging, restaurant, and club industries.
- 5333. Hospitality Management Research and Application (3:3:0).** Examination of hospitality management and research concepts and their application in hospitality management settings.
- 5340. Hospitality Consumer (3:3:0).** Analysis of hospitality customers with emphasis on application of theoretical based research.
- 5341. Strategic Management in the Hospitality Industry (3:3:0).** Prerequisite: Completion of RHIM core. Examination of strategy formulation, content development, implementation, and evaluation at the unit and multi-unit level.
- 5350. Advanced Travel and Tourism (3:3:0).** In-depth study of principles and concepts of travel and tourism behavior. Emphasis on tourism theories, history, planning, development, and research techniques.
- 5353. Introduction to Restaurant, Hotel, and Institutional Management Issues and Research (3:3:0).** Analysis of issues and methods of research related to the study of food, equipment, design, consumer acceptance, concept development, cost analysis, and operational efficiency.
- 5355. Human Resources in the Hospitality Industry (3:3:0).** In-depth study of human resources management in the service industry. Emphasis on employment issues, labor relations, and government regulations.
- 5360. Internship in the Hospitality Industry (3:3:0).** Prerequisite: Consent of instructor. Internship experience in established career-related positions in the hospitality industry.
- 5370. Advanced Food Systems Management (3:3:0).** Examination of current trends in food service operations and technology. Emphasis on the functional subsystems of procurement, production, service and delivery, and sanitation and maintenance.
- 5375. Operations Management for Service Industries (3:3:0).** Prerequisite: ISQS 5346 or consent of instructor. Integration of quantitative production, operations methods, and traditional qualitative management in both the unit and multi-unit service operations.
- 6000. Master's Thesis (V1-6).**
- 6330. Theoretical Developments in Hospitality (3:3:0).** Review and analysis of the history of the theoretical developments in the hospitality industry including a comparison with other disciplines.
- 7000. Research (V1-12).**

### Department of Human Development and Family Studies

Professor Dean Busby, Chairperson.

Professor Emeritus Riley; Professors Bell, Fischer, Haley, Hendrick, Peek, Scott, and K. Wampler; Associate Professors Caldera, Crawford, Fitzpatrick, Ivey, Munsch, Sorell, and R. Wampler; Assistant Professors Colwell, Feng, Harris, Hart, Kowalski, Lindsey, McCarty, Mulsow, Reifman, Stelle, and Weaver; Adjunct Faculty: Powell, Reid, Shapiro, and Shumway.

This department offers study in the following graduate degree programs: HUMAN DEVELOPMENT AND FAMILY STUDIES and MARRIAGE AND FAMILY THERAPY, *Master of Science* and *Doctor of Philosophy*. These programs have prepared students for careers as university faculty, full-time researchers, medical school faculty, human service providers, and marriage and family therapists.

The M.S. and Ph.D. programs in human development and family studies focus upon the development of the individual across the life span. Both degree programs offer flexibility in study that encourages students to pursue research in early childhood, adolescent development, adult development, and gerontology as well as in related substantive issues including risk-taking behaviors, gender issues, program planning and evaluation, addictions, marriage, parenting, family violence, divorce, and blended families. Graduate minors are also available in women's studies and adolescent and young adult risk-taking, interdisciplinary programs which are coordinated by graduate faculty within the department. The M.S. degree requires a minimum of 30 hours of graduate course work and 6 hours of thesis research. The Ph.D. degree requires a minimum of 73 hours of graduate course work—12 hours of which are leveling requirements—plus at least 12 hours of dissertation research. Up to 30 transfer hours may be applied toward doctoral program requirements upon the approval of the student's committee and the Graduate School.

The M.S. and Ph.D. degree programs in marriage and family therapy provide clinical and academic training to students who will function as marriage and family therapists at the highest level of clinical competence, and who will make unique contributions to the field of marriage and family therapy through research, teaching, clinical practice, and other professional activities. The M.S. degree is intended to provide the academic requirements leading to licensure as a Marriage and Family Therapist in the State of Texas. Actual licensure requires additional post-master's degree clinical experience. The Ph.D. degree requires a minimum of 42 hours beyond the master's degree plus a clinical internship and at least 12 hours of dissertation research. The Ph.D. program is accredited by the Commission on Accreditation for Marriage and Family Therapy Education of the American Association for Marriage and Family Therapy.

Applicants should contact the department concerning admission requirements, programs of study, and financial assistance. Admission to a graduate degree program requires the recommendation of the department and the Graduate School.

**Courses in Human Development and Family Studies. (HDFS)**

- 5101. Teaching College Human Development and Family Studies (1:0:1).** Strategies and direction in teaching college-level human development and family studies courses including supervision, advice and assistance, and review of teaching materials. May be repeated one time for credit. Pass-fail grading.
- 5302. Introduction to Gerontology (3:3:0).** A multidisciplinary introduction to aging and gerontological issues.
- 5310. Theories of Human Development (3:3:0).** Introduction to the application of concepts and theories in human development.
- 5311. Problems in Human Development and Family Studies (3:3:0).** May be repeated for credit.
- 5313. Psychosocial Development (3:3:0).** In-depth study of social, emotional, and psychological growth with emphasis on the development of personal and interpersonal competency.
- 5314. Infant Development (3:3:0).** Analysis of empirical research regarding development processes during the first two years of life.
- 5317. Adolescent Development (3:3:0).** Multidisciplinary survey of adolescent development including theories, research, and enhancement strategies.
- 5319. Development in Adulthood (3:3:0).** Survey of theory and research concerning psychosocial development during adulthood and review of strategies for research with adult populations.
- 5320. Interpersonal and Family Dynamics (3:3:0).** Group processes; factors influencing personal and family adjustment.
- 5321. Family Theory (3:3:0).** A comprehensive exploration of theory in family studies. The role of theory in empirical investigation; conceptual frameworks; strategies of theory building; examination of systems theory and a spectrum of other models useful in the interdisciplinary study of individual, couple, and family behavior.
- 5341. Socialization Processes and Addiction (3:3:0).** Multidisciplinary survey of socialization processes throughout the life span with implications for understanding addictions.
- 5344. Aging and the Family (3:3:0).** Detailed examination of the family relationships of adults in late life. Emphasis on intergenerational issues and the enhancement of development and family life in later years.
- 5351. Research Methods in Individual and Family Studies (3:3:0).** Study of research strategies and techniques relevant to human development, family studies, and marriage and family therapy including experience in conducting research investigations.
- 5352. Sex-Gender Roles (3:3:0).** Survey of contemporary theory and research on sex-gender systems and roles and the impact of sex and gender on psychosocial development and relationship processes.
- 5353. Issues and Research in Human Development and Family Studies (3:3:0).** History, philosophy, and current issues relevant to the areas of family studies and human development. May be repeated for credit under various topics.
- 5354. Analysis of Multiple Dependent Variables (3:3:0).** Prerequisite: Research methods or introductory statistics. Introduction to both theoretical and practical aspects of quantitative methods for multiple dependent variables in human development, family studies, and marriage and family therapy.
- 5361. Parent-Child and Peer Relationships (3:3:0).** Review of current research in parenting and peer relationships and implications for program development.
- 5380. Relationship Development (3:3:0).** Theory and research related to the formation of initial impressions of others and the development of interpersonal relationships.
- 5381. Individual and Family Measurement (3:3:0).** Detailed examination of measurement methods appropriate for individual and family research, consideration of strengths and weaknesses of each, and experience in development and application of measures.
- 6000. Master's Thesis (V1-6).**
- 6320. Seminar in Risk Taking (3:3:0).** Survey of theory and research in adolescent and adult risk-taking behaviors. Introductory course for graduate minor in risk taking.
- 6330. Family Problems (3:3:0).** Examines theoretical and empirical contributions to the understanding and treatment of family problems within a family systems perspective.
- 6370. Analyzing Developmental Data (3:3:0).** Prerequisite: Research methods, introductory statistics, or consent of instructor. Statistical methods for analyzing individual and family change over time and time ordered processes of interactional data.
- 6371. Practicum in Human Development and Family Studies (3:3:0).** Supervised experiences in professional positions. May be repeated for credit up to 9 hours.
- 6390. Program Development and Evaluation (3:3:0).** Reviews evaluation issues, critiques evaluation research, and undertakes planning and evaluation of original programs.
- 7000. Research (V1-12).**
- 8000. Doctor's Dissertation (V1-12).**

**Courses in Marriage and Family Therapy. (MFT)**

- 5300. Introduction to Marriage and Family Therapy Practice (3:0:3).** Prerequisite: Consent of instructor. Analyses of and solutions for common problems in marriage and family therapy practice.
- 5301. Family Therapy I (3:3:0).** Prerequisite: Consent of instructor. Examination of structural, strategic, and systemic approaches to family therapy including the work of Minuchin, Haley, Mental Research Institute, and Milan Associates.
- 5302. Family Therapy II (3:3:0).** Prerequisite: Consent of instructor. Examination of transgenerational and object relations approaches to family therapy including the work of Bowen, Boszormenyi-Nagy, Whitaker, and Satir.
- 5304. Systemic Evaluation in Couple and Family Therapy (3:3:0).** This course provides an in-depth examination of a systemic approach to clinical evaluations. Students receive training in administration and application of systemic assessment methods.
- 5322. Family Systems (3:3:0).** Application of general systems theory and cybernetics to family systems. Exploration of interactional patterns, information processing, family structure, family belief systems, and family life cycle transitions with an emphasis on change processes.
- 5370. Issues in Professional Development (3:3:0).** An examination of the major issues for professionals in marriage and family therapy. Emphasis on ethical standards, professional identity, and private practice issues.
- 6000. Master's Thesis (V1-6).**
- 6303. Family Therapy III (3:3:0).** Prerequisite: Consent of instructor. An examination of family influences on human sexual functioning, basic interactional assessment, and interventions for common sexual dysfunctions. Intervening in incestuous families and the role of addiction in sexual behavior.
- 6305. Developmental Issues in Therapy (3:3:0).** An examination and integration of human development topics within a systems framework.
- 6311. Contemporary Directions in Marriage and Family Therapy (3:3:0).** An examination of postmodern thought on marriage and family therapy with emphasis on the collaborative and narrative approaches.
- 6322. Family Systems II (3:3:0).** Advanced topics and issues in systems theory. Special focus on marriage and family therapy research.
- 6323. Qualitative Research Methods in Marriage and Family Therapy (3:3:0).** Focuses on qualitative research methodologies specifically related to marriage and family therapy research. Students will gain practical experience applying qualitative methods to their research with clinical populations and family therapy topics.
- 6342. Advanced Family Therapy Topics (3:3:0).** Prerequisite: Consent of instructor. Advanced topics in the field of family therapy that may include family therapy with special populations and recent developments in family therapy theory and application. May be repeated for credit.



- 6370. Diversity in Marriage and Family Therapy (3:3:0).** An examination of issues of race, ethnicity, and culture as they relate to family therapy. The course is designed to raise awareness and to train multiculturally competent therapists.
- 6395. Practicum in Marriage and Family Therapy (3).** Supervised experiences designed to prepare the student for involvement in marriage and family therapy and family life education. May be repeated for credit up to 48 hours.
- 6396. Supervision of Marriage and Family Therapy (3:3:0).** Prerequisite: Two years of marriage and family therapy practicum and consent of instructor. Theory, research, and supervised practicum in supervision of family therapy.
- 6397. Supervision Practicum in Marriage and Family Therapy (3:3:0).** Prerequisite: Completion of MFT 6396 or equivalent and consent of instructor. Course provides structured experience in supervision of marriage and family therapy students.
- 7000. Research (V1-12).**
- 7395. Internship in Marriage and Family Therapy (3).** Prerequisite: Permission of Director of Marriage and Family Therapy Program. Full-time supervised internship in an appropriate setting. May be repeated for up to 12 hours credit.
- 8000. Doctor's Dissertation (V1-12).**

## Department of Merchandising, Environmental Design, and Consumer Economics

Professor JoAnn L. Shroyer, Chairperson.

Rockwell Professor Horridge; Associate Professors Curry, Gustafson, Hampton, Harp, and Khan; Assistant Professors Amor, Bagwell, Bean, Hopkins, Joo, Russ, and Tombs; Adjunct Faculty: Barnhill, Ethridge, Hutton, Lupton, and Waldren.

This department offers study in the following graduate degree programs: ENVIRONMENTAL DESIGN, and FAMILY FINANCIAL PLANNING, *Master of Science*; ENVIRONMENTAL DESIGN AND CONSUMER ECONOMICS, *Doctor of Philosophy*.

The master's degree in environmental design requires a minimum of 45 semester hours including thesis. The master's degree in family financial planning requires a minimum of 42 hours, including thesis. Students are required to defend the thesis based on original research and to take a final oral examination. Appropriate leveling course work may be required. A nonthesis option is available in family financial planning. This option requires a minimum of 38 hours of course work. The program is certified by the Certified Financial Planner Board of Standards, INC. The marks "CFP" and "Certified Financial Planner" are the most respected professional designations in the financial services industry. The mark "CFP" identifies a person who has met the educational standards, passed the CFP Board of Standards examination, satisfied a work experience requirement, and agreed to the CFP Board of Standards Code of Ethics.

The doctor's degree requires a minimum of 75 semester hours of graduate work beyond the bachelor's degree, exclusive of credit for the dissertation. Students develop their courses of study in consultation with a graduate advisory committee. Leveling course work may be required. A preliminary examination is required of all students before the end of the second semester of work

toward the Ph.D. degree. The student's progress will be evaluated and recommendations will be made concerning continuation of graduate studies and leveling course work necessary to remove any deficiencies revealed by the examination. Following the completion of all course work, a qualifying examination for admission to candidacy for the Ph.D. degree will be conducted in accordance with the requirements of the Graduate School.

Admission into the master's and the doctor's programs requires submission of GRE scores and/or GMAT scores. Admission of international students requires submission of TOEFL scores. The master's programs require a minimum of 3.0 GPA on the last 60 hours of undergraduate course work. Acceptance into the doctoral programs requires a 3.2 GPA on the last 60 hours of undergraduate course work or 3.5 GPA at the master's level.

The department offers an optional 6-hour credit internship for students who have not previously had experience in family financial planning, environmental design, or consumer economics. Students should contact the associate chairperson for graduate programs for departmental procedures and guidelines.

### Courses in Clothing, Textiles, and Merchandising. (CT&M)

- 5301. Graduate Research Seminar (3:3:0).** Introduction to philosophies, technologies, and processes involved in research and graduate study related to the student's major area of specialization.
- 5303. Advanced Study in Historic Costume and Textiles (3:3:0).** In-depth study of costume or textile artifacts and design through the ages. May be repeated for credit up to 6 hours.
- 5306. Advanced Apparel Design and Production (3:3:0).** Prerequisite: FADS 2303 or consent of instructor. Advanced clothing design problems applied to mass-produced and custom apparel.
- 5307. Internship (3:1:6).** Supervised internship experiences in established career-related positions in the student's major area of specialization. May be repeated for credit up to 6 hours.
- 5310. Readings (3:3:0).** A comprehensive and critical review of literature and research data related to the student's major area of specialization.
- 5311. Individual Study in Clothing, Textiles, and Merchandising (3:3:0).** May be repeated for credit.
- 5365. Contemporary Merchandising Issues (3:3:0).** Definitive studies of current issues and problems that affect merchandising. Investigations into related influences from government, economics, technology, education, and society. May be repeated for credit up to 6 hours.
- 5378. Research Methods I (3:3:0).** Positivist, interpretive, and critical modes of research inquiry in the student's major area of specialization.
- 5381. Conservation of Historic Textiles and Clothing (3:3:0).** Prerequisite: Consent of instructor. Comprehensive study of preservation techniques employed for the conservation of textile and clothing artifacts—includes cleaning, repairing, storing, mounting, and displaying procedures.
- 5385. Case Studies (3:3:0).** Exploration of case study methodology to develop problem solving and decision making skills in the student's major area of specialization.
- 6000. Master's Thesis (V1-6).**
- 6378. Research Methods II (3:3:0).** Prerequisite: CT&M 5378 or equivalent and 3 credit hours of statistics. Application of statistical packages to analyze data and interpret results. Includes mainframe and micro applications.
- 7000. Research (V1-12).**
- 8000. Doctor's Dissertation (V1-12).**

### **Courses in Consumer Economics and Environmental Design. (CEED)**

- 5198. Advanced Professional Practices in Family Financial Planning (1:1:0).** Prerequisite: Completion or concurrent enrollment in CEED 5371 (enrollment precedes CEED 5307). Emphasis on the principles of professional practice focusing on ethics, effective managerial strategies, and the student's transition to the professional workplace.
- 5301. Graduate Research Seminar (3:3:0).** Introduction to philosophies, technologies, and processes involved in research and graduate study related to the student's major area of specialization.
- 5307. Internship (3:1:6).** Supervised internship experiences in established career-related positions in the student's major area of specialization. May be repeated for credit up to 6 hours.
- 5310. Readings (3:3:0).** A comprehensive and critical review of literature and research data related to current issues in the student's major area of specialization.
- 5311. Individual Study in Environmental Design and Consumer Economics (3:3:0).** May be repeated for credit.
- 5371. Advanced Family Financial Planning (3:3:0).** The study and use of methods to assist families of different socioeconomic groups in family financial planning decisions.
- 5372. Family Asset Management and Allocation (3:3:0).** Prerequisite: CEED 5371. Applications of family financial planning models to decision making and asset resource allocation.
- 5373. Professional Practice in Family Financial Planning (3:3:0).** Prerequisite: CEED 5371, 5377 or equivalent, CEED 5394, 5395, 5398, and ACCT 5311. Techniques and methods for practice development and operation in family financial planning.
- 5374. Family Economics (3:3:0).** Economic status of families at all income levels; factors influencing their standard of living; interrelationships with the economy.
- 5375. Current Consumer Issues (3:3:0).** Analysis of current consumer problems and decision-making responsibilities. Policies and programs for consumer protection and education. May be repeated for credit.
- 5376. Family and Personal Consumption Behavior (3:3:0).** Emphasis on factors involved in individual and family consumption. Concepts related to levels and standards of living and quality of life will be examined.
- 5377. Advanced Family Financial Counseling (3:3:0).** The study and use of methods to assist families of different socioeconomic groups in correcting family financial dysfunction.
- 5378. Research Methods I (3:3:0).** Positivist, interpretive, and critical modes of research inquiry in the student's major area of specialization.
- 5379. International Issues for Families and Households (3:3:0).** Analysis of relevant social, economic, and political developments pertinent to individuals and family welfare approached from a global perspective.
- 5381. Environmental Design Analysis (3:3:0).** Implications from the social sciences as applied to analyzing causes and arriving at possible solutions to problems related to housing and interiors in contemporary society.
- 5382. Interior Design Systems (3:3:0).** Study of systems used in the design of residential and nonresidential interiors.
- 5383. Housing Policy (3:3:0).** A survey of housing policies focusing on current issues, alternatives, and dilemmas concerning housing consumers.
- 5384. Advanced Lighting Systems (3:3:0).** Prerequisite: I D 3381 or equivalent. Advanced study and application of lighting systems.
- 5385. Case Studies (3:3:0).** Exploration of case study methodology to develop problem solving and decision making skills in the student's major area of specialization.
- 5388. Design of Interior Environments for Physically and Mentally Challenged Populations (3:3:0).** Adaptation and evaluation of proximate environments to meet the needs of the physically and mentally challenged.
- 5394. Advanced Family Retirement Planning (3:3:0).** Application of retirement planning models and programs to personal and financial aspects of retirement.
- 5395. Advanced Family Risk Management (3:3:0).** Application of risk management theory to family risk analysis and financial loss prevention throughout the family life cycle.
- 5398. Advanced Family Estate Planning (3:3:0).** Application of estate planning methodologies and policies to personal and family financial planning.
- 6000. Master's Thesis (V1-6).**
- 6330. Research Fund Development (3:3:0).** Exploration of processes for preparing research ideas for presentation to individuals, groups, and/or organizations. Study of research proposal characteristics, how proposals are reviewed, strategies for success, and public versus private funding sources.
- 6370. Environmental Design Technology and Development (3:3:0).** Examination of the social, economic, physical, and aesthetic dimensions of the family's near and far environments. Emphasis on systems theory and the management of family material resources.
- 6378. Research Methods II (3:3:0).** Prerequisite: CEED 5378 or equivalent and 3 credit hours of statistics. Application of statistical packages to analyze data and interpret results. Includes mainframe and micro applications.
- 7000. Research (V1-12).**
- 8000. Doctor's Dissertation (V1-12).**

## College of Visual and Performing Arts

*Professor Garry W. Owens, Dean*

Programs are available through the College of Visual and Performing Arts leading to the following degrees: ART EDUCATION, *Master of Art Education*; ART, *Master of Fine Arts*; MUSIC HISTORY AND LITERATURE, MUSIC THEORY, and PERFORMANCE, *Master of Music*; MUSIC EDUCATION, *Master of Music Education*; COMPOSITION, CONDUCTING, PERFORMANCE, and PIANO PEDAGOGY, *Doctor of Musical Arts*; THEATRE ARTS, *Master of Arts* and *Master of Fine Arts*; FINE ARTS, *Doctor of Philosophy* with majors in art, music, or theatre arts.

Admission to graduate programs in the College of Visual and Performing Arts is a two-step process with requirements established by both the Graduate School and the school or department in which the student plans to study. The student should note carefully any particular requirements for admission established by the school or department in which he or she plans to major and contact the graduate advisor of the unit for more detailed information.

### School of Art

Professor Terry Morrow, Interim Director.

Professors Dingus, Dixon, Fuentes, Gibbons, Kreneck, Morrow, and Waters-Watkins; Associate Professors Fehr, Glover, Granados, Keifer-Boyd, Lloyd, Martin, Reed, Slagle, Steele, Stinespring, Tate, and Tedeschi; Assistant Professors Check, Fluekiger, Germany, Rhodes-Cannings, and Ricco.

This school offers study in the following graduate degree programs: ART EDUCATION, *Master of Art Education*; ART, *Master of Fine Arts*; FINE ARTS, *Doctor of Philosophy* with a major in art. The school is an accredited institutional member of the National Association of Schools of Art and Design.

The mission of the School of Art is to provide a stimulating and challenging environment in which students develop creative and scholarly potential, to support faculty members in the pursuit of excellence in teaching and research, to serve and lead public and professional constituencies, and to facilitate intercultural understandings through art.

The Master of Art Education degree (M.A.E.) program is comprised of a minimum of 36 semester hours of graduate work including 12 semester hours of art education core courses, 9-12 semester hours of related art courses, 6-9 semester hours as a minor (taken outside the school), and 6 semester hours of thesis, professional project, or studio problem leading to an art exhibition. The M.A.E. Graduate Coordinator will evaluate applicants who have met the minimum entrance requirements of the Graduate School of Texas Tech University. The applicant for

the Master of Art Education degree may be asked to submit a portfolio and/or slides of his or her art and, if possible, examples of student art to the preview committee during a personal interview. On the basis of these requirements, the preview committee will make recommendations concerning the acceptance of students to the Master of Art Education degree program and will determine and prescribe any leveling work to be completed before or after acceptance.

The Master of Fine Arts degree (M.F.A.) is the recognized terminal degree in the practice of art. It is offered with a major in art and requires a minimum of 60 semester hours of graduate work.

Specialization is possible in the areas of ceramics, jewelry design and metalsmithing, painting, photography, printmaking, or sculpture. Drawing may be selected as a minor studio option or studio elective. Admission to the Master of Fine Arts program normally presumes that students hold a Bachelor of Fine Arts degree in studio art. A graduate preview committee, composed of three graduate faculty members in the school, will examine a portfolio of the student's work and hold a personal interview, if feasible, with each student who meets the minimum entrance requirements of the Graduate School. On the basis of these examinations, the preview committee will make recommendations concerning acceptance to the M.F.A. program and will determine and prescribe any leveling work to be completed before or after acceptance.

The program leading to the Doctor of Philosophy degree in Fine Arts is detailed in the "Opportunities for Interdisciplinary Study" section of this catalog. The major in the School of Art (the visual arts major) is designed to prepare broadly-trained teachers in art education and/or art history-criticism. The visual arts major includes preparation in the following: Focus in teaching survey art history and art appreciation and/or beginning and upper division art education classes at the university level; or a combination of art education or art history-criticism with museum science can be arranged. These combinations are best supported by available resources; however, in some instances, an individualized plan of study can be arranged. All individualized plans must be clearly defined prior to entry into the program.

For acceptance into the doctoral program, the applicant must have completed a master's degree, or its equivalent, with emphasis in some area of the visual arts. Every effort is made to select candidates who show strong scholarship and professional competence. Art doctoral faculty will evaluate each applicant's professional goals and any evidence of progress toward these goals. More specific qualifications will pertain to specific career directions. For further information on programs and admission requirements, contact the graduate coordinator, visual arts major, Interdisciplinary Fine Arts Program, School of Art.

For admission into this program, the graduate art education and art history-criticism faculty review the applicant's dossier; a personal interview is recommended. Faculty submit recommendations to a three-member preview committee, who upon approval, recommend the applicant to the Fine Arts Doctoral Committee for ac-



ceptance into the program. Acceptance is also contingent upon satisfaction of all Graduate School requirements for admission. After admission, a specific degree plan is determined. In part, this process entails a formal evaluation that clarifies students' goals and aims, and, if necessary, provides a basis for assigning leveling course work. Ordinarily, the formal evaluation scrutinizes materials presented with the application and is conducted at a meeting with the graduate faculty during a student's first semester of enrollment.

### Courses in Art. (ART)

- 5100. Advanced Art Unit (1).** Prerequisite: Instructor approval. Individual investigation in art. May be repeated for credit.
- 5101. Art Seminar (1:1:0).** Prerequisite: Instructor approval. Required of all graduate students admitted to the MFA program. Students must complete three seminars by graduation. Topics vary. Pass-fail grading.
- 5102. Teaching Studio Art in Higher Education (1:1:0).** Required seminar of all studio art teaching assistants. Provides methodology and practical teaching strategies unique to teaching studio art courses. Does not count toward minimum requirement for a graduate degree. Pass-fail grading.
- 5304. Advanced Studio: Two-Dimensional (3).** Prerequisite: Instructor approval. The development and execution of advanced two-dimensional studio problems. May be repeated for credit.
- 5305. Advanced Studio: Three-Dimensional (3).** Prerequisite: Instructor approval. The development and execution of advanced three-dimensional studio problems. May be repeated for credit.
- 5309. Theories of Contemporary Art (3:3:0).** Prerequisite: Instructor approval. Advanced survey of contemporary art theory and critical methods, with emphasis on the impact of the post-structuralist critique of representation.
- 5310. Historical and Critical Perspectives in the Visual Arts (3:3:0).** Historical and critical overview of the field including introduction to major theories and methodologies; study of particular artists, works, or movements that provide insight into specific creative techniques; basic media and techniques of the field; and interdisciplinary relationships with the other arts.
- 5311. Art of Classical Antiquity (3:3:0).** Prerequisite: Instructor approval. Examines architecture, painting, and sculpture of the Greek and Roman civilizations. May be repeated for credit with different emphasis.
- 5313. 18th and 19th Century Art (3:3:0).** Prerequisite: Instructor approval. Principal developments in 18th and 19th century painting, sculpture, and architecture. Emphasis on Europe and the United States. May be repeated for credit with different emphasis.
- 5314. The Visual Arts in Contemporary Context (3:3:0).** Contemporary issues in the field: current artistic trends, theory and criticism, organization (e.g., funding, administration), and cultural policy (e.g., education, assessment, multi-cultural issues, censorship).
- 5315. Arts of the Indian Americas (3:3:0).** Prerequisite: Instructor approval. Examines art, culture, and architecture of North, Central, or South American Indians. May be repeated for credit with different emphasis.
- 5316. Art Theory and Criticism (3:3:0).** Prerequisite: Instructor approval. Examination of art works from antiquity to the early twentieth century using a variety of traditional and current artistic theories, critical models, and methodologies.
- 5317. Renaissance and Baroque Art (3:3:0).** Prerequisite: Instructor approval. Examination focusing upon major developments in Renaissance or Baroque painting, sculpture, architecture, and art criticism. May be repeated for credit with different emphasis.
- 5319. 20th-Century Visual Art (3:3:0).** An examination of major developments in 20th-century painting, sculpture, graphic, and ceramic art. May be repeated for credit with different emphasis.
- 5320. Graduate Drawing (3:0:9).** Prerequisite: Instructor approval. The development and execution of advanced problems in drawing. May be repeated for credit.
- 5322. Graduate Painting (3:0:9).** Prerequisite: Instructor approval. The development and execution of advanced problems in painting. May be repeated for credit.
- 5326. Graduate Photography (3:0:9).** Prerequisite: Instructor approval. Experimental investigation into varied aspects of photography as creative media. May be repeated for credit.
- 5328. Graduate Printmaking (3:0:9).** Prerequisite: Instructor approval. The development and execution of advanced problems in printmaking. May be repeated for credit.
- 5330. Graduate Ceramics (3:0:9).** Prerequisite: Instructor approval. The development and execution of advanced problems in ceramics. May be repeated for credit.
- 5331. Ceramic Raw Materials (3:0:9).** Prerequisite: Graduate standing and one graduate course in ceramics or consent of instructor. A specialized area of ceramics with emphasis on chemistry and formulation of clay bodies and glazes. Outside assignments and exams.
- 5334. Graduate Metal and Jewelry Design (3:0:9).** Prerequisite: Instructor approval. The exploration of personal direction and execution of advanced problems and techniques in metalsmithing and jewelry design. Emphasis will vary. May be repeated for credit.
- 5338. Graduate Sculpture (3:0:9).** Prerequisite: Instructor approval. The development and execution of advanced problems in sculpture. May be repeated for credit.
- 5360. Seminar in Art Education (3:3:0).** Topics vary per course from faculty research to publication processes, ecology, technology, interpretation, and issues of power, privilege, and ideology. May be repeated for credit.
- 5361. Critical Pedagogy in the Visual Arts (3:3:3).** Corequisite: ART 5101. Introduction to curriculum materials and technology to develop awareness of and practice in innovative procedures for teaching visual arts disciplines.
- 5362. Historical Survey of the Teaching of Art (3:3:0).** Survey of the historic growth of art education in Europe and America.
- 5363. Research Methods in the Visual Arts (3:3:0).** Prerequisite: Instructor approval. A survey of research methods applicable to the visual arts. May be repeated for credit. Offered online.
- 5364. Feminist Research Methodologies in Visual Studies (3:3:0).** Prerequisite: WS 5310, equivalent, or pass entrance essay exam. This interdisciplinary course focuses on the vision and methods that feminist scholars use to study feminist issues within and across a range of traditional disciplines. (WS 5320)
- 5365. Apprenticeship in Teaching Art Methods to Elementary Education Majors (3:1:5).** Prerequisite: Instructor approval. Through observation and practical experience, graduate students are taught how to teach art methods to elementary education majors.
- 5366. Instructional Technology in the Visual Arts (3:3:0).** Research in critical theories and the cultural implications of visual arts instructional technology in schools, museums, and alternative sites.
- 5370. Survey of Two-Dimensional Studio Art (3).** Prerequisite: Instructor approval. A course wherein graduate students pursue a particular area of two-dimensional studio art at their own level. May be repeated for credit.
- 5371. Survey of Three-Dimensional Studio Art (3).** Prerequisite: Instructor approval. A course wherein graduate students pursue a particular area of three-dimensional art at their own level. May be repeated for credit.
- 6000. Master's Thesis (V1-6).**
- 6001. Master's Thesis: Professional Project (V1-6).** Prerequisite: ART 5363, 9 hours of degree program course work, and advisor approval. The professional project requires a written proposal, an oral defense of the proposal, a final written report, and an oral defense of the report. May be repeated 3 times for credit up to 6 hours.

**6002. Master's Thesis: Exhibition (V1-6).** Prerequisite: ART 5363, 9 hours of degree program course work, and advisor approval. A written proposal of an artistic problem leading to an exhibition which connects to teaching and culminates in a public lecture during the exhibition opening. May be repeated 3 times for credit up to 6 hours.

**6301. Master's Report (3).**

**7000. Research (V1-12).**

**8000. Doctor's Dissertation (V1-12).**

## School of Music

Professor Garry Owens, Director.

Horn Professors Gillas, van Appledorn, and Westney; Professors Barber, Bearden, Bogle, Brittin, Davis, Dickson, Henry, Hobbs, Meek, Shinn, and Stoune; Associate Professors Anderson, Arnold, Birdwell, Deahl, Dent, Dolter, Fried, Gilbert, Hughes, Lewis, Lucas, Paxton, Strieder, and Wilson; Assistant Professors Brumfield, Capuzzo, Dees, Ezerman, Garner, McNeil, Neumann, Rogers, Santa, Sharpe, Shea, Sifford, and Smith; Visiting Assistant Professor Elrod.

The school offers study in the following graduate degree programs: MUSIC HISTORY AND LITERATURE, MUSIC THEORY, and PERFORMANCE, *Master of Music*; MUSIC EDUCATION, *Master of Music Education*; COMPOSITION, CONDUCTING, PERFORMANCE, and PIANO PEDAGOGY, *Doctor of Musical Arts*; FINE ARTS, *Doctor of Philosophy* with a major in music.

The Master of Music degree consists of 30 hours of graduate work including recitals for the performance major or thesis for the music history and literature or music theory major. The Master of Music Education degree may be attained with a 30-hour program including a thesis or a 36-hour program without a thesis. For the performance or the accompanying-chamber music major, two public performances are required. Both performances must be judged satisfactory by the student's applied music faculty committee. The conducting student may present either two performances or one with a paper in support of the performance. A student whose recital is judged unsatisfactory will be permitted to present another recital program no earlier than four months from the date of the previous recital. The Master of Music degree in performance with a string pedagogy or a keyboard pedagogy specialization may be attained with a 36-hour program without thesis or recitals.

The music history specialization in the doctoral program requires one foreign language. Other specializations may or may not, depending upon the dissertation area. Except for the music history major (one foreign language), there is no foreign language requirement for the Master of Music degrees or for the Master of Music Education degree; however, vocal performance majors must demonstrate singing proficiency in French, German, and Italian.

All applicants for admission to graduate programs in music are required to submit scores for the Aptitude Test of the Graduate Record Examination. Students beginning a master's degree program take placement tests in music history and music theory, as well as in applied music if the major is performance or in music education if the major is music education. Texas Tech graduates with a

bachelor's degree in music or music education are required to take the placement examinations. All students beginning doctoral study must complete preliminary examinations. All placement and preliminary examinations are administered by the School of Music during the registration period of each semester. Deficiencies, if any, may be removed by appropriate leveling work. The prospective graduate student should also consult the section of this catalog entitled "Admission to the Graduate School."

The Doctor of Musical Arts degree is a 45 hour program oriented toward professional practice in music emphasizing the creation or performance of musical works and the application and transmission of knowledge about musical works. Specializations are in performance, conducting, composition, and piano pedagogy. A nondissertation program, the degree culminates in four doctoral performance projects which are designed to suit the professional interests and aspirations of the student. Of singular importance is the inclusion of 9 credit hours of fine arts courses drawn from visual arts, theatre, and aesthetics. Additional information may be obtained from the School of Music.

The music major in the Fine Arts doctoral program consists of a minimum of 60 semester hours including fine arts requirements and electives, an individualized music curriculum, and a dissertation. Specializations are in composition, music history, theory, conducting, music education, administration, performance, and pedagogy. See the section of this catalog entitled "Opportunities for Interdisciplinary Study—Fine Arts" for further description of the program. Additional information may be obtained from the School of Music.

### Courses in Music. (MUSI)

**5100. Teaching Music in College (1).**

**5310. Historical and Critical Perspectives in Music (3:3:0).**

Historical and critical overview of the field including introduction to major theories and methodologies, study of particular artists, works or movements that provide insight into specific creative techniques, basic media and techniques of the field; and interdisciplinary relationships with the other arts. Not for music majors.

**5314. Music in Contemporary Context (3:3:0).** Contemporary issues in the field including current artistic trends, theory and criticism, organization (e.g., funding, administration), and cultural policy (e.g., education, assessment, multicultural issues, censorship).

**5341. Introduction to Technology for Musicians (3:3:0).** Introduction to technological resources for all aspects of the musical experience, primarily from the standpoint of the Macintosh operating system. Topics covered include computer-assisted instruction, music printing, MIDI sequencing, digital sampling, HyperCard software development, and nonmusic topics such as word processing, graphics, multimedia, and electronic communication.

**5342. Advanced Technology for Musicians (3).** Prerequisite: MUSI 3341 or 5341 or consent of instructor. Intensive and extensive student-centered study topics to be selected from programming and software development in music, MIDI sequencing, multimedia development, advanced music notation, and digital sampling and synthesis.

**7000. Research (V1-12).**

**7301. Music Bibliography and Research (3).** Required of all doctoral students.

**8000. Doctor's Dissertation (V1-12).**

**8301, 8302, 8303, 8304. Doctoral Performance Projects I-IV (3 each).** Individual directed projects in music performance or composition.

### Courses in Applied Music. (MUAP)

Applied music instruction is offered in bassoon, clarinet, cornet or trumpet, double bass, euphonium, flute, guitar, harp, harpsichord, horn, oboe, organ, percussion, piano, saxophone, trombone, tuba, viola, violin, violoncello, and voice.

**5001. Applied Music (V1-4).**

**5101. Dimensions of Performance (1:1:1).** Prerequisite: Consent of instructor. An interactive course open to all performers. Expressive movement, group dynamics, and free improvisation are used to maximize the spontaneity, confidence, and creativity of performers. May be repeated for credit.

**5205. Jazz Improvisation (2).** Prerequisite: Consent of instructor. Study and application of techniques of improvisation in jazz performance. May be repeated for credit.

**5302. Applied Music Literature (3).** Prerequisite: The undergraduate music literature courses required on the B.M. or B.M.E. degree. Advanced study of literature for the various applied music areas. Individual research projects and class performance.

**5303. Pedagogy of Applied Music (3).** Advanced study in the pedagogy of applied instrumental or vocal masterworks from easy-moderate to difficult. Emphasis in the pedagogy of interpretation, technique, and memorization.

**5304. Techniques of String Education (3).** Study of the latest trends in individual and group string instruction. Laboratory observation and analysis.

**5305. String Methods and Etude Materials (3).** Advanced studies in the materials, methods, procedures, philosophies, and/or techniques of string pedagogy. Final demonstration project, research paper, and/or recital required.

**5306, 5307. Conducting Techniques and Analysis (3 each).** Structural analysis and study of conducting problems. Individual instruction course. Participation in a major ensemble required. May be repeated with consent of instructor.

**5313. Materials and Methods of Keyboard Instruction (3).** Investigation of elementary and intermediate levels of piano methods, repertoire, and pedagogical procedures.

**5314. Problems in Keyboard Pedagogy (3).** Advanced studies in the materials, methods, procedures, philosophies, and/or techniques of keyboard pedagogy. Final demonstration project, research paper, and/or recital required.

**5315. Techniques of Group Piano Instruction (3).** Materials, methods, and procedures for teaching class piano, with particular attention to managing electronic keyboard laboratories.

**6000. Thesis Recital (V1-6).**

### Courses in Music Composition. (MUCP)

**5307. Contemporary Techniques (3).** A study of current musical practices and the materials of new music, emphasizing the work of living composers. May be an individual study course.

**5308, 5309. Composition (3 each).** Prerequisite: MUCP 4402, MUTH 4303, or equivalent. Advanced writing for chamber ensembles, orchestra, band, chorus, or electronic media. May be individual study courses. May be repeated for credit.

**5312. Advanced Orchestration (3).** Scoring for large instrumental, choral, and dramatic ensembles. May be an individual study course.

### Courses in Music Education. (MUED)

**5211, 5212, 5213. Teaching Applied Music in the Public Schools I, II, III (2 each).** Techniques, materials, and procedures for class and individual instruction of applied areas in the public schools. I. Woodwinds; II. Brass; III. Percussion.

**5326. Instrumental Music Workshop (3:3:0).** Prerequisite: Departmental approval. Emphasis upon the organization and development of instrumental groups in the public schools, and upon development of performance excellence by these groups. May be repeated in a new section.

**5332. Learning and Music (3:3:0).** A study of aesthetic, sociological, and psychological foundations of music education applied to teaching. An emphasis is given to historical development and present day applications.

**5333. Tests, Measurements, and Evaluations in Music (3:3:0).** A study of general descriptive statistical measures as applied to music testing. Emphasis is placed upon existing music aptitude and achievement tests used in the discipline.

**5337. Workshop of Contemporary Trends in Elementary Music Education (3:3:0).** For graduates in elementary education and for specialists in music at the elementary level. Music activities for elementary school students stressing techniques and materials of current pedagogical approaches. Topics will vary. May be repeated for credit.

**5340. Introduction to Graduate Studies in Music Education (3:3:0).** A study of historical perspectives, basic concepts, and present research practices in music education.

**5344. Special Problems in Music Education (3).** Prerequisite: Consent of advisor. Investigation and execution of special problems in the field of music education. May be repeated with a new problem.

**6000. Master's Thesis (V1-6).**

### Courses in Music Ensemble. (MUEN)

**5101. Choir (1:0:5).**

**5102. Music Theatre (1:0:5).**

**5103. Band (1:0:5).**

**5104. Orchestra (1:0:5).**

**5105. Jazz Ensemble (1:0:5).**

**5106. Small Ensemble (1:0:1).**

**5107. New Music Ensemble (1:0:5).** The rehearsal and performance of twentieth-century music, with an emphasis upon the works of living composers. Audition required.

**5110. Medium Ensemble (1:0:2).**

### Courses in Music History and Literature. (MUHL)

**5311. Symphonic Literature (3:3:0).** Studies in the development of orchestral music from the Classic Period to the present.

**5312. Chamber Music Literature (3:3:0).** Studies in the development of chamber music from the Classic Period to the present.

**5313. Great Composer Seminar (3:3:0).** Critical examination of the works of a single composer, e.g., Bach, Haydn, Mozart, Beethoven, Wagner, Verdi, Brahms, or Stravinsky. A different composer will be studied each time the course is offered. May be repeated for credit.

**5330. Music in the United States (3:3:0).** A study of twentieth-century American music together with its historical and cultural background.

**5331, 5332, 5333, 5334, 5335, 5336, 5337. Seminar in the History and Literature of Music; Medieval (5331), Renaissance (5332), Baroque (5333), Classic Period (5334), Romantic Period (5335), Twentieth Century (5336), World Music (5337) (3:3:0 each).** May be repeated with consent of instructor.

**6000. Master's Thesis (V1-6).**

### Courses in Music Theory. (MUTH)

**5300. Studies in Harmony and Voice Leading (3).** Common-practice harmony, counterpoint, and figured bass. Prerequisite to enrollment in graduate music theory unless waived by placement or preliminary examination or by consent of the Division of Theory-Composition. Not intended to fulfill major or minor graduate degree requirements.

**5303, 5304. Styles (3:3:0 each).** A study of the development of harmonic, melodic, rhythmic, modal, and tonal practices from Gregorian Chant to the present.

**5306. Pedagogy of Theory (3).** A survey of the materials, organization, techniques, and problems of college freshman and sophomore theory courses.

**5310. Modal Counterpoint (3).** A study of sixteenth-century vocal counterpoint, beginning with the principles of melodic writing and concentrating on the analysis and synthesis of polyphonic textures, as found in the motet and the Mass.



- 5311. Tonal Counterpoint and Fugue (3).** The analysis and synthesis of eighteenth-century counterpoint in two to four voices, concentrating upon the instrumental style and techniques of the invention and the fugue.
- 5313. Dictation and Sight-Singing (3).** Studies in melodic, harmonic, and contrapuntal dictation, complemented by the sight-singing of equivalent materials. Prerequisite to enrollment in graduate music theory unless waived by placement or preliminary examination or by consent of the Division of Theory-Composition. Does not fulfill graduate degree requirements.
- 5314. Critical Approaches to Music Theory and Analysis (3).** An introduction to advanced studies in music theory and analysis through a survey of current philosophical orientations, methodologies, and techniques; relationship between theory, analysis, criticism, and performance.
- 5315. Analytical Techniques (3:3:0).** Topics will alternate between tonal music (Schenkerian analysis) and post-tonal music. May be repeated once for credit as the topic varies.
- 5320. Special Topics in Music Theory (3).** Topics include history of music theory, advanced analysis projects, and other topics as needed. Some topics offered on-line. May be repeated for credit on different topic.
- 6000. Master's Thesis (V1-6).**

## Department of Theatre and Dance

Associate Professor Fred Christoffel, Chairperson.  
Professor Emeritus Sorensen; Professors Bert and Willis-Aarnio; Associate Professor Marks; Assistant Professors Donahue, Homan, and Williams; Visiting Assistant Professors Merz and Stinespring.

This department offers study in the following graduate degree programs: THEATRE ARTS, *Master of Arts* and *Master of Fine Arts*; FINE ARTS, *Doctor of Philosophy* with a major in theatre arts.

The Master of Arts degree in theatre arts requires a minimum of 30 semester hours beyond the baccalaureate. Completion of the M.A. degree requires a thesis and a final examination.

The Master of Fine Arts degree is a terminal professional degree that provides for intensive specialization in acting and directing, design, playwriting, or arts administration. A minimum of 54 hours is required beyond the baccalaureate. Completion of the M.F.A. degree requires a thesis. In the case of acting-directing and design candidates, the thesis is based on a performance or production project accomplished during their program. In the case of playwriting candidates, the thesis is based on a script which is produced during their program.

The department participates with the faculties in art, music, and philosophy in an interdisciplinary program leading to the Ph.D. degree in Fine Arts, which is detailed in the "Opportunities for Interdisciplinary Study" section of this catalog. Doctoral students whose major area is theatre choose two of the following fields of concentration: Acting and directing; design; history, theory, and criticism; arts administration; and playwriting. Work towards the degree is both scholarly and practical, requires a minimum of 60 semester hours at the graduate level beyond the master's degree, includes a rigorous comprehensive examination, and culminates in a dissertation requirement that allows a choice of several avenues of research.

Applicants for the Ph.D. program with the major area of theatre must have completed a master's degree or its equivalent in theatre or a related field. Each applicant must meet minimum Graduate School requirements, be recommended by the department's faculty, and be approved by the Fine Arts Doctoral Committee.

For admission to any graduate program in theatre, the applicant must fulfill all requirements of the Graduate School as well as departmental requirements; for the latter contact the graduate advisor in the department. All incoming students must take a diagnostic examination, which is administered at the start of the fall term, and which provides a basis for faculty decisions about any leveling courses that may be required and credits that may be transferred. After this examination, a degree plan must be decided upon and filed; master's students must do so during the first term of work, and doctoral students before the end of the second term.

In keeping with the department's commitment to educate students practically as well as academically, all graduate students are expected to participate actively in the department's production program.

### Courses in Theatre Arts. (TH A)

- 5118. Rehearsal and Performance (1).** Credit for acting in University Theatre and Laboratory Theatre productions.
- 5301. Advanced Playwriting (3:3:0).** Advanced study in the theory and practice of playwriting. May be repeated for credit.
- 5303. Theatre Scene Design (3:0:9).** Advanced work in the process of designing for the stage. Includes work on models, sketches, renderings, and theatre drafting. May be repeated for credit.
- 5304. Theatre Lighting Design (3:0:9).** Advanced work in theatrical lighting design with an emphasis on the use of light as artistic expression. May be repeated for credit.
- 5305. Theatre Costume Design (3:0:9).** Advanced work in the total process of designing costumes for the stage through design projects for representative plays. May be repeated for credit.
- 5307, 5308. Advanced Practicum in Repertory Theatre I, II (3:0:9 each).** Prerequisite: An undergraduate major in theatre arts, or consent of instructor. Practical work in supervision of the organization, mounting, and presentation of plays in a repertory situation. May be repeated for credit.
- 5309. Seminar in Theatre History (3:3:0).** Prerequisite: An undergraduate major in theatre arts or consent of instructor. Consideration of the theatre of a specific historical epoch, or the comparative study of the theatre of several periods.
- 5310. Historical and Critical Perspectives in Theatre Arts (3:3:0).** Historical and critical overview of the field including introduction to major theories and methodologies; study of particular artists; works or movements that provide insight into specific creative techniques; basic media and techniques of the field; and interdisciplinary relationships with the other arts.
- 5311. Advanced Directing (3:2:3).** Prerequisite: Undergraduate directing course or consent of instructor. Study of procedures and techniques of directing. Enrollment in non-credit lab is required.
- 5312. Theatre Management (3:3:0).** Study of university, community, and professional theatre management with special attention to policy making, audience building, play selection, staff organization, budget preparation, and relationships with governmental and private agencies and foundations.
- 5313. Dramatic Criticism (3:3:0).** Principles of dramatic criticism from Aristotle to the present day.
- 5314. Theatre Arts in Contemporary Context (3:3:0).** Study of contemporary issues in the field: Current artistic trends,

theory and criticism, organization (e.g., funding, administration), and cultural policy (e.g., education, assessment, multicultural issues, censorship).

- 5316. Promotion in Theatre Arts (3:3:0).** An approach to the field of promotion with emphasis on application to theatre arts.
- 5317. Funding of Theatre Arts (3:3:0).** A seminar in locating and arranging funding for theatre organizations.
- 5318. Advocacy for the Performing Arts (3:3:0).** Study of the importance and impact of external environments on the formation, production, and funding of arts activities.
- 5320. Theatre Planning (3:3:0).** A study of the planning and design of theatre facilities.
- 5323. Problems in Lighting, Costuming, and Scenery (3:3:0).** Development of complete scenery, costume, and lighting designs for selected plays and theatre buildings from research to presentation.
- 5324. The Teaching of Acting (3:3:0).** Study of modern theories and practices of acting and actor training. Design of the acting course.
- 5325. Period Styles in Acting (3:3:3).** Prerequisite: TH A 5329. Scene study in various periods ranging from Ancient Greece through Medieval, Spanish Golden Age, Jacobean, Restoration, and beyond. Two labs at progressive skill levels.
- 5326. Seminar in Directing Methods (3:3:0).** A study of the methods of selected modern directors and directing theories.
- 5327. Special Problems in Directing (3).** Individual directing project on or off campus. Project must be approved by instructor before enrollment.
- 5328. Special Problems in Playwriting (3).** Prerequisite: TH A 5301. Advanced study in developing, writing, and revising play scripts. May be repeated for credit.
- 5329. Advanced Scene Study (3:3:3).** Scene study in realist and contemporary acting styles. Various approaches to acting in

20th century drama. Required of all first-year acting and directing MFA students.

- 5331. Studies in Contemporary Theatre (3:3:0).** A seminar in contemporary theatre theories and practices.
- 5333. Studies in the Production of Pre-Modern Drama (3:3:0).** A study of the problems of producing classical, Elizabethan, French neo-classic, Restoration, and eighteenth-century drama for present-day audiences.
- 5334. Topics in Acting (3:3:3).** In-depth workshop in specific acting styles, genres, national and ethnic theatres, and techniques or training.
- 5335. Dramatic Analysis (3:3:0).** Study of dramatic structures and script analysis methods as a preparation for writing, directing, designing, performing, and criticizing plays.
- 5341. Seminar in Dramatic Theory (3:3:0).** Prerequisite: An undergraduate major in theatre arts or consent of instructor. The consideration of a specific theoretical approach to the theatre or the comparative study of several theoretical approaches. Repeatable for credit.
- 5343. Seminar in Voice and Movement (3:3:3).** Intensive training in specific voice and movement techniques and methodologies culminating in a studio performance of improvisations, montages, and solo performances.
- 5350. Seminar in Theatre Research Methods (3:3:0).** Examination of research and critical processes in dramatic history, theory, and performance or production through current philosophical orientations, methodologies, and techniques. Required of all graduate students.
- 6000. Master's Thesis (V1-6).**
- 6001. Internship (V1-6).** Prerequisite: Consent of instructor. Service assignment in an arts organization for students in the graduate theatre and dance program. May be repeated for credit.
- 7000. Research (V1-12).**
- 8000. Doctor's Dissertation (V1-12).**



## Texas Tech University Health Sciences Center

Texas Tech University Health Sciences Center cooperates with Texas Tech University to offer graduate programs in selected areas related to the health sciences. The Texas Tech University Health Sciences Center graduate programs are administered through the Graduate School of Biomedical Sciences, the School of Nursing, and the School of Allied Health.

Programs are currently offered at the master's and doctor's level in the basic sciences within the Graduate School of Biomedical Sciences. A master's level program in nursing is offered by the School of Nursing. The School of Allied Health offers master's level studies in athletic training, occupational therapy, physical therapy, physician assistant studies, speech-language pathology, and vocational rehabilitation, as well as a doctorate in audiology. The School of Nursing also collaborates with the School of Nursing at the University of Texas Health Sciences Center-San Antonio to offer a Ph.D. in Nursing.

Prospective students and others interested in services for students with disabilities should make specific inquiries to the coordinator of graduate programs listed below. Qualified graduate students are considered for admission without regard to race, color, religion, sex national origin, or disability.

Further information about graduate programs in the Health Sciences Center may be obtained as follows:

### *for Graduate School of Biomedical Sciences*

Graduate School of Biomedical Sciences  
2B 106 HSC  
Texas Tech University Health Sciences Center  
Lubbock, Texas 79430  
(806) 743-2556  
email: acagsbs@ttuhsc.edu

### *for Nursing*

Office of Student Affairs  
School of Nursing, 3BC 100 HSC  
Texas Tech University Health Sciences Center  
Lubbock, Texas 79430  
(806) 743-2737

### *for Allied Health*

Office of Admissions and Student Affairs  
School of Allied Health, 2B 194 HSC  
Texas Tech University Health Sciences Center  
Lubbock, Texas 79430  
(806) 743-3220

## Graduate School of Biomedical Sciences

Development of a strong program of graduate education in the basic biomedical and related health sciences is one of the responsibilities and goals of the Texas Tech University Health Sciences Center. Present-day medicine cannot exist outside the academic framework and intellectual discipline which the biological, chemical, and medical sciences provide. Graduate training in these areas, an integral component of the overall program of the

Health Sciences Center, is provided by the Graduate School of Biomedical Sciences.

Opportunities are offered for study and research leading to the *Master of Science* degree in HEALTH SERVICES RESEARCH and BIOTECHNOLOGY and the *Master of Science* and *Doctor of Philosophy* degrees in CELL AND MOLECULAR BIOLOGY, MEDICAL BIOCHEMISTRY, MEDICAL MICROBIOLOGY, PHARMACEUTICAL SCIENCES, PHARMACOLOGY, and PHYSIOLOGY. Individual program descriptions can be found within the specific department or program sections in this catalog.

Students interested in pursuing a career in academic medicine as a physician-scientist may apply simultaneously to the School of Medicine and the Graduate School of Biomedical Sciences. The M.D.-Ph.D. program permits a student to complete the requirements of both the degrees in one of the approved graduate programs. M.D.-Ph.D. students will receive a stipend throughout the graduate portion of the program, tuition scholarships for both the medical and graduate portions of the program, and health insurance for the duration of the stipend. This program is designed to be completed in six to seven years and will provide the student with rigorous training in both clinical medicine and biomedical research. Students interested in this program should so indicate on the application forms they simultaneously submit to both the TTUHSC School of Medicine and the Graduate School of Biomedical Sciences.

The graduate courses listed in this section are available, with the consent of the course instructor and the Associate Dean of the Graduate School of Biomedical Sciences, to graduate students at Texas Tech University or other qualified applicants as a graduate interdisciplinary student (GIDS). Applications must be made to the Graduate School of Biomedical Sciences, the application fee (\$30 for U.S. citizens and \$55 for international students) paid, and registration accomplished at TTUHSC. Currently enrolled TTUHSC and TTU students are exempt from the fee.

Further information about graduate programs offered through the Health Sciences Center Graduate School of Biomedical Sciences may be obtained by contacting the Graduate School of Biomedical Sciences, Texas Tech University Health Sciences Center, Lubbock, Texas 79430, (806) 743-2556, 1-800-528-5391, FAX (806) 743-2656, or e-mail <acagsbs@ttuhsc.edu>. Access our website: <<http://www.ttuhsc.edu/pages/grad/default.htm>> for more information, to apply online, or download the application.

Programs are subject to change, depending on availability of resources and educational goals.

### Courses in Graduate School of Biomedical Sciences. (GSBS)

**5101. Responsible Conduct of Research (1:1:0)** This course will address the regulatory and ethical environment of today's biomedical research using lectures and case discussions. Course is required for all students.



## Department of Cell Biology and Biochemistry

Professor Harry M. Weitlauf, Chairperson.

Professors Chilton, Everse, Faust, Hutson, Morrow, Norman, Phillips, Reid, and Stocco; Associate Professors Beale, Coates, Cornwall, Khan, Lee, Little, Pelley, Pence, Sridhara, Welsh, Whelly, Williams, and Wright; Assistant Professors Coué, Hardy, MacDonald, Pfarr, Ravnik, Schneider, and Webster.

This department offers study in the following graduate degree programs: CELL AND MOLECULAR BIOLOGY and MEDICAL BIOCHEMISTRY, *Master of Science* and *Doctor of Philosophy*.

### Cell and Molecular Biology

The purpose of the Ph.D. program is to prepare students for careers in cellular, developmental, and molecular biology. Employment opportunities for graduates of this program include traditional university professorships, positions in the biotechnology industry, and governmental appointments. The curriculum centers around four courses: Cell Function and Regulation, Mechanisms of Cellular Differentiation, Cell Cycle, and Medical Biochemistry. During the first year of study, the student will progress through a minimum of three laboratory rotations in order to determine his or her research interest. Dissertation topics can be pursued in the following areas: Regulation of gene expression, RNA processing, the role of transcription factors in cellular transformation and differentiation, cell cycle, molecular basis of intercellular communication, control of microtubular function, central nervous system regulation of fertility in primates, embryo implantation, molecular mechanisms of epididymal sperm function, proliferation and differentiation of gonadal cells, molecular basis of gamete interactions, molecular regulation of ovarian development and function, and development and regeneration of the nervous system.

The Master of Science program in Cell and Molecular Biology offers 2 instructional tracks. The research track is designed for students who need extra preparation for the Ph.D. program or whose career track is geared toward technical or staff level positions in industry or universities. Students undertake study and research in similar areas as that of the Ph.D. program. The education-medical track is designed for students whose eventual goal is towards a teaching career in the anatomical sciences or for those students who desire to improve their academic credentials in preparation for medical school. Students in the education-medical track will take courses in the anatomical sciences and in modern instructional methods and design, and will participate in the teaching mission of the medical school as teaching assistants.

Students with undergraduate degrees in biology and chemistry are well suited for this program. Please contact Dr. James Hutson (806) 743-2712 or Pam Roddy (806) 743-2701 for more information concerning admission to this program.

### Courses in Cell and Molecular Biology. (GANM)

**5112, 5212, 5312. Laboratory Methods (1:0:2; 2:0:4; 3:0:6).**

Taken as (1) a hands-on introduction to the laboratories in which a student may wish to do dissertation research or (2) after a student is well established in his or her dissertation research, additional rotations can be done to gain expertise in techniques applicable to the student's research but not available in the faculty advisor's laboratory. Requires permission of the faculty member. May be repeated if different methods are covered for each registration.

**5113, 5213, 5313. Selected Topics in Cell and Developmental Biology (1:1:0; 2:2:0; 3:3:0).** Topics vary from semester to semester and reflect the research interests of the faculty. Recent offerings have included oncogenes and molecular biology of hormone action. May be repeated provided that different topics are covered for each registration.

**5302. The Cell Cycle (3:3:0).** Prerequisite: Consent of instructor. Examination of DNA replication and repair, meiosis and recombination, and mitosis and the genetics of cell cycle control.

**5310. Histology (3:2:4).** Correlation of the structural organization with functional specializations of human tissues and organs; clinical correlations are also an integral part. Since this is the histology course offered in the first-year medical curriculum, departmental approval prior to registration is required.

**\*5321. Advanced Gross Anatomy (3:0:3).** An in-depth gross anatomical study devoted to one of the following areas of emphasis: topographical anatomy, head and neck, thorax and abdomen, pelvis and perineum, extremities and back, depending on the student's needs. The course may be repeated for credit if another area of emphasis is selected.

**5406. Mechanisms of Cellular Differentiation (6:6:0).** Prerequisite: Consent of instructor. Topics include the determination of cell fate in invertebrates and vertebrates, lineage versus environmental controls, multipotential stem cells, and the regulation of cell type-specific gene expression.

**5409. Biology of Reproduction (4:4:1).** The various aspects of biological reproduction with an emphasis on human problems. The reproductive process will be taught from union of the gametes to the delivered fetus. Morphology will be stressed.

**\*5611. Gross Anatomy (6:2:10).** A highly integrated introductory course of anatomical study (including human prosection) which embodies the gross morphology of the body and coordinates it with the clinical, developmental, and microscopic aspects of the human body.

**6000. Master's Thesis (V1-6).**

**6704. Cell Function and Regulation (7:7:0).** Topics include structure and function of membranes and organelles, mechanisms of transcription and translation, and regulation of cellular processes including both endocrine and nonendocrine aspects. (GBCH 6704, GPHY 6704)

**7000. Research (V1-12).**

**\*7101. Seminar (1:1:0).** The student will attend and participate in departmental seminars.

**8000. Doctoral Dissertation (V1-12).**

### Medical Biochemistry

The Medical Biochemistry program is designed to prepare students for research and teaching careers in biochemistry and molecular biology as related to the medical and life sciences. Admission to the program requires prior course work in mathematics, general physics, organic chemistry, analytical chemistry, and biological science. Students with deficiencies in any of these areas may be conditionally admitted pending successful completion of leveling courses prescribed by the department. Students are required to take GBCH 5921, 6522, 6533, and 6704 or their equivalents as determined by the department. In addition, students are urged to take or to have successfully completed courses in physical chemis-

try, statistics, and computer programming. GBCH 5921 is open only to students requiring this course as a part of a regular graduate degree program, and enrollment requires the permission of both the department chairperson and the Dean for Graduate School of Biomedical Sciences.

Generally within 12 months after enrolling in the program, each student will take a preliminary examination in general biochemistry. After a major portion of the required course work has been completed, the student must pass a qualifying examination that consists of two parts: a written portion in the form of an original research proposition designed to demonstrate the student's comprehension of some field of study related to biochemistry, ability to develop hypotheses, and competence in the design and conduct of promising and significant experiments; and an oral portion in which the student is expected to defend the proposition and demonstrate an understanding of the fundamental concepts and principles of biochemistry that relate to the proposition.

During the first year in the program, students will rotate through at least three different laboratories to broaden their education and research experience and to help them identify a field of specialization for their dissertation research. Major areas of current research include studies of the regulation of gene expression in a variety of eukaryotic tissues, biochemistry of development, mechanisms of hormone action, biochemistry of neoplasia, genetics of somatic cells in culture, biochemistry of membranes, mechanisms of enzyme action, and recombinant DNA.

Information covering specific requirements for degree programs is contained in the departmental *Graduate Student Handbook*. For more information, contact Dr. Charles Faust, the medical biochemistry program advisor, at (806) 743-2031.

### Courses in Medical Biochemistry. (GBCH)

- 5621. General Biochemistry (6:6:0).** Human life processes at the molecular level with emphasis on biochemical homeostasis and control mechanisms.
- 5921. Medical Biochemistry (9:9:0).** Prerequisite: CHEM 3305, 3306 or equivalent. Human life processes at the molecular level with emphasis on biochemical homeostasis and control mechanisms. These principles are examined through clinical correlations.
- 6000. Master's Thesis (V1-6).**
- 6101. Biochemistry Conference (1:1:0).** Informal conferences between faculty and students considering topics of current interest in biochemistry not normally included in other courses. Literature search, evaluation, organization, writing, and oral presentation by the student are emphasized. Different topic each semester. May be repeated for credit.
- 6121. History of Biochemistry (1:1:0).** Highlights in the advancement of biochemical knowledge will be discussed.
- 6127. Seminar in Cell Biology (1:1:0).** Prerequisite: Consent of instructor. May be repeated. Presentation of current research topics in the genetics and molecular biology of eukaryotic cells, and related areas: oncogenesis, differentiation, aging.
- 6135, 6235, 6335, 6535. Topics in Biochemistry (1:1:0; 2:2:0; 3:3:0; 5:5:0).** Prerequisite: Consent of instructor. Lectures in specific areas of biochemistry not normally included in other courses. May be repeated for credit with change of content.

- 6221. Human Intermediary Metabolism and Its Regulation (2:2:0).** Prerequisite: GBCH 5921, CHEM 4303, 4306, 4307, or equivalent. Consideration of normal and abnormal human intermediary metabolism with major emphasis on biosynthetic and catabolic pathways and on modulation and control.
- 6222. Medical Biochemistry Problem Solving (1:1:0).** Concurrent course to GBCH 5921 to help students develop problem solving skills. Discussion of solutions to assigned problems with topics correlated to lectures in GBCH 5921.
- 6320. Clinical Biochemistry (3:3:0).** Prerequisite: GBCH 5921, CHEM 4303, 4306, 4307, or equivalent. A study of clinical chemistry with emphasis on the interpretation of clinical laboratory data and concepts of laboratory-assisted diagnosis of human disease.
- 6426. Advanced Human Genetics (4:4:0).** Prerequisite: A course in genetics and consent of instructor. Detailed consideration of population genetics, cytogenetics, molecular biology, and biochemistry as related to human heredity. Includes one hour discussion of papers from current literature.
- 6522. Molecular Biology of Eukaryotes: Nucleic Acids (5:5:0).** Prerequisite: GBCH 5921 or equivalent and consent of instructor. An in-depth study of nucleic acid biosynthesis and gene expression and its control in eukaryotes, as well as the study and application of the principles of genetic engineering to nucleic acid structure and molecular biology.
- 6533. Molecular Biology of Eukaryotes: Proteins (5:5:0).** Prerequisite: GBCH 5921 or equivalent and consent of instructor. An in-depth description of the process of protein biosynthesis, degradation and regulation in eukaryotes, as well as the study of physico-chemical methods used to characterize proteins and their molecular structure.
- 6704. Cell Function and Regulation (7:7:0).** Topics include structure and function of membranes and organelles, mechanisms of transcription and translation, and regulation of cellular processes including both the endocrine and nonendocrine aspects. (GANM 6704, GPHY 6704)
- 7000. Research (V1-12).**
- 7101. Biochemistry Seminar (1:1:0).**
- 8000. Doctor's Dissertation (V1-12).**
- 9000. Postdoctoral Research (V1-12).**

### Biotechnology Master of Science Biomedical Track

Although this program is listed among degrees offered by the Department of Cell Biology and Biochemistry, it is an interdisciplinary degree supported by all basic science departments in the Health Sciences Center. The Texas Tech University general academic campus administers a complimentary track in General Science-Agricultural Biotechnology.

The biomedical track is a 21-month curriculum consisting of two terms (nine months) of course work and 12 months of full-time laboratory research. It is typically a nonthesis degree with an optional thesis at the end of the second year by arrangement with the advisor. The research component may be completed either at the HSC campus or at a biotechnology industry laboratory. Students who choose to do their research at the HSC campus will work with a member of the biotechnology graduate faculty. All biotechnology graduate faculty have active research programs that emphasize use of molecular biology methods.

Prerequisites for the program include a bachelor's degree in science with at least one semester of organic chemistry. Please contact Dr. Daniel Hardy (806) 743-2053 for more information regarding admission to the program.

### Courses in Biotechnology. (GBTC)

- 5338. Biochemical Methods (3:1:6).** Provides integrated approach to modern biochemical techniques. Present methods used to manipulate a gene, purify and characterize the enzymatic properties of the encoded protein.
- 6000. Master's Thesis (V1-6).**
- 6101. Biotechnology Seminar (1:1:0).**
- 6301. Introduction to Biotechnology (3:3:0).** Broad coverage of topics with high current interest and utility to the medical and agricultural biotechnology industries. Emphasizes application of technologies.
- 7000. Research (V1-12).**

## Department of Health Services Research and Management

Professor James Rohrer, Chairperson.

Associate Professor Rohland; Assistant Professors Arif, Borders, and Xu.

This department offers study in the following graduate degree program: HEALTH SERVICES RESEARCH, *Master of Science*. The M.S. degree in health services research and management (HSR) will take advantage of the specialized training of faculty in the department. Health services research and management can be defined as the study of access, quality, and cost in health care and it requires both a multidisciplinary approach and knowledge of the HSR literature. Our students will study the behavior of consumers and the behavior of health care providers as they seek to respond to consumer needs and the performance of the health care system. We draw careful distinction between any particular discipline and the interdisciplinary field of health services research. For more information contact Dr. James Rohrer at (806) 743-3013.

### Courses in Health Services Research. (GHSR)

- 5111. Topics in Health Services Research (1:1:0).** Special topics in health services research that are not normally included in other classes. May be repeated for credit with change in content.
- 5211. Topics in Health Services Research (2:2:0).** Special topics in health services research that are not normally included in other classes. May be repeated for credit with change in content.
- 5301. Introduction to Health Care Organization (3:3:0).** Provides an overview of the health care system in its economic, sociological, epidemiological, policy, and behavioral aspects.
- 5302. Health Services Epidemiology (3:3:0).** Provides an overview of how epidemiological methods, particularly population-based surveys, can be applied to study the determinants and outcomes of health services use.
- 5303. Health Economics Research (3:3:0).** Applies economic theory and methods to the study of health services.
- 5304. Mental Health Administration and Services Research (3:3:0).** Applies principles and methods of psychiatric epidemiology to mental health services research.
- 5305. Field Study in HSR (3:3:0).** Supervised involvement in HSR projects.
- 5306. Health Planning and Services Research (3:3:0).** Applies the methods and findings of utilization research to planning and evaluation of health care programs.
- 5307. Directed Readings in Health Services Research (3:3:0).** Readings and term paper relating to a specialized topic in health services research.

- 5308. Introduction to Community Health Care Systems (3:3:0).** Provides an overview of assessment of community health needs and types of care systems available to meet community needs.
- 5309. Data Management (3:3:0).** Prerequisite: Introductory statistics. The learning objectives are to manage data, conduct statistical analysis, and report scientific findings using industry standard and research oriented computer software.
- 5311. Topics in Health Services Research (3:3:0).** Special topics in health services research that are not normally included in other classes. May be repeated for credit with change in content.
- 5312. Introduction to Statistical Methods in Public Health (3:3:0).** This course is designed for students whose future work will require extensive data analysis in research problems of public health and the biological sciences.
- 5313. Statistical Methods in Epidemiology (3:3:0).** This course will provide the foundation skills for basic epidemiological concepts and statistical methods used in an analysis of epidemiological data.
- 6000. Master's Thesis (V1-6).**
- 6308. Teaching Practicum (3:3:0).** Development of teaching skills by working with an instructor on preparation and delivery of a course in HSR.
- 6312. Advanced Survey Methods for Services Research (3:1:2).** A lecture and laboratory course designed to provide an overview of design, implementation, and analysis of surveys in health services research under direct guidance of a faculty member.
- 6313. Advanced Secondary Data Analysis for Health Services Research (3:1:2).** A lecture and laboratory course designed to provide an overview of secondary data analysis in health services research under direct guidance of a faculty member.
- 7000. Health Services Research (V1-12).**
- 7101. Health Services Research Seminar (1:1:0).**

## Department of Microbiology and Immunology

Professor Ronald C. Kennedy, Chairperson.

Professors Chaffin, Fralick, Griswold, Pence, Rolfe, San Francisco, and Straus; Associate Professors Hamood, Siddiqui, Warner, and Wright; Assistant Professors Reilly and Schneider.

This department offers study in the following graduate degree programs: MEDICAL MICROBIOLOGY, *Master of Science* and *Doctor of Philosophy*. The course work and information presented below describe those aspects of the programs of particular interest to students choosing to study and conduct research in the areas of medical microbiology which are traditionally found in a medical center.

Students seeking information concerning admission to the graduate program in medical microbiology, training and research opportunities, or teaching and research assistantships in the Department of Microbiology and Immunology should contact the chairperson of the department. For further information, see our website at <[www.ttuhsu.edu/pages/micro/home.htm](http://www.ttuhsu.edu/pages/micro/home.htm)>.

### Courses in Microbiology. (GMIB)

- 5181, 5281, 5381. Selected Topics in Microbiology (1:1:0; 2:2:0; 3:3:0).** Prerequisite: Consent of instructor. Specific areas in microbiology and immunology or related research not normally included in other sources. May be repeated for credit.



- 5399. Introduction to Microbiological Research (3:0:3).** Beginning students. Exposure to experimental design, research methodology and data analysis in the laboratories of three faculty members.
- 6000. Master's Thesis (V1-6).**
- 6201. Medical Parasitology (2:1:1).** An overview of important protozoan helminth and arthropod infections and vectors of disease.
- 6237. Medical Mycology for Graduate Students (2:2:0).** Prerequisite: Medical or pathogenic microbiology or consent of instructor. A study of the biology of pathogenic fungi and human mycoses.
- 6323. Genetics and Molecular Biology of Prokaryotes (3:3:0).** Prerequisite: Biochemistry and general microbiology. Current concepts on the molecular biology and genetics of prokaryotes with emphasis on regulation of gene expression.
- 6324. The Molecular Biology of Pathogenic Bacteria (3:3:0).** Prerequisite: Medical microbiology, biochemistry. Lectures and discussions concerning the molecular analysis of mechanisms by which pathogenic bacteria produce infections. The regulation and expression of virulence factors are emphasized.
- 6325. The Biology of Animal Viruses (3:3:0).** Prerequisite: General biochemistry and general microbiology. Emphasis will be placed on DNA and RNA tumor viruses, tumor suppressor genes and human immunodeficiency virus.
- 6329. Advances in Immunology (3:3:0).** Prerequisite: GMIB 6931 or consent of instructor. A discussion of current knowledge of the immune system with emphasis on molecular and cellular interactions.
- 6335. The Pathogenesis of Infectious Disease (3:3:0).** Prerequisite: Medical or pathogenic microbiology or consent of the instructor. A study of the processes by which microorganisms produce disease in humans and how the host responds.
- 6931. Medical Microbiology (9:8:1).** A study of bacteria, fungi, parasites, and viruses and how they function to produce diseases in humans. The response of the body to invasion by these microorganisms is also discussed.
- 7000. Research (V1-12).**
- 7101. Microbiology Seminar (1:1:0).**
- 8000. Doctor's Dissertation (V1-12).**

## Department of Pharmaceutical Sciences

Professor Quentin R. Smith, Chairperson.

Professors Khan, Mehvar, and Shah; Associate Professors Bickel, Siddiqui, Thekkumkara, Weis, and Wright; Assistant Professors Abbruscato, Ahsan, Allen, Bouma, Fisher, Lindsey, Roder, Stoll, Weidanz, and Youan.

This department offers study in the following graduate degree programs: PHARMACEUTICAL SCIENCES, *Master of Science* and *Doctor of Philosophy* in the Texas Tech School of Pharmacy at Amarillo. Pharmaceutical sciences encompass all those areas of pharmacy research that pertain to drug design, delivery, formulations, and therapeutics. The faculty members of the department exhibit research interests and expertise in drug design and delivery, pharmacology, pharmaceuticals (including formulations and industrial pharmacy), pharmacokinetics, drug receptor modeling, molecular and reproductive biology, biochemistry, pathophysiology, immunology and cancer therapy, toxicology, and pharmacy administration. The graduate program in pharmaceutical sciences is designed to train students for careers in pharmaceutical industry, academia, and federal agencies including the FDA. Admissions requirements include a degree in phar-

macy, chemistry, biology, or related areas and a TOEFL score of at least 550 (written) or 213 (electronic) for international students. Teaching and research assistantships are awarded on a competitive basis. The departmental courses are listed below. Additional required and elective courses have been arranged through the Departments of Chemistry and Biochemistry, Geology, and Mathematics and Statistics of Texas Tech University, and through the Departments of Physiology and Pharmacology of Texas Tech University Health Sciences Center. For more information contact Dr. Mansoor A. Khan, Director of Graduate Programs, (806) 356-4000 ext. 285.

### Courses in Pharmaceutical Sciences. (GPSC)

- 5101. Topics in Pharmacology (1:1:0).** Special topics in pharmaceutical sciences that are not normally included in other courses. May be repeated for credit with change in content.
- 5201. Topics in Pharmacology (2:2:0).** Special topics in pharmaceutical sciences that are not normally included in other courses. May be repeated for credit with change in content.
- 5301. Topics in Pharmacology (3:3:0).** Special topics in pharmaceutical sciences that are not normally included in other courses. May be repeated for credit with change in content.
- 5304. Principles of Drug Action (3:3:0).** Principles that govern drug action within the body (pharmacodynamics) as well as drug absorption, distribution, metabolism, and excretion (pharmacokinetics).
- 5307. Pharmaceutical Sciences Research Methods (3:3:3).** A lecture and laboratory course designed to provide an overview of current research methods in pharmaceutical sciences under direct guidance of a faculty member.
- 5310. Drug Design and Discovery (3:3:0).** Prerequisite: GPSC 5304. Overview of the new methods for quantitative SAR, computer-aided drug design, mass screening, and combinatorial chemistry.
- 5320. Drug Metabolism (3:3:0).** Analysis of the primary metabolic enzymatic systems that are involved in the clearance of drugs from the body and the mechanisms that regulate their activity.
- 5330. Pharmacokinetics (3:3:0).** A quantitative treatment at the graduate level of the dynamics of drug disposition in the body and the rational design of drug dosage regimens.
- 5340. Molecular Drug Action (3:3:0).** Analysis of drug action at the molecular level, including molecular biology and signal transduction.
- 5350. Advanced Pharmaceutics (3:3:0).** Prerequisite: DDS3 or equivalent. Quantitative treatment of reactions of pharmaceutical interest. Drug decomposition, approaches to stabilization and preservation, accelerated stability analysis, complexation and micromeritics.
- 5360. Industrial Pharmacy (3:3:0).** Principles of formulation of powders, capsules, and compressed and coated tablets for conventional and controlled drug delivery.
- 5370. Biotechnology (3:3:0).** An introduction to the area of molecular biology, genomics, and protein chemistry.
- 5380. Special Topics in Drug Design—Immunopharmacology (3:3:0).** Principles of disease treatment with focus on the immunological system and new advances in immunotherapy.
- 5390. Pharmaceutical Science Research Design and Analysis (3:3:0).** Overview of experimental design implementation and data analysis, including biostatistics for pharmaceutical science investigations.
- 5440. Biopharmaceutics (4:4:0).** Prerequisite: DDS3 and kinetics or equivalent. Advanced treatment of the influence of dosage forms, route of administration, and dosage regimen on drug availability and newer technologies for targeting drug delivery to specific organs and cell types.
- 6000. Master's Thesis (V1-6).**
- 7000. Pharmaceutical Sciences Research (V1-12).**

- 7101. Pharmaceutical Sciences Seminar (1:1:0).** Weekly seminar series designed to provide training in research data presentation and analysis.
- 8000. Doctor's Dissertation (V1-12).**

## Department of Pharmacology

Professor Reid Norman, Interim Chairperson.

Professors Carroll, Lombardini, and Tenner; Associate Professors Blanton, Dickerson, Freeman, Machu, McMahon, H. Strahlendorf, and Syapin; Assistant Professors Frame and Roghani.

This department offers study in the following graduate degree programs: PHARMACOLOGY, *Master of Science* and *Doctor of Philosophy*. The objective is to prepare students for careers in research and teaching. The faculty of the program seeks to foster a creative and productive research atmosphere, to provide encouragement and positive challenge, and to equip students with the intellectual tools they will need to be effective teachers and investigators. Specialized research training is available in the areas of biochemical pharmacology, calcium imaging, circadian pharmacology, autonomic pharmacology, cardiovascular pharmacology, neuropharmacology, and molecular pharmacology.

### Courses in Pharmacology. (GPHM)

- 5101, 5201, 5301. Topics in Pharmacology (1:1:0, 2:2:0, 3:3:0).** Prerequisite: Consent of instructor. Specific areas of pharmacology not normally included in other courses. May be repeated for credit with change in content.
- 5303. Principles of Pharmacology (3:3:0).** Prerequisite: Biochemistry and physiology or consent of instructor. A study of the principles and theories of pharmacokinetics and pharmacodynamics of chemicals in relationship to dose and time. The course will consist of lectures, discussions, and oral presentations of original papers by the class and is oriented for both pharmacology and nonpharmacology majors.
- 5314, 5315. General Pharmacology I and II (3:3:0 each).** Study of drugs that affect various organ systems and human disease states. Includes pharmacokinetics, pharmacodynamics, and toxicology of drugs. For M.S. students.
- 5326. Pharmacology of the Autonomic Nervous System (3:3:0).** Prerequisite: GBCH 5921, GPHY 5803, GPHM 5613 or equivalent. A conceptual study of drugs which alter the function of the autonomic nervous system. Emphasis will be on mechanisms by which drugs affect transmitter synthesis, release, uptake, and metabolism as well as receptor function.
- 5336. Molecular and Cellular Pharmacology (3:3:0).** Prerequisite: Consent of instructor. Topic areas will include receptors, second messenger systems, ion transport, pre-synaptic cellular biology, and anti-AIDS treatments. The course will consist of lectures and student discussions of the topics listed above.
- 5337. Neuropsychopharmacology (3:3:0).** Prerequisite: Consent of instructor. A structured in-depth study of specific topics concerning neurochemical pharmacology, behavioral pharmacology, and neuropsychopharmacology. Topics to be studied will vary each semester. The course will consist of lectures, discussions, and oral presentations of original papers by the class.
- 5425. Techniques in Pharmacological Research (4:2:6).** Prerequisite: GBCH 5921, GPHY 5803, or equivalent. A lecture and laboratory course designed to provide an introduction to and hands-on experience with standard experimental techniques used in pharmacological research.
- 5613. Pharmacology (6:5:1).** A study of pharmacology with emphasis on mechanisms of drug action, drug interactions, and therapeutics. For Ph.D. students.

- 6000. Master's Thesis (V1-6).**
- 7000. Research (V1-12).**
- 7101. Pharmacology Seminar (1:1:0).**
- 8000. Doctor's Dissertation (V1-12).**

## Department of Physiology

Professor John Orem, Chairperson.

Professors Davies, Lutherer, McGrath, Nathan, Pressley, Sabatini, J. Strahlendorf, and Wesson; Associate Professors Fowler, Györke, and Martinez-Zaguilan; Assistant Professors Escobar and Sarvazy; Joint Faculty Heavner, Janssen, Jumper, Kurtzman, and Laski.

This department offers study in the following graduate degree programs: PHYSIOLOGY, *Master of Science* and *Doctor of Philosophy*. The program is designed primarily to train persons for careers in biomedical research and/or teaching in medical institutions or industry, but can accommodate those interested in alternative careers in physiology. Faculty research programs are diverse, encompassing the general areas of systemic, cardiovascular, renal, and neurophysiology. Specific areas include membrane biophysics,  $\text{Ca}^{++}$  channels and other membrane transporters, pH and  $\text{Ca}^{++}$  homeostasis,  $\text{Na}^+/\text{K}^+$  ATPase, excitation-contraction coupling, oxygen free radicals and cell injury, apoptosis, neuronal protective mechanisms, particle toxicology, cerebral blood flow, hypertension, shock, sleep and control of respiratory and cardiovascular function.

Advanced courses in specialized areas are taught under the topics course and are designed to fit a student's specific needs.

Applicants should have a demonstrated interest in research and preferably have identified an area for their dissertation research. All candidates for graduate degrees who hold assistantships must fulfill certain requirements while appointed as assistants.

GPHY 5803 is normally a prerequisite for all courses in or above the 6000 level but may be waived for students in other programs with approval of the instructor. Enrollment in GPHY 5803 is limited to students admitted to degree programs and requires approval by the thesis director and the department chairperson.

### Courses in Physiology. (GPHY)

- 5302. Human Physiology: Cellular and Integrated Mechanisms (3:3:0).** Prerequisite: College biology and consent of instructor. An introduction to the physiology of mammalian organ systems placing emphasis on the human. Subject matter includes membrane transport, muscle, cardiovascular, respiratory, renal, water and electrolyte balance, gastrointestinal, and endocrine physiology as well as neurophysiology.
- 5350. Laboratory Methods in Physiology (3:0:3).** Fundamental principles of physiology are explored through a series of hands-on laboratory exercises. Numerous techniques common to research in many fields will be introduced.
- 5803. Medical Physiology (8:7:4).** A study in human physiology emphasizing body-controlling systems and their interrelationships. Pathological mechanisms are also stressed.
- 5910. Integrated Neurosciences (9:8:1).** This cooperative, interdepartmental effort offers a detailed study of the nervous system. Students examine both gross and fine structure and function from the subcellular through the behavioral level. (GIDN 5910)

- 6000. Master's Thesis (V1-6).**
- 6105, 6205, 6305. Topics in Physiology (1:1:0; 2:2:0; 3:3:0).** Prerequisite: Consent of instructor. Advanced training in a specialized area of physiology. May be repeated for credit with change in content.
- 6210. Advanced Cardiovascular Physiology (2:2:0).** Prerequisite: GPHY 5803 and consent of instructor. Advanced level coverage of topics in cardiovascular physiology with much material being covered in reviews of the research literature.
- 6311. Cellular and Molecular Physiology (3:3:0).** Prerequisite: GIDN 5910 or GPHY 5502 or consent of instructor. The study of the structure and function of ion channels and transporters, excitation-contraction coupling, and mechanisms of cell damage and death.
- 6314. Membrane Biophysics (3:3:0).** Students are introduced to the mechanisms of ion transport through membrane channels; models of membrane excitability; molecular structures of ion channels and their physiological functions.
- 6315. Physiology of Neuroeffector Systems (3:3:0).** A consideration of adrenergic, cholinergic, histaminic, and serotonin receptor systems and their physiological applications. Offered summers even years only.
- 6704. Cell Function and Regulation (7:7:0).** Topics include structure and function of membranes and organelles, mechanisms of transcription and translation, and regulation of cellular processes including both the endocrine and nonendocrine aspects. (GANM 6704, GBCH 6704)
- 7000. Research (V1-12).**
- 7101. Physiology Seminar (1:1:0).** This weekly seminar series provides invited speakers from this and other departments as well as other universities and laboratories with the opportunity to present their current research in some area of physiology.
- 7102. Readings in Physiology (1:1:0).** Students review literature on special topics of research. (Students may be assigned or may select these topics.) May be repeated for credit.
- 7103. Supervised Teaching in Physiology (1:1:0).** Prerequisite: GPHY 5803. Supervised teaching experience including leading laboratory groups and small-group discussions and presenting lectures in some departmental courses (all under faculty supervision).
- 8000. Doctor's Dissertation (V1-12).**

## Graduate Interdisciplinary Courses in the Health Sciences Center Graduate School of Biomedical Sciences

In addition to the courses listed by department, the following courses are available in the areas indicated.

### Interdisciplinary Courses in Health Communications. (GIHC)

- 5315. Health Information Research (3:3:0).** Critical examination and synthesis of past and ongoing research in the health information process including Internet training.
- 5319. Seminar in Current Topics of Information Sciences (3:3:0).** Prerequisite: Must be enrolled or accepted in a graduate program. This course will vary each semester emphasizing information science topics including Internet training.

### Interdisciplinary Courses in Health Organization Management. (GIHM)

- 5305. Introduction to Health Organization Management (3:3:0).** Designed to provide an overview of the health care system; its managerial, social, behavioral, and economic aspects from an organizational and strategic viewpoint.

- 5306. HOM I: Medical Aspects (3:3:0).** Prerequisite: MGT 5370 or consent of instructor. Focuses on the implications for the management of health care organizations of medical issues such as the natural history of disease, epidemiology and health policies. (MGT 5306)
- 5307. HOM II: Managed Health Care Organizations (3:3:0).** Prerequisite: GIHM 5306 or consent of instructor. Examines fundamental and contemporary issues in the organization and management of managed health care organizations. (MGT 5307)
- 5308. HOM III: Medical Groups and Ambulatory Care (3:3:0).** Prerequisite: GIHM 5307 or consent of instructor. An organization-based view of the health care system emphasizing the provision of comprehensive health care to populations via medical group practices and ambulatory care organizations. (MGT 5308)
- 5309. HOM IV: Hospitals and Integrated Delivery Systems (3:3:0).** Prerequisite: GIHM 5308 or consent of instructor. Analyzes and evaluates selected contemporary problems, issues, and trends in hospitals and integrated delivery systems. (MGT 5309)
- 7000. Research (V1-12).**

### Interdisciplinary Courses in Neuroscience. (GIDN)

- 5910. Integrated Neurosciences (9:8:1).** This cooperative, interdepartmental effort offers a detailed study of the nervous system. Students examine both gross and fine structure and function from the subcellular through the behavioral level. (GPHY 5910)

### Interdisciplinary Courses in Preventive Medicine. (GIPM)

- 6303. Principles of Epidemiology (3:3:0).** This course considers the variety, behavior, and distribution of both infectious and noninfectious diseases in populations. It will show how an understanding of the etiology, transmission, and pathogenesis of disease can lead to methods of disease prevention. Emphasis will be placed on the principles and methods of epidemiologic investigation. Arranged. F.
- 6304. Topics in Community Health (3:3:0).** This course will consider various topics in epidemiology, preventive medicine, and community health not normally included in other courses. Emphasis on the interactions of various agencies in the community to abate hazards and promote health. May be repeated for credit with change in content. Arranged.

## School of Nursing

*Professor Alexia Green, Dean*

Professors Armstrong, Esperat, Masten, McConnell, Ketner, Pollock, Valadez, and Yoder Wise; Associate Professors Cannon, Johnston, Miller, Owen, and Weiss-Kaffie; Assistant Professors Amos, Ashcraft, Boswell, Holden-Huchton, O'Keefe, and Scholler-Jaquis.

The School of Nursing is located in the Texas Tech University Health Sciences Center—a legally separate institution from Texas Tech University. Texas Tech University Health Sciences Center has four campuses throughout West Texas.

As one of the three schools within the Texas Tech University Health Sciences Center (TTUHSC), the purpose of the Master of Science in Nursing program is to prepare the graduate to practice nursing within an expanded role. In synthesizing a clinical and functional fo-



cus, the graduate assumes an encompassing perspective of practice, service, research, and education. The graduate in an expanded role is prepared to:

- Participate in scientific inquiry;
- Integrate scientific analysis of theories, therapies, and research in providing high quality care;
- Disseminate acquired knowledge by participation in scholarly activities;
- Evaluate current legal, ethical, economic, and cultural issues;
- Contribute to the advancement of the profession;
- Implement effective outcomes in an advanced practice setting; and
- Implement an advanced practice role.

These objectives are met by all components of the graduate program, including the collaborative program with the University of Texas at Tyler College of Nursing and Health Sciences.

The TTUHSC School of Nursing graduate program offers numerous opportunities for students to pursue a master's education that meets their career plans at Lubbock and Odessa campuses. Students can select to complete a Master of Science in Nursing with a clinical focus in gerontics or community health. They can also choose a functional track of education or administration to complete the degree. The MSN-Family Nurse Practitioner and Post Master's Certificate programs prepare graduates to assume a primary care provider role in rural agencies and other health care settings in under served areas. Additionally, the Master of Science Acute Care Nurse Practitioner and Post Master's Certificate programs prepare graduates to provide culturally sensitive, comprehensive care for adults with common episodic and chronic health problems managed across the continuum of acute care centers. The ACNP assumes responsibility for promoting, maintaining, and restoring health to adults who are acutely or critically ill. Emphasis includes identification of health risks, promotion of wellness, diagnostics and management of acute and critical illnesses. Our programs offer unique opportunities for the graduate student to receive the latest state-of-the-art nursing education. We also offer a dual master's program with the College of Business Administration. Students can obtain an MSN-MBA that provides opportunities in leadership and management in health care organizations.

The students at the collaborative site, University of Texas at Tyler College of Nursing and Health Sciences can obtain a MSN-Family Nurse Practitioner, Post Master's Nurse Practitioner, MSN-Acute Care Nurse Practitioner, and Post Master's Acute Care Nurse Practitioner from TTUHSC. The school also offers a collaborative doctorate program with the University of Texas Health Science Center at San Antonio. The doctoral program in nursing will prepare the student for a career as an independent researcher, who develops as a teacher and disseminator of knowledge within professional, academic, and clinical areas. Distance education is accomplished through the use of a two-way interactive video system and Web-based strategies linking the campuses together.

The Nursing program is accredited by National League for Nursing Accrediting Commission (NLNAC) and the Commission on Collegiate Nursing Education (CCNE).

The minimum requirements for all applicants to the graduate nursing programs are the following:

- Have a valid RN License in the State of Texas;
- Have a baccalaureate nursing degree from a nationally discipline accredited college or university;
- Have successfully completed an undergraduate research and statistics course;
- Have a minimum 3.0 GPA or better (on a 4.0 scale) in upper division work and all graduate level work;
- Sufficient test scores (GRE or MAT); and
- Applicants to the Post Master's program must have a Master of Science in Nursing degree from an NLN accredited college or university.

An applicant will not be disqualified for admission based solely on a standardized score.

Applicants to the collaborative programs with Texas Tech University College of Business Administration, the University of Texas at Tyler College of Nursing and Health Sciences, and the University of Texas Health Science Center at San Antonio are required to contact those schools regarding further admissions criteria. Applicants to these programs will have to meet the requirements set by both institutions.

For further information visit our web site at <[www.nursing.ttuhs.edu](http://www.nursing.ttuhs.edu)> to download a bulletin and an application.

NOTE: Applications for all campuses should be mailed to the Lubbock Campus, attention: Graduate Student Affairs Coordinator.

Texas Tech University Health Sciences Center  
Graduate Student Affairs Coordinator  
3601 4th Street, MS 6264, 2B164  
Lubbock, Texas 79430-6264  
806-743-3063

### **Courses in Nursing. (NURS)**

- 5015. Application of Research in Nursing.**
- 5060. Independent Study.**
- 5070. Special Topics.**
- 5140. Laboratory Methods for Nurses in Advanced Practice.**
- 5210. Developing Nursing Education Programs.**
- 5230. The Middle Manager in Nursing: A Conceptual Perspective.**
- 5240. Managerial Role Development.**
- 5300. Community Health I: Foundations of Community Health Nursing.**
- 5301. Community Health II: Role Design and Implementation.**
- 5310. Gerontics I: Foundations of Gerontic Nursing.**
- 5311. Gerontics II: Role Design and Implementation.**
- 5330. Theories and Therapies.**
- 5340. Primary Health Care Practice I: Advanced Assessment, Pathology, and Management.**
- 5341. Primary Health Care Practice II: Advanced Role Application.**
- 5342. Advanced Health Assessment.**
- 5343. Pharmacotherapeutics for Nurses in Advanced Practice.**
- 5344. Advanced Practice Role Development: Advanced Cardiac Life Support.**
- 5345. Advanced Practice Nursing: Application of Pathophysiology.**
- 5350. Diagnostic Methods & Skill I.**
- 5351. Diagnostic Methods & Skill II.**
- 5352. Acute Care Nursing I.**

- 5353. Acute Care Nursing II.
- 5371. Professional Nursing Issues.
- 5373. Nurses and Technology.
- 5374. Writing for Publication.
- 5375. Nursing Ethics Across Life Span.
- 5391. Principles of Advanced Research.
- 5392. Application of Advanced Research.
- 5410. Facilitating Learning.
- 6000. Thesis.
- 6050. Acute Care Practicum.
- 6060. Nursing Practicum.
- 6071. Supervised Teaching.
- 6220. The Nurse Manager as Leader.

## School of Allied Health

Professor Paul P. Brooke Jr., Dean

### Department of Communication Disorders

Associate Professor Rajinder Koul, Chairperson.  
Associate Professors Paschall and Sancibrian; Assistant Professors Bogenschutz, Corwin, Hicks-Bourland, Nigam, and Zhang; Instructors Flores, Keller, Schmitt, and Sims.

This department offers study in the following graduate degree programs: COMMUNICATION DISORDERS, *Master of Science in Communication Disorders* and AUDIOLOGY, *Doctor of Audiology*.

#### Speech-Language Pathology

This professional education requires two years of study beyond the baccalaureate level. Admission into the professional program begins in March of each year for the fall class. Class enrollment is limited each year and admission is competitive. To be considered for admission into the professional program, the applicant must meet a number of requirements that include a baccalaureate degree in communication disorders or completion of leveling course work. Students have two options for satisfying the requirements for the comprehensive examination. They may conduct an independent investigation culminating in a master's thesis or complete a two-day written examination.

#### Courses in Speech-Language Pathology. (AHCD)

- 5100. Research Colloquium (1:1:0).
- 5310. Special Topics in Speech and Hearing (3).
- 5320. Research Design (3:3:0).
- 5321. Clinical Observation and Methods (3:3:0)
- 5323. Language Development (3:3:0).
- 5325. Childhood Speech Disorders (3:3:0).
- 5328. Seminar in Voice Disorders (3:3:0).
- 5329. Fluency Disorders (3:3:0).
- 5330. Dysphagia (3:3:0).
- 5343. Aural Rehabilitation (3:3:0).
- 5362. Motor Speech Disorders (3:3:0).
- 5366. Augmentative and Alternative Communication (3:3:0).
- 5380. Graduate Clinical Practicum: SLP (3).
- 5385. Internship in Speech Pathology and Audiology (3).
- 5390. Graduate Clinical Practicum: Audiology (3).

- 5399. Clinical Syndromology (3:3:0).
- 5424. Pediatric Language Assessment and Intervention (4:4:0).
- 5463. Adult Language Assessment and Intervention (4:4:0).
- 6000. Master's Thesis (V1-6).

#### Audiology

This professional education requires four years of study beyond the baccalaureate level which includes a professional residency year. Admission into the professional program begins in fall of each year. Class enrollment is limited each year and admission is competitive. To be considered for admission into the professional program, the applicant must meet a number of requirements that include a baccalaureate degree in communication disorders, basic sciences, or a similar program. Admissions are also open to current holders of a Master's degree in audiology via application and portfolio review. Students will complete both a research project and a comprehensive capstone course before graduation.

Students enrolled in either program are required to adhere to all policies as outlined by the department, the school, and the Health Sciences Center. Students also have specific rights as outlined in the student handbook.

The following courses are departmental course requirements. Students must maintain a 3.0 grade-point average in order to continue in the program. By the time of graduation, students are expected to have completed the requirements for professional certification by the American Speech-Language-Hearing Association.

#### Courses in Audiology. (AHCD)

- 5320. Research Design (3:3:0).
- 5323. Language Development (3:3:0).
- 5380. Graduate Clinical Practicum: SLP (3).
- 7347. Aural Rehabilitation (3:3:0).
- 7348. Educational Audiology (3:3:0).
- 7351. Counseling in Audiology (3:3:0).
- 7352. Medical Aspects of Audiology (3:3:0).
- 7355. Hearing Conservation and Instrumentation (3:3:0).
- 7364, 7365. Electrophysiology I and II (3:3:0 each).
- 7370. Cochlear Implants (3:3:0).
- 7373. Neuroaudiology (3:3:0).
- 7375. Professional Issues in Audiology (3:3:0).
- 7379. Audiology Grand Rounds (3:3:0).
- 7385. Internship in Audiology (3).
- 7390. Clinical Practicum (3).
- 7442. Psychoacoustics (4:4:0).
- 7445. Advanced Clinical Amplification (4:4:0).
- 7449. Anatomy and Physiology of the Auditory System (4:4:0).
- 7450. Pediatric Audiology (4:4:0).
- 7544. Clinical Amplification (5:5:0).
- 8000. Doctoral Dissertation (V1-12).

For additional information concerning a career in either speech-language pathology or audiology, contact the Department of Communication Disorders. All programs are accredited by the Council on Academic Accreditation and the Council on Professional Services Accreditation.

## Department of Diagnostic and Primary Care

Associate Professor Hal Larsen, Chairperson.

Associate Professors Bartold, Border, Rice-Spearman, and Runyan; Assistant Professors Baesa, Dennis, Milhauser, and Roch.

This department offers study in the following graduate degree programs: PHYSICIAN ASSISTANT, *Master of Physician Assistant Studies* and MOLECULAR PATHOLOGY, *Master of Science*.

### Physician Assistant

The program is located at the TTUHSC Midland College campus in Midland, Texas. To be considered for admission, the applicant must have completed at least 74 semester hours of prerequisite courses with a cumulative GPA of 3.0 or above. A bachelor's degree is not required for admission. Individuals already holding a bachelor's or graduate degree in another field are eligible, however, they must meet the same prerequisite course and grade requirements as all other applicants. Contact the School of Allied Health Admission and Student Affairs Office or the physician assistant program for specific requirements and further information.

Applications are accepted beginning September 1 preceding the year of expected matriculation. New classes begin each year in early June. Applications must be received by the School of Allied Health Admission and Student Affairs Office by December 15 to be considered for admission into the professional curriculum, beginning the following June. It is the applicant's responsibility to assure that all required supporting documentation is received by the deadline.

Upon successful completion of the professional program, students are eligible to take the Physician Assistant National Certification Examination required for state licensure to practice as a physician assistant in Texas.

### Courses in Allied Health Physician Assistant Program. (AHPA)

- 5101. Introduction to Physician Assistant Profession (1:1:0).
- 5202. Introduction to Pharmacology (2:2:0).
- 5301. Clinical Laboratory and Microbiology (3:3:0).
- 5302. Physical Examination I (3:2:3).
- 5303. Physical Examination II (3:2:3).
- 5304. Medical Psychology (3:3:0).
- 5305. Clinical Methods and Approach (3:3:0).
- 5308. Neuroscience (3:3:0).
- 5309. Biomedical Research and Statistics (3:3:0).
- 5310. Medical Interview (3:3:0).
- 5401. Physiology and Pathology I (4:4:0).
- 5402. Physiology and Pathology II (4:4:0).
- 5403. Clinical Medicine I (4:4:0).
- 5404. Clinical Medicine II (4:4:0).
- 5405. Pharmacotherapeutics (4:4:0).
- 5501. Anatomy (5:4:3).
- 6201. Medical Ethics and Jurisprudence (2:2:0).
- 6301. Preventive Medicine and Community Health (3:3:0).
- 6302. Medical Spanish (3:3:0).
- 6303. Introduction to Clerkship (3:3:0).
- 6304. Medical Information Sciences (3:3:0).

- 6401. Clinical Practice and Organization (4:4:0).
- 6402. Clinical Medicine III (3:3:0).
- 6601. Family Practice Clerkship (6:0:40).
- 6602. Internal Medicine Clerkship (6:0:40).
- 6603. Perinatal Care and Gynecology Clerkship (6:0:40).
- 6604. Pediatric Clerkship (6:0:40).
- 6605. Emergency Medicine Clerkship (6:0:40).
- 6606. Geriatric Clerkship (6:0:40).
- 6607. Psychiatry Clerkship (6:0:40).
- 6608. Surgery Clerkship (6:0:40).
- 6801. Master Project Tract (8:8:0).
- 6802. Health Care Management and Administration Tract (8:8:0).

### Molecular Pathology

To be considered for admission the applicant must have completed one of the following options: A degree in clinical laboratory science from a NAACLS accredited program (3.0 GPA) and certification from ASCP or NCA; Bachelor of Science in a life science (chemistry, biology, zoology, etc.) and a Clinical Laboratory Technician certification from a NAACLS accredited program (3.0 GPA) and certification from ASCP or NCA; or a Bachelor of Science in a life science (chemistry, biology, zoology, etc.) which must include the following prerequisites:

- 8 credit hours of general chemistry with lab;
- 8 credit hours of organic chemistry with lab;
- 4 credit hours of microbiology;
- 4 credit hours of cell biology;
- 3 credit hours of college algebra;
- 8 credit hours of general biology;
- 3 credit hours of genetics;
- 4 credit hours of biochemistry;
- 8 credit hours of anatomy and physiology; and
- 3 credit hours of immunology.

Clinical laboratory scientists and clinical laboratory technicians must complete a 3 credit hour genetics course.

Applications are accepted beginning September 1 preceding the year of expected matriculation. A new class begins each year in the summer term. Applications must be received by the School of Allied Health Admission and Student Affairs Office by February 1 to be considered for admission into the professional curriculum. It is the applicant's responsibility to assure that all required supporting documentation is received by the deadline. Upon successful completion of the professional program, students are eligible to take the National Credentialing Agency (NCA) for laboratory professionals certification examination in molecular biology.

### Courses in Allied Health Molecular Pathology Program. (AHMP)

- 4300. Applied Statistics and Research.
- 4305. Molecular Diagnostics.
- 5100. Issues in Molecular Pathology I.
- 5101. Issues in Molecular Pathology II.
- 5301. Clinical Laboratory and Microbiology.
- 5401. Physiology and Pathology I.
- 5402. Physiology and Pathology II.
- 5406. Diagnostic Molecular Pathology.
- 5407. Applied Molecular Techniques.
- 5741. Clinical Preceptorship I.
- 5842. Clinical Preceptorship II.



## Department of Rehabilitation Sciences

Professor H.H. Merrifield, Chairperson.

Associate Professors Clopton, Fell, and Latman; Assistant Professors Billingsley, Boss, Brismee, Cook, Daniel, Everhardt, Gilbert, Grubbs, Hartgraves, Hrachovy, Karakostas, Knotts, Matthews, Mincinski, Priest, Rodriguez, Sawyer, Schultz, Sizer, Smith, Stickley, Taylor, Tristan, and Vellacott; Instructors Anderson, Haas, Hooker, and Smith.

This department offers study in the following graduate degree programs: *ATHLETIC TRAINING, Master of Athletic Training*; *OCCUPATIONAL THERAPY, Master of Occupational Therapy*; *PHYSICAL THERAPY, Master of Physical Therapy*; and *VOCATIONAL REHABILITATION, Master of Vocational Rehabilitation*.

### Athletic Training

The entry-level program in athletic training is offered at the TTUHSC Lubbock campus only. To be considered for admission, the candidate must hold a bachelor's degree, including prerequisites, with a minimum cumulative GPA of 2.7 or above. See the athletic training program for specific requirements.

Applications are accepted beginning September 1 preceding the year of expected matriculation. Applications must be received by the School of Allied Health Admissions and Student Affairs Office by February 1 to be considered for admission into the professional curriculum, beginning the following June. It is the applicant's responsibility to assure that all required supporting documentation is received by the deadline.

Upon successful completion of the professional program, students are eligible to take the National Athletic Trainers' Association Board of Certification (NATABOC) examination which is required to practice athletic training in every state except Texas. After successful completion of the NATABOC certification exam, students will be eligible to sit for the Texas State Licensure Exam, which is required to practice athletic training in the State of Texas.

### Courses in Allied Health Athletic Training. (AHAT)

- 5120. Research Directed Study I (1:0:3).
- 5126. Research Directed Study II (1:0:3).
- 5200. Research Methods in Athletic Training (2:2:0).
- 5201. Clinical Rotation I (2:0:6).
- 5202. Management and Prevention of Injuries (2:1:3).
- 5204. Principles of Kinesiology (2:1:3).
- 5206. Clinical Rotation II (2:0:6).
- 5207. Current Medical Diagnosis and Treatment (2:2:0).
- 5208. Management of Acute Injuries (2:1:3).
- 5220. Musculoskeletal Evaluation and Management I (2:1:3).
- 5223. Special Populations and Concerns (2:2:0).
- 5225. Clinical Rotation III (2:0:6).
- 5228. Clinical Rotation IV (2:0:6).
- 5304. Special Topics in Athletic Training (3:3:0).
- 5324. Management-Identification of General Medical Conditions (3:3:0).
- 5422. Administration of Athletic Training Programs and Professional Development (4:3:3).
- 5500. Human Anatomy (5:3:6).
- 5505. Patient Evaluation and Management I (5:3:6).
- 5506. Patient Evaluation and Management II (5:3:6).
- 5529. Musculoskeletal Evaluation and Management II (5:3:6).

### Occupational Therapy

The entry-level master's degree in occupational therapy is offered at three TTUHSC campuses: Amarillo, Lubbock, and Odessa. Occupational therapy is skilled intervention that helps individuals achieve independence in all facets of their lives and gives people "skills for the job of living."

Occupational therapy practitioners are skilled professionals whose education includes the study of human growth and development with specific emphasis on the social, emotional, and physiological effects of illness and injury. Practitioners must complete supervised clinical internships in a variety of health care setting and pass a national examination. Most states also regulate occupational therapy practice.

Applications are accepted each year for admission into the class beginning the following May. The first year summer semester courses are offered in Lubbock only. Applications are due in the Office of Admissions and Student Affairs each year including the most recent transcript and letters of reference. Class size is limited and all admissions are competitive. For more complete admissions information, please visit the admissions Web site at <[www.ttuhsc.edu/pages/alh](http://www.ttuhsc.edu/pages/alh)>; contact us by e-mail <[alhadm@ttuhsc.edu](mailto:alhadm@ttuhsc.edu)>; by phone (806) 743-3220; or by mail to Admissions and Student Affairs, 3601-4th Street Room 2B-194, Lubbock, TX, 79430.

### Courses in Allied Health Occupational Therapy. (AHOT)

- 5071. Field Work II: Specialization (V3-6).
- 5072. Special Topics in Occupational Therapy (V1-3).
- 5073. Individual Projects (V1-3).
- 5102. Occupational therapy Professional Concepts I (1:1:0).
- 5104. Occupational therapy Professional Skills II (1:0:3).
- 5108. Field Work I:1 (1:0:3).
- 5121. Field Work I:2 (1:0:3).
- 5122. Field Work I:3 (1:0:3).
- 5201. Professional Concepts II (2:2:0).
- 5202. Principles of Kinesiology (2:1:3).
- 5203. Occupational Therapy Professional Skills II (2:0:6).
- 5204. Psychosocial Aspects of Illness and Disability (2:2:0).
- 5206. Community Health I (2:2:0).
- 5208. Occupational Therapy Professional Skills III (2:0:6).
- 5221. Introduction to Research (2:2:0).
- 5222. Community Health II (2:2:0).
- 5224. Research Methods: Quantitative and Qualitative Approaches (2:2:0).
- 5231. Resource Management for Health Professionals (2:2:0).
- 5232. Advanced Clinical Reasoning (2:2:0).
- 5233. Marketing for Health Professional (2:2:0).
- 5235. Entrepreneurship for Health Professionals (2:2:0).
- 5301. Human Physiology (3:3:0).
- 5302. Human Neurosciences (3:3:0).
- 5303. Clinical Kinesiology (3:2:3).
- 5304. Clinical Assessment and Reasoning (3:2:3).
- 5305. Occupation Across the Lifespan (3:3:0).
- 5306. Adaptations and Technology (3:2:2).
- 5307. Occupational Therapy Media and Modalities (3:1:6).
- 5322. Occupational Function-Dysfunction: Children and Adolescents II (3:2:3).
- 5324. Occupational Function-Dysfunction: Adults II (3:2:3).
- 5326. Health Organization Management (3:3:0).
- 5421. Occupational Function-Dysfunction: Children and Adolescents I (4:3:3).

- 5423. Occupational Function-Dysfunction: Adults I (4:3:3).
- 5425. Occupational Function-Dysfunction: Older Adults I (4:3:3).
- 5432. Occupational Function-Dysfunction: Children and Adolescents III (4:3:3).
- 5434. Occupational Function-Dysfunction: Adults III (4:3:3).
- 5436. Occupational Function-Dysfunction: Older Adults II (4:3:3).
- 5500. Human Anatomy (5:5:15).
- 5631. Field Work II: 1 (6:0:6).
- 5632. Field Work II: 2 (6:0:6).

### **Physical Therapy**

The Master of Physical Therapy degree is offered at three TTUHSC campuses—Amarillo, Lubbock, and Odessa. To be considered competitive for admission, the applicant must have completed at least 90 semester hours of prerequisite courses with a cumulative GPA of 3.0 or above. Individuals already holding bachelor's and graduate degrees in other fields are eligible for admission. They must have a minimum 2.7 GPA in the last 90 semester hours and meet the same requirements as all other applicants. See the physical therapy program for specific requirements.

Applications are accepted beginning September 1 preceding the year of expected matriculation. Applicants interested in early admission must have applications in by October 15. Applications must be received in the School of Allied Health Admissions and Student Affairs Office by February 1 to be considered for admission into the professional curriculum, beginning the following May. It is the applicant's responsibility to assure that all required supporting documentation is received by the deadline.

Upon successful completion of the professional program, students are eligible to take the state licensure examination which is required in order to practice as a physical therapist.

Further information about the program, school requirements, and other related matters may be obtained from the School of Allied Health.

### **Courses in Allied Health Physical Therapy. (AHPT)**

- 5098. Practicum in Athletic Training (V1-6).
- 5099. Independent Studies in Physical Therapy (V1-6)
- 5104. Clinical Education (1:1:0).
- 5108. Clinical Reasoning I (1:1:0).
- 5122. Residual Limb Care and Prosthetics (1:1:0).
- 5124. Current Medical Diagnosis and Treatment II (1:1:0).
- 5126. Research Process I (1:1:0).
- 5128. Research Process III (1:1:0).
- 5129. Clinical Reasoning II (1:1:0).
- 5140. Clinical Seminar (1:1:0).
- 5146. Research Process V (1:1:0).
- 5147. Research Process IV (1:1:0).
- 5149. Clinical Reasoning III (1:1:0).
- 5150. Women's Physical Therapy (1:1:0).
- 5152. Seminar in Physical Therapy I (1:1:0).
- 5154. Introduction to Athletic Training (1:1:0).
- 5156. Seminar in Physical Therapy II (1:1:0).
- 5200. Introduction to Patient Management (2:1:3).
- 5202. Principles of Kinesiology (2:1:3).
- 5204. Health Care Issues and Ethics (2:2:0).
- 5205. Neuroscience (2:2:0).
- 5206. Pharmacology (2:2:0).
- 5220. Musculoskeletal Evaluation and Management I (2:1:3).
- 5227. Current Medical Diagnosis and Treatment I (2:2:0).

- 5228. Motor Control and Learning (2:2:0).
- 5229. Research Process II (2:2:0).
- 5240. Personnel Management (2:2:0).
- 5243. Current Medical Diagnosis and Treatment III (2:2:0).
- 5245. Orthotic Devices (2:1:3).
- 5304. Clinical Applied Physiology (3:2:3).
- 5305. Clinical Kinesiology (3:2:3).
- 5320. Early Growth and Development (3:3:0).
- 5321. Adult Development and Aging (3:3:0).
- 5336. Clinical Experience I (3:0:9).
- 5338. Clinical Experience II (3:0:9).
- 5341. Developmental Evaluation and Management (3:2:3).
- 5343. Cardiopulmonary Evaluation and Management (3:2:3).
- 5345. Health Care Business Administration (3:3:0).
- 5361. Special Topics I (3:3:0).
- 5362. Special Topics II (3:3:0).
- 5405. Pathophysiology of Body Systems (4:4:0).
- 5420. Neuroscience (4:3:3).
- 5444. Adult Neurological Assessment and Rehabilitation (4:3:3).
- 5446. Clinical Experience III (4:0:12).
- 5448. Clinical Experience IV (4:0:12).
- 5500. Human Anatomy (5:3:8).
- 5505. Patient Evaluation and Management I (5:3:6).
- 5506. Patient Evaluation and Management II (5:3:6).
- 5529. Musculoskeletal Evaluation and Management II (5:3:6).

### **Vocational Rehabilitation**

The master's degree in vocational rehabilitation is offered by distance education and full-time residency on campus is not required. To be considered for admission, the applicant should hold a bachelor's degree from a regionally accredited college or university and an overall GPA of 2.7 in the last 60 hours of college credit. Provisional admission may be offered to applicant's with a GPA of less than 2.7, but such applications are considered on an individual basis. Graduate Record Examination (GRE) or Millers Analogies Test (MAT) scores are not required for entry into the MVR program. Prior work or volunteer experience in human service settings is considered a valuable attribute for applicants, but is not mandatory. Persons with disabilities are particularly encouraged to apply.

Students may start their program in either the fall or spring semester. Applications must be received in the School of Allied Health Admissions and Student Affairs Office by April 1 for the fall semester and by August 1 for the spring semester. It is the applicant's responsibility to assure that all supporting documentation is received by the deadline. Detailed information on application procedures and admission criteria can be obtained by contacting either the program director at (806) 743-3242 or the School of Allied Health Admissions and Student Affairs Office (806) 743-3220.

Upon successful completion of the professional program, students may apply to take the rehabilitation counseling certification examination, and if successful, be awarded certification as a Certified Rehabilitation Counselor (CRC).

### **Courses in Allied Health Vocational Rehabilitation. (AHVR)**

- 5300. Practicum I (V1-6).
- 5301. Foundations of Vocational Rehabilitation (3:3:0).
- 5302. Counseling Theory (3:3:0).

- 5303. Medical and Psychosocial Aspects of Disability (3:3:0).
- 5304. Vocational and Career Development (3:3:0).
- 5310. Special Topics-Seminars in Vocational Rehabilitation (3:3:0).
- 5320. Practicum II (V1-6).
- 5321. Vocational Assessment (3:3:0).
- 5322. Employment Development and Placement (3:3:0).
- 5323. Advanced Vocational Counseling (3:3:0).
- 5324. Research Methodologies and Interpretation of Research Findings (3:3:0).

- 5340. Clinical Internship I (3:3:0).
- 5341. Clinical Internship II (3:3:0).
- 5342. Case Management (3:3:0).
- 5343. Administration and Management (3:3:0).
- 5344. Assistive Technology (3:3:0).
- 5345. Practice in Multicultural and Rural Environments (3:3:0).
- 5347. Clinical Supervision in Rehabilitation (3:3:0).
- 5349. Rehabilitation Professional Development (3:3:0).
- 5351. Clinical Supervision Internship (3:3:0).





## Directory

### Horn Professorships

- Appointed 1977  
MAGNE KRISTIANSEN, Electrical Engineering
- Appointed 1978  
M.M. AYOUB, Industrial Engineering
- Appointed 1979  
ROBERT J. BAKER, Biological Sciences
- Appointed 1981  
WILLIAM J. CONOVER, Business Administration
- Appointed 1983  
DAVID LEON HIGDON, English  
SHELBY D. HUNT, Business Administration
- Appointed 1984  
JAMES G. HUNT, Business Administration
- Appointed 1986  
JOHN A. GILLAS, Music  
JANET W. PEREZ, Classical and Modern Languages  
and Literatures
- Appointed 1987  
DAVID B. KNAFF, Chemistry and Biochemistry  
WALTER R. McDONALD, English
- Appointed 1988  
RICHARD A. BARTSCH, Chemistry and  
Biochemistry
- Appointed 1989  
MARY JEANNE VAN APPLIEDORN, Music
- Appointed 1990  
ALLAN J. KUETHE, History
- Appointed 1991  
CLYDE F. MARTIN, Mathematics and Statistics  
KISHOR C. MEHTA, Civil Engineering
- Appointed 1992  
PURNENDU K. DASGUPTA, Chemistry and  
Biochemistry
- Appointed 1994  
SANKAR CHATTERJEE, Museum Science  
and Geosciences
- Appointed 1996  
CLYDE HENDRICK, Psychology
- Appointed 1997  
E. ROLAND MENZEL, Physics  
HENRY NGUYEN, Plant and Soil Science
- Appointed 1999  
CLYDE JONES, Biological Sciences  
KENNETH KETNER, Institute for Studies  
in Pragmaticism
- Appointed 2000  
DANIEL BENSON, Law  
STEPHAN ESTREICHER, Physics  
GERALD SKOOG, Education  
HENRYK TEMKIN, Electrical Engineering
- Appointed 2001  
FRITS RUYMGAART, Mathematics and Statistics  
WILLIAM WESTNEY, Music

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- WENDELL AYCOCK, Ph.D., Professor of English and  
Associate Dean
- ALLAN D. HEADLEY, Ph.D., Associate Professor of  
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- CINDY L. SHEPHERD, Executive Assistant to the  
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- PEGGY J. EDMONSON, Senior Administrative  
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Coordinator

### Graduate Admissions

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Center
- RICHARD HOMAN, M.D. Dean, School of Medicine
- BARBARA PENCE, Ph.D., Associate Vice President  
for Research and Associate Dean for Research and  
Graduate Studies
- PAM JOHNSON, Director of Graduate Programs,  
Graduate School of Biomedical Sciences

## Graduate Council

The Graduate Council is composed of thirteen members, ten of whom are elected by the graduate faculty and two of whom are appointed by the dean, and one who is elected from the graduate faculty membership of the Faculty Senate by the Faculty Senate. All thirteen are voting members of the Graduate Council. The Senior Associate Dean is *ex officio* chairperson of the council; associate deans are *ex officio* and nonvoting members of the council as is the Provost or a designated representative. Elective members other than the Faculty Senate representative serve for a period of three years and are not eligible for immediate reelection unless they have been chosen to fill an unexpired term. Appointive members serve for two years. By a system of rotation, some new members join the council each year, replacing those whose terms of office have expired. The dates after names listed below indicate the year of expiration of term of office. In addition, a student representative is appointed each year by the Graduate Dean.

The Graduate Council, assisted by the graduate faculty, is charged with the responsibility of formulating the policies of the Graduate School and the requirements for graduate degrees. These policies are administered by the dean.

RONALD M. ANDERSON, Ph.D., Professor of Mathematics and Statistics and Dean of the Graduate School  
 BRYCE D. CONRAD, Ph.D., Associate Professor of English (2002)  
 LORÁ DEAHL, Ph.D., Associate Professor of Music (2003)  
 PHILIP DENNIS, Ph.D., Professor of Anthropology (2003)  
 TIM DODD, Ph.D., Associate Professor of Restaurant, Hotel, and Institutional Management (2003)  
 FRED HARTMEISTER, Ph.D., Associate Professor of Education and Law (2004)  
 ANDY HERRING, Ph.D., Associate Professor of Animal Science and Food Technology (2004)  
 MARILYN HOUCK, Ph.D., Associate Professor of Biological Sciences (2002)  
 SHELBY HUNT, Ph.D., Horn Professor of Marketing; J. B. Hoskins Professor of Marketing (2002)  
 KARLENE HOO, Ph.D., Associate Professor of Chemical Engineering (2004)  
 WILLIAM MAKI, Ph.D., Professor of Psychology (2003)  
 JOHN STINESPRING, Ph.D., Faculty Senate Representative, Associate Professor of Art (2002)  
 ELIZABETH WATTS, Ph.D., Associate Professor of Mass Communications (2002)

## Graduate Faculty

Members of the graduate faculty participate in all phases of the graduate program, assist in determining policy, and vote on candidates for graduate degrees. Membership is conceived of as a means of recognizing the members of the faculty for scholarly activities, creativity, direction of graduate research and study, and other contributions to the graduate programs of the University and the Health Sciences Center. Except in special cases, which must be approved by the graduate dean, only graduate faculty may serve as instructors of graduate courses, conduct graduate examinations, and serve on thesis and dissertation committees.

### Texas Tech University

JAMES ABBOTT, Ph.D., Massachusetts Inst. of Technology, Associate Professor of Chemical Engineering  
 JOHN R. ABERNATHY, Ph.D., Illinois, Professor of Plant and Soil Science and Dean of the College of Agricultural Sciences and Natural Resources  
 NOUREDDINE ABIDI, Ph.D., Montpellier II (France), Adjunct Faculty in Plant and Soil Science  
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 MUJAHID AKRAM, Ph.D., West Virginia, Assistant Professor of Civil Engineering  
 TERENCE C. AHERN, Ph.D., Pennsylvania State, Associate Professor of Education  
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 KWAME ALFORD, Ph.D., Missouri (Columbia), Assistant Professor of History  
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 B.L. ALLEN, Ph.D., Michigan State, Rockwell Professor of Plant and Soil Science  
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 RANDY D. ALLEN, Ph.D., Texas A&M, Professor of Biological Sciences and Plant and Soil Science  
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- LEE MALLORY BOYLAN, Ph.D., Virginia Polytechnic Inst. and State U., Associate Professor of Food and Nutrition
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- LEE MICHAEL COHEN, Ph.D., Oklahoma State, Assistant Professor of Psychology
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- NATHAN LLOYD COLLIE, Ph.D., California, Associate Professor of Biological Sciences
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- MALINDA J. COLWELL, Ph.D., Auburn, Assistant Professor of Human Development and Family Studies
- JILL CONNELLY, Ph.D., Chicago, Assistant Professor of Classical and Modern Languages and Literatures
- WILLIAM JAY CONOVER, Ph.D., Catholic U. of America, Horn Professor of Business Administration
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- STEVEN M. CROOKS, Ph.D., Arizona State, Assistant Professor of Educational Psychology and Leadership
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- ZANE D. CURRY, Ph.D., Texas Tech, Associate Professor of Interior Design
- HOWARD J. CURZER, Ph.D., Texas (Austin), Associate Professor of Philosophy
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- ANN DAHGISTANY, Ph.D., Southern California, Associate Professor of English
- JEFFERY A. DAHLBERG, Ph.D., Texas A&M, Adjunct Faculty in Plant and Soil Science
- TIMOTHY DALLAS, Ph.D., Texas Tech, Assistant Professor of Electrical Engineering
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## **Texas Tech University Health Sciences Center**

### **Graduate School of Biomedical Sciences Graduate Council**

The graduate programs within the Graduate School of Biomedical Sciences are under the general supervision of its Graduate Council, composed of two elected Graduate Faculty members from each of the programs involved. The Associate Dean, Graduate School of Biomedical Sciences, is the chairperson of the TTUHSC Graduate School of Biomedical Sciences Graduate Council. This council is charged with formulating program policies and with review and approval of applications for membership on the Graduate Faculty of TTUHSC Graduate School of Biomedical Sciences.

MICHAEL BLANTON, Ph.D., Associate Professor of Pharmacology  
 TY BORDERS, Ph.D., Associate Professor of Health Sciences Research  
 GAIL CORNWALL, Ph.D., Associate Professor of Cell Biology and Biochemistry  
 CHARLES FAUST, Ph.D., Professor of Cell Biology and Biochemistry  
 JOE FRALICK, Ph.D., Professor of Microbiology and Immunology  
 ABDUL N. HAMOOD, Ph.D., Associate Professor of Microbiology and Immunology

JAMES HUTSON, Ph.D., Professor of Cell Biology and Biochemistry  
 MANSOOR KHAN, R.Ph., Ph.D., Professor of Pharmaceutical Sciences  
 TOM PRESSLEY, Ph.D., Professor of Physiology  
 ALI ROGANI, Ph.D., Professor of Pharmacology  
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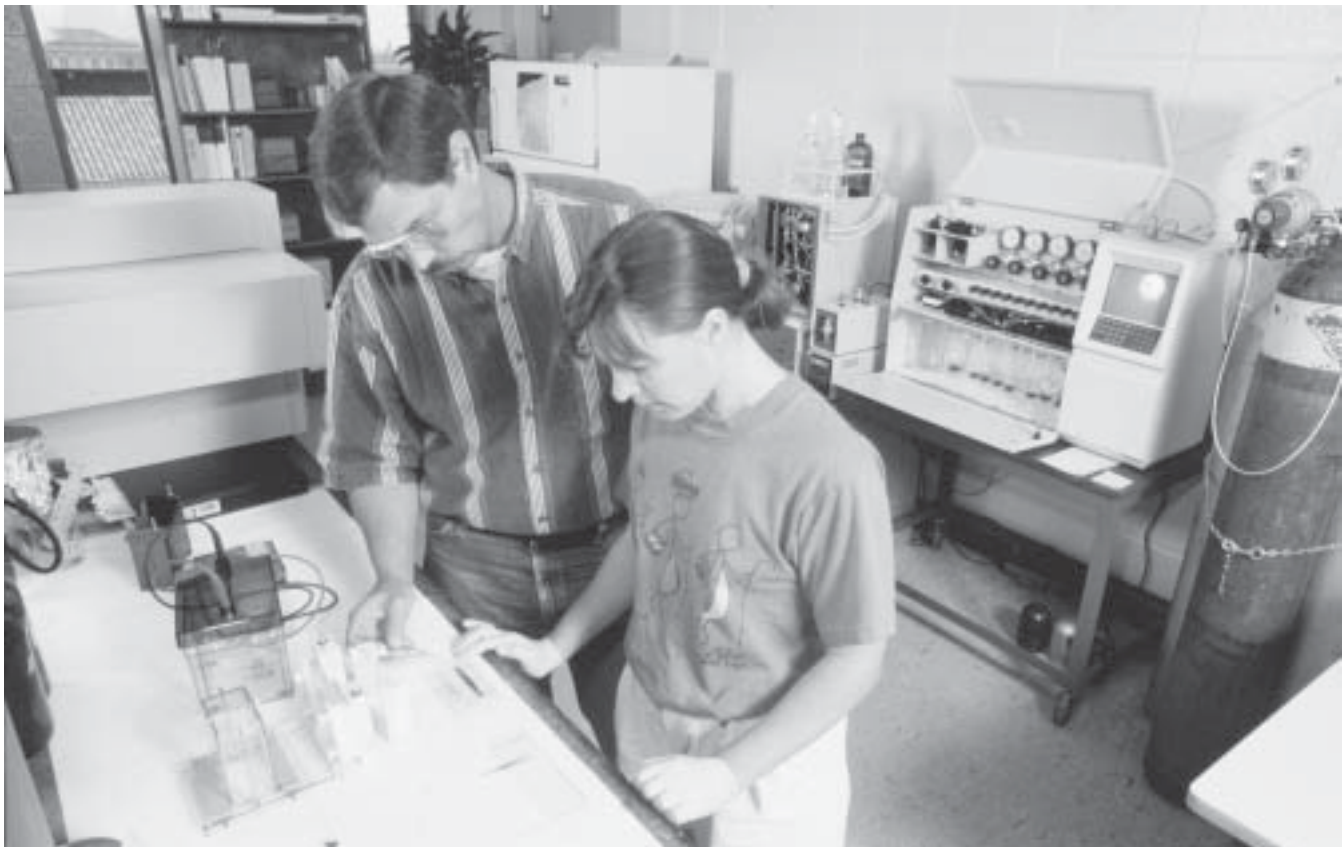
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 EDWINA A. McCONNELL, RN, Ph.D., FRCNA, Illinois (Chicago), Professor of Nursing  
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 MARY O'KEEFE, Ph.D., RN, JD, Texas Woman's, Assistant Professor of Nursing  
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 SUSAN POLLOCK, Ph.D., RN, FAAN, Texas (Austin), Professor of Nursing  
 ALWILDA SCHOLLER-JAQUISH, Ph.D., CSPCS, Maryland (College Park), Assistant Professor of Nursing  
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## **School of Allied Health Graduate Faculty**

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 HILDA BAESA, B.S., PA-C, Texas (Galveston), Assistant Professor of Physician Assistant Studies  
 STEPHEN BARTOLD, M.D., Michigan, Associate Professor and Medical Director of Physician Studies  
 CASEY C. BILLINGSLEY, MOT, OTR, Texas Woman's, Assistant Professor and Interim Program Director of Occupational Therapy  
 RENEE BOGSCHUTZ, Ph.D., Iowa, Assistant Professor of Communication Disorders  
 JEFFREY L. BOSS, M.S., OTR, Bowie State, Assistant Professor of Occupational Therapy  
 JEAN MICHEL BRISMEE, P.T., M.S., Texas Tech, Assistant Professor of Physical Therapy  
 PAUL P. BROOKE JR., Ph.D., FACHE, Iowa, Professor of Health Care Management and Dean of the School of Allied Health  
 DAVID J. BROOKS, M.S., Oklahoma State, Assistant Professor and Director of Vocational Rehabilitation  
 NANCY CLOPTON, P.T., Ph.D., Texas Tech, Associate Professor of Physical Therapy  
 CHAD COOK, M.B.A., Phoenix, Assistant Professor of Physical Therapy and Regional Chairperson of Physical Therapy  
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NEAL S. LATMAN, Ph.D., Oklahoma State, Associate Professor of Occupational Therapy  
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# Residency Status Determination

**Interpretations of Residence.** It is the duty of each student to register under the proper residence and pay the correct tuition fees. The explanation below of what constitutes a non-resident is intended to assist students in properly determining whether or not they qualify as residents of the state for tuition purposes. If there is any possible question whether or not a student qualifies as a resident of Texas, he or she should consult the office of admissions. For each improper registration there may be a penalty of \$10 per semester in addition to the proper fee. There can be no change in residence status except upon express authorization by the Office of Admissions. *The following State Statutes and Coordinating Board's Rules and Regulations for Determining Residence Status are subject to change respectively by the State Legislature and the State Coordinating Board without notice.* Please refer to the last item of this section for a glossary that explains the terms used in residency interpretation.

## General Residency Rules

### Minors and Dependents

*Statute: Section 54.052(a)(3) "Dependent" means an individual who is claimed as a dependent for federal income tax purposes by the individual's parent or guardian at the time of registration and for the tax year preceding the year in which the individual registers.*

*Section 54.052(c) An individual who is under 18 years of age or is a dependent and who is living away from his family and whose family resides in another state or has not resided in Texas for the 12-month period immediately preceding the date of registration shall be classified as a nonresident student.*

*Section 54.052(d) An individual who is 18 years of age or under or is a dependent and whose family has not resided in Texas for the 12-month period immediately preceding the date of registration shall be classified as a nonresident student regardless of whether he has become the legal ward of residents of Texas or has been adopted by residents of Texas while he is attending an educational institution in Texas, or within a 12-month period before his attendance, or under circumstances indicating that the guardianship or adoption was for the purpose of obtaining status as a resident student.*

*Section 54.055 An individual who is 18 years of age or under or is a dependent and whose parents were formerly residents of Texas is entitled to pay the resident tuition fee following the parents' change of legal residence to another state, as long as the individual remains continuously enrolled in a regular session in a state-supported institution of higher education.*

**Residence of a Minor or a Dependent.** The residence of the person to whom custody was granted by court order (e.g., divorce decree, child custody actions, guardianship or adoption proceedings), provided custody was granted at least 12 months prior to the student's enrollment and was not granted for the purpose of obtaining status as a resident student.

**Custody by Court Order.** If the custody of the minor has been granted by court order (e.g., divorce decree, child custody action, guardianship or adoption proceedings) to some person other than the parent, the residence of that person shall control; provided, however, that such grant of custody was not

ordered during or within a year prior to the minor's enrollment in a public institution of higher education and was granted under circumstances indicating that such guardianship was not for the purpose of obtaining status as a resident student.

**Abandoned Child.** In the case of an abandoned child, the residence of a person who has stood *in loco parentis* for a period of time may determine the residence. The fact of abandonment must be clearly established and must not have been for the purpose of affecting the residence of the minor, and the minor must have actually resided in the home of such person for two years immediately prior to enrolling in a public institution of higher education in Texas and such person must have provided substantially all of the minor's support. In the event that the *in loco parentis* relationship has not existed for the full two year period, a lesser period of time is acceptable in unusual hardship cases, such as death of both parents.

**Orphans.** Orphans who have lived for longer than a year in an established orphans' home in Texas operated by a fraternal, religious, or civic organization and have been graduated from the orphans' home shall be considered residents of Texas provided they reside in Texas from the time of such graduation until they enter an institution of higher education.

**Emancipation.** A minor who has been legally emancipated may establish his or her claim to residency following the rules applicable to independent individuals 18 years of age or older.

**Married Minors.** Minors who are married have the power and capacity of single persons of full age.

**Dependents Whose Parents Moved to Another State or Foreign Country and No Longer Claim Residence in Texas.** If both of the parents of dependents who have been enrolled as resident students move their residence to another state or foreign country, the dependents shall be classified as nonresidents at all subsequent registration periods.

1) Under the provisions of Texas Education Code 54.055, although classified as nonresidents, the dependents will be entitled to pay the resident tuition fee as long as they remain continuously enrolled in a state-supported institution of higher education. Such dependent students must enroll for the next available fall or spring semester immediately following the parents' change of residence to another state.

2) When the parents of dependents who have established their residence in another state or foreign country return and reestablish their residence in Texas the dependents must continue to be classified as nonresidents until the first registration after the parents have resided in the state for a 12-month period.

**Dependents Whose Parents Moved to Another State or Foreign Country But Continue to Claim Texas Residence.**

1) If both of the parents of dependents move to another state or foreign country, or reside outside the state or in a foreign country at the time the dependents enroll in an institution of higher education, but claim residence in Texas, conclusive evidence must be presented that the parents are still claiming residence in the State of Texas and that they have the present intent to return to the state. A certificate from the employer of the parents that the move outside the state was temporary (generally less than five years) and that there are definite plans to return the parents to Texas by a determinable future date will be considered in this connection.

2) Persons who resided in Texas for at least five years prior to moving from the state, and who have returned to the state for residence purposes before having resided out of the state for a year, shall be classified as residents. The parent(s) of dependents must return to the state to live in order for the dependent to be considered a resident.

### Residence of Independent Individuals 18 Years of Age or Older

*Statute: Section 54.052(e) An individual who is 18 years of age or over who has come from outside Texas and who is gainfully employed in Texas for a 12-month period immediately preceding registration in an educational institution shall be classified as a resident student as long as he continues to maintain a legal residence in Texas.*

*Section 54.052(f) An individual who is 18 years of age or over who resides out of the state or who has come from outside Texas and who registers in an educational institution before having resided in Texas for a 12-month period shall be classified as a nonresident student.*

*Section 54.052(g) An individual who would have been classified as a resident for the first five of the six years immediately preceding registration, but who resided in another state for all or part of the year immediately preceding registration, shall be classified as a resident student.*

**Establishment of Residence.** Independent individuals 18 years of age or over who move into the state and who are gainfully employed within the state for a period of 12 months prior to enrolling in an institution of higher education are entitled to classification as residents. An individual who is self employed or employed as a homemaker within the home may be considered gainfully employed for tuition purposes. If such 12 months residence, however, can be shown not to have been for the purpose of establishing residence in the state but to have been for some other purpose, the individuals are not entitled to be classified as residents. Students enrolling in an institution of higher education prior to having resided in the state for 12 months immediately preceding time of enrollment shall be classified as nonresidents for tuition purposes.

**Establishment of Residence For Individuals 18 Years of Age or Older Whose Parents or Court-Appointed Legal Guardians No Longer Claim Them as Dependents For Federal Tax Purposes.** If the parents or legal guardians of an individual 18 years of age or older move out of state and continue to claim the individual as a dependent for tax purposes, the individual continues to have the residence of the parents or guardians. If the individual remains in Texas, he/she may claim residency for tuition purposes as an independent student once 12 months have passed from the end of the last calendar year in which the parents or guardians claimed the student as a dependent.

**Retention of Residence.** If the parents of an individual 18 years of age or older move out of the state and immediately cease claiming the student as a dependent for federal tax purposes, the individual may retain his/her claim to Texas residency for tuition purposes if he/she remains in Texas and begins filing federal income tax returns as an independent student.

### Married Students

*Statute: Section 54.056 A student who is a resident of Texas and who marries a nonresident is entitled to pay the resident tuition fee as long as the student does not adopt the legal residence of the spouse in another state.*

Marriage of a Texas resident to a nonresident does not jeopardize the former's right to pay the resident tuition rate unless the resident has taken steps to claim the out-of-state residence of his or her spouse.

A nonresident who marries a resident of Texas must establish his or her own residency by meeting the standard requirements. (See section relating to Residence of Independent Individuals 18 Years of Age or Older or section relating to Married Minors.)

### Foreign Students

*Statute: Section 54.057(a) An alien who is living in this country under a visa permitting permanent residence or who has applied to or has a petition pending with the Immigration and Naturalization Service to attain lawful status under federal immigration law has the same privilege of qualifying for resident status for fee purposes under this Act as has a citizen of the United States. A resident alien residing in a junior college district located immediately adjacent to Texas Boundary lines shall be charged the resident tuition by that junior college.*

*Section 54.057(b) A nonimmigrant alien who resides in this state in accordance with the Agreement between the Parties to the North Atlantic Treaty Regarding the Status of Their Forces (4 U. S. T. 1792) and the spouse or children of such an alien are residents for tuition and fee purposes under this code.*

*Section 54.052(j) Notwithstanding any other provision of this subchapter, an individual shall be classified as a Texas resident until the individual establishes a residence outside this state if the individual residing with the individual's parent, guardian, or conservator while attending a public or private high school in this state and: (1) graduated from a public or private high school or received the equivalent of a high school diploma in this state; (2) resided in this state for at least three years as of the date the person graduated from high school or received the equivalent of a high school diploma; (3) registers as an entering student in an institution of higher education not earlier than the 2001 fall semester; and (4) provides to the institution an affidavit stating that the individual will file an application to become a permanent resident at the earliest opportunity the individual is eligible to do so.*

**Eligible Aliens.** Aliens living in the United States under a visa permitting permanent residence, and aliens who are permitted by Congress to adopt the United States as their domicile while they are in this country, and aliens who have filed with the proper federal immigration authority a declaration of intent to become a United States citizen have the same privilege of qualifying for Texas resident status for tuition purposes as do citizens of the United States. The Immigration and Naturalization Service has identified the following categories of foreign students as being eligible to establish domicile in the United States, however, if an individual provides proof from the Department of Justice or Immigration and Naturalization Service that the visa he/she holds has been granted eligibility to establish a domicile in the United States, such individuals may be granted the same privileges in establishing Texas Residency for tuition purposes:

- a. is living in this country under a visa permitting permanent residence; or
- b. is permitted by Congress to adopt the United States as his or her domicile, or
- c. has applied to or has a petition pending with the Immigration and Naturalization Service to attain lawful status under federal immigration law, or
- d. has met coordinating Board requirements for being treated as a permanent resident

A foreign individual who enters a Texas institution or higher education in fall 2001 or later is a resident of Texas if he or she:

- a. attended a public or private high school while residing with a parent or legal guardian;
- b. graduated from the high school or received the equivalent of a high school degree in Texas;

- c. resided in Texas for at least three (3) consecutive years as of the date he/she graduated from high school or received the equivalent of a high school degree;
- d. registers as an entering student no earlier than fall 2001; and
- e. provides his/her college an affidavit that he or she intends to file an application to become a permanent resident of the United States at the earliest opportunity the individual is eligible to do so.

A list of eligible visas, along with a discussion of eligible applicants for permanent resident status, is available through the coordinating Board web site at <[www.thecb.state.tx.us](http://www.thecb.state.tx.us)>.

**Family Unity Program.** A noncitizen residing in Texas under the Immigration and Naturalization Service's (INS) Family Unity Program may qualify to pay the resident tuition rate. A noncitizen is eligible to apply for benefits under the Family Unity Program if he or she entered the United States on or before May 5, 1988 and has been residing in the United States since that date; and if he or she was the spouse or unmarried child of a legalized alien as of that date and continues to be so. An individual proving his or her eligibility should provide an institution two Immigration and Naturalization Service forms I-797, one of which indicates an INS-approved "Application for Voluntary Departure under the Family Unity Program," and the other which must indicate either an INS-approved "Immigration Petition for Relative" or a "Visa Petition for Spouse". Since INS may cancel eligibility for the Family Unity Program at any time, it is necessary that institutions confirm the student's current INS status each time he or she registers. To comply with the provisions of the Family Unity Program and qualify to pay resident tuition rates at Texas Institutions, the parent or spouse must have established a domicile in the State of Texas.

\*Students holding I688A and I688B cards are not eligible to establish domicile in the United States.

### Reclassification

*Section 54.054 A nonresident student classification is presumed to be correct as long as the residence of the individual in the state is primarily for the purpose of attending an educational institution. After residing in Texas for at least 12 months, a nonresident student may be reclassified as a resident student as provided in the rules and regulations adopted by the Coordinating Board, Texas College and University System. Any individual reclassified as a resident student entitled to pay the tuition fee for a resident of Texas at any subsequent registration as long as he continues to maintain his legal residence in Texas.*

**Reclassification.** Persons classified as nonresidents upon first enrollment in an institution of higher education are presumed to be nonresidents for the period during which they continue as students. Students classified as nonresident students shall be considered to retain that status until they make written application for reclassification in the form prescribed by the institution and are officially reclassified in writing as residents of Texas for admissions and tuition purposes by the proper administrative officers of the institution. Application for reclassification must be submitted prior to the official census date of the relevant term. If such nonresident students withdraw from school and reside in the state while gainfully employed for a period of 12 consecutive months, upon reentry into an institution of higher education they will be entitled to be reclassified as residents for tuition purposes if other evidence indicates they have established a domicile in the State of Texas. Accumulations of summer and other vacation periods do not satisfy this requirement.

If such nonresident students enroll while gainfully employed for a period of 12 consecutive months, they shall be considered for reclassification as residents for tuition purposes if other evidence indicates they have established a domicile in the State of Texas. Material to the determination of the establishment of a domicile in Texas are business or personal facts or actions unequivocally indicative of a fixed intention to reside permanently in the state. Such facts shall include, but are not limited to:

- (1) the length of residence and employment prior to enrolling in the institution;
- (2) the nature of employment while a student;
- (3) presence in Texas as a part of a household transferred to the state by an employer or as part of a household moved to the state to accept employment offered in Texas;
- (4) purchase of a homestead, or
- (5) dependency upon a parent or legal guardian who has resided in Texas for at least 12 consecutive months immediately preceding the student's enrollment.

All of these facts are weighed in the light of the fact that a student's residence while in school is primarily for the purpose of education and not to establish residence, and that decisions of an individual as to residence are generally made after the completion of an education and not before. A person who moves to Texas as the spouse of an individual transferred here by the military (see section relating to Military Personnel, Veterans, and Commissioned Officers of the Public Health Service), through the state's plan for economic development and diversification (see section relating to Economic Development and Diversification Employees) or as a part of a household moved to the state to accept employment offered in Texas, is considered not to have come to Texas for the purpose of going to school. Therefore, once he or she has physically resided in Texas for 12 consecutive months, even though the student may have been enrolled full time, the person may be considered a resident if he or she has otherwise established a domicile in the state.

**Loss of Residence.** Residents who move out of state will be classified as nonresidents immediately upon leaving the state, unless their move is temporary (generally less than five years) and residence has not been established elsewhere. Conclusive evidence must be provided by the individuals supporting their present intent to return to the state. Among other things, a certificate from the employer that the move outside the state is temporary and that a definite future date has been determined for return to Texas may qualify as proof of the temporary nature of the time spent out of state. Internship programs as part of the academic curriculum that require the student to return to the school may qualify as proof of the temporary nature of the time spent out of state.

**Reestablishment of Residence.** Persons who resided in Texas for at least five years prior to moving from the state, and who have returned to the state for residence purposes before having resided out of the state for a year, shall be classified as residents.

**Application for Reclassification.** Students classified as nonresident students shall be considered to retain that status until they make written application for reclassification in the form prescribed by the institution and are officially reclassified in writing as residents of Texas by the proper administrative officers of the institution.

**Reclassification as a Nonresident.** Persons who have been classified as residents of Texas shall be reclassified as nonresident students whenever they shall report, or there is found to exist, circumstances indicating a change in residence to another state. If students who have been classified as residents of



Texas are found to have been erroneously classified, those students shall be reclassified as nonresidents and shall be required to pay the difference between the resident and nonresident tuition for those semesters in which they were so erroneously classified.

**Reclassification as a Resident.** If students have been erroneously classified as nonresident students and subsequently prove to the satisfaction of the appropriate officials of an institution of higher education that they should have been classified as resident student, they shall be reclassified as residents of Texas and may be entitled to a refund of the difference between the resident and nonresident fees for the semesters in which they were so erroneously classified. Normally the refunds must be requested and substantiated during the current term.

## Exceptions to Basic Residency Rules

### Military Personnel and Veterans and Commissioned Officers of the Public Health Service

*Statute: Section 54.058(a) Military personnel are classified as provided by this section.*

*Section 54.058(b) A person who is an officer, enlisted person, selectee, or draftee of the Army, Army Reserve, Army National Guard, Air National Guard, Air Force, Air Force Reserve, Navy, Navy Reserve, Marine Corps, Marine Corps Reserve, Coast Guard, or Coast Guard Reserve of the United States, who is assigned to duty in Texas and the spouse and children of such an officer, enlisted person, selectee, or draftee are entitled to register in a state institution of higher education by paying the tuition fee and other fees or charges required of Texas residents, without regard to the length of time the officer, enlisted person, selectee, or draftee has been assigned to duty or resided in the state. However, out-of-state Army National Guard or Air National Guard members attending training with Texas Army or Air National Guard units under National Guard Bureau regulations may not be exempted from nonresident tuition by virtue of such training status nor may out-of-state Army, Air Force, Navy, Marine Corps, or Coast Guard Reserves training with units in Texas under similar regulations be exempted from nonresident tuition by virtue of such training status. It is the intent of the legislature that only those members of the Army or Air National Guard or other reserve forces mentioned above be exempted from the nonresident tuition fee and other fees and charges only when they become members of Texas units of the military organizations mentioned above.*

*Section 54.058(c) As long as they reside continuously in Texas, the spouse and children of a member of the Armed Forces of the United States who has been assigned to duty elsewhere immediately following assignment to duty in Texas are entitled to pay the tuition fees and other fees or charges provided for Texas residents.*

*Section 54.058(e) A Texas institution of higher education may charge to the United States Government the nonresident tuition fee for a veteran enrolled under the provisions of a federal law or regulation authorizing education or training benefits for veterans.*

*Section 54.058(f) The spouse and children of a member of the Armed Forces of the United States who dies or is killed are entitled to pay the resident tuition fee, if the wife and children become residents of Texas within 60 days of the date of death.*

*Section 54.058(g) If a member of the Armed Forces of the United States is stationed outside Texas and his spouse and children establish residence in Texas by residing in Texas*

*and by filing with the Texas institution of higher education at which they plan to register a letter of intent to establish residence in Texas, the institution of higher education shall permit the spouse and children to pay the tuition, fees, and other charges provided for Texas residents without regard to length of time that they have resided within the State.*

**Legal Residence—General Rule of Domicile For Members of the Military.** Persons in military service and commissioned Public Health Service officers are presumed to maintain during their entire period of active service the same domicile which was in effect at the time of entering the service. Persons stationed in a state for or Public Health Service are presumed not to establish a domicile in that state because their presence is not voluntary but under military or Public Health Service orders.

**Change of Domicile.** It is possible for members of the military service or Public Health Service to abandon the domicile of original entry into the service and to select another, but to show establishment of a new domicile during the term of active service, there must be clear and unequivocal proof of such intent including evidence of abandonment of domicile of original entry, evidence of establishment of a domicile in Texas, and proof that Texas has remained the individual's domicile when stationed outside of Texas after having established Texas as his or her domicile. Abandonment of domicile of original entry is evidenced by the establishment of a domicile in Texas.

Establishment of a domicile in Texas requires 12 consecutive months assignment to the state, during which the military member must simultaneously file the appropriate documentation to change his or her military records to reflect Texas as the state of legal residence. Other actions may be considered in determining whether a domicile has been established in Texas. If four of the following actions have been taken by the military member at least 12 consecutive months immediately prior to the date of enrollment and continue to be in effect, the member has established a domicile in Texas:

- (1) purchasing a residence and claiming it as a homestead,
- (2) registering to vote and voting in local elections,
- (3) registering automobiles in Texas and paying personal property taxes thereon,
- (4) maintaining a Texas driver license,
- (5) maintaining checking accounts, savings accounts, or safe deposit boxes in Texas,
- (6) having wills or other legal documents that indicate residence in Texas,
- (7) having membership in professional organizations or other state organizations, and/or
- (8) establishing a business in Texas.

To prove Texas has remained as his or her domicile when stationed outside of Texas, and individual must provide evidence that he or she was a Texas resident upon entry into the service and that Texas continues to be his or her state of record with the military. If he or she has established a domicile in Texas while in the service in accordance with the above conditions, the member must currently meet at least three of the following criteria in order to qualify to pay the resident tuition rate at a public institution of higher education:

- (1) owning a residence in Texas and claiming it as a homestead,
- (2) registering to vote and voting in Texas elections,
- (3) registering automobiles in Texas and paying personal property taxes thereon,
- (4) maintaining checking accounts, savings accounts, or safe deposit boxes in Texas,

- (5) maintaining a Texas driver's license, and/or
- (6) having wills or other legal documents indicate legal residence in Texas.

**Eligibility of Nonresident Military Personnel, Commissioned Public Health Service Officers, and Their Spouses and Their Dependents.**

Eligibility of nonresident military personnel, commissioned Public Health Service Officers, and their spouses and their dependents. Certain military and Public Health Service personnel, spouses and dependent children classified as nonresidents are entitled to pay the resident tuition regardless of their length of residence in Texas if they comply with the following provisions of the statute.

**Status of Military Personnel, Commissioned Public Health Service Officers, and Their Spouses and Dependents Stationed in Texas.** Education Code 54.058(b) provides that military personnel assigned to duty within the state of Texas, their spouse and their dependent children, shall be entitled to pay the same tuition as a resident of Texas regardless of the length of their physical presence in the state. To be entitled to pay resident tuition, such military personnel shall submit at least once per 12 month academic year as defined by the institution a statement from an appropriately authorized officer in the service certifying that they are then assigned to duty in Texas and that same will be in effect at the time of such enrollment in a public institution of higher education. This same provision also applies to commissioned Public Health Service officers and their spouses and their dependents. This subsection also provides that nonresident members of an out-of-state National Guard unit who are temporarily training with a Texas National Guard unit will not be entitled to pay the resident tuition.

**Status of Spouses and Dependents of Military Personnel or Commissioned Public Health Service Officers Reassigned Out-of-State.** Texas Education Code 54.058(c) provides that if they reside continuously in the State of Texas, the spouse and dependent children of members of the armed forces previously assigned to active duty in Texas, but reassigned to duty outside the state of Texas may pay resident tuition rates. This provision also applies to spouses and dependents of commissioned Public Health Service officers.

**Status of Spouses and Dependents of Military Personnel or Commissioned Public Health Service Officers Stationed in Out-of-State Locations.** Texas Education Code 54.058(g) provides that the spouse and dependent children of members of the armed forces who are assigned to duty outside the State of Texas may be entitled to pay the resident tuition if they reside in Texas and file with the public institution of higher education at which a child or spouse plans to register a letter of intent, an affidavit, or other evidence satisfactory to the institution stating they intend to become permanent residents of Texas. This provision also applies to commissioned Public Health Service officers and their spouses and their dependents.

**Status of Spouses and Dependents of Military Personnel or Commissioned Public Health Service Officers Once Stationed in Texas But Now Stationed in Out-of-State Locations.** Texas Education Code 58.058 (d) provides that a spouse or dependent child of a member of the Armed Forces of the United States, who is not assigned to duty in Texas but who has previously resided in Texas for a 12-month period, is entitled to pay the tuition fees and other fees or charges provided for Texas residents at a state institution of higher education if the member:

- (a) at least one year preceding the first day of the term or semester executed a document with the applicable military service that is in effect on the first day of the term or semester and that:
  - (i) indicates that the member's permanent residence address is in Texas and
  - (ii) designates Texas as the member's place of legal residence for income tax purposes;
- (b) has been registered to vote in Texas for the entire year preceding the first day of the term or semester, and
- (c) satisfies at least one of the following
  - (i) for the entire year preceding the first day of the term or semester has owned real property in Texas and in that time has not been delinquent in the payment of any taxes on the property;
  - (ii) has had an automobile registered in Texas for the entire year preceding the first day of the term or semester, or
  - (iii) at least one year preceding the first day of the term or semester executed a will that has not been revoked or superseded indicating that the member is a resident of this state and deposited the will with the county clerk of the county of the member's residence under Section 71, Texas Probate Code.

**Status of Spouses and Dependents of Military Personnel or Commissioned Public Health Service Officers Who Die While in Service.** Texas Education Code 54.058(f) provides that members of the immediate family (which includes spouse or dependent children) of members of the armed forces who die while in military service or public health service may qualify to pay the resident tuition if they become residents of Texas within 60 days of the date of death. To qualify under this provision, the students shall submit to the institution of higher education satisfactory evidence establishing the date of death and residence in Texas. This provision also applies to commissioned Public Health Service officers and their dependents.

**Nonresidents Attending College Under Federal Benefits Programs for Veterans.** Texas Education Code 54.058(e) provides that the public institution of higher education may charge the nonresident tuition fee for nonresident veterans to the United States government under the provisions of any federal law or regulation authorizing educational or training benefits for veterans.

**Residence Classification Upon Separation from Military or Public Health Service.**

**Waiver of Nonresident Tuition for Veterans or Commissioned Public Health Service Officers Upon Separation from Military or Public Health Service.** A former member of the Armed Forces of the United States or the former member's spouse or dependent child is entitled to pay the tuition fees and other fees or charges provided for Texas residents for any term or semester at a state institution of higher education that begins before the first anniversary of the member's separation from the Armed Forces if the former member has retired or been honorably discharged from the Armed Forces and has complied with the requirements of subsection 21.28 (f)(4) of this section.

**Students Enrolled in ROTC Programs.** A nonresident student who is a member of an ROTC unit will be required to pay nonresident tuition rates until such time the student has signed a contract which cannot be terminated by the student and which obligates the student to serve a period of active military duty.

**NATO Forces Stationed in Texas.** Nonresident aliens stationed in Texas in keeping with the agreement between the parties to the North Atlantic Treaty regarding status of forces, their spouses, and dependent children are entitled to pay the same tuition rate at public institutions of higher education as residents of Texas.

**Other Federal Employees.** The privilege of paying resident tuition rates described in this section is restricted to persons in the military service and commissioned officers of the Public Health Service, and is not extended to other federal employees.

**Civilian Employees of the Military.** The privilege of paying resident tuition rates described in this section is restricted to persons in the military service and commissioned officers of the Public Health Service, and is not extended to civilians employed by the military or the Public Health Service.

A nonresident who marries a resident of Texas who is in the military must establish his or her own residency by meeting the standard requirements as stated in this title (relating to married students).

### Teachers, Professors, and Their Dependents

*Statute: Section 54.059 A teacher or professor of an institution of higher education, and the spouse and children of such a teacher or professor, are entitled to register in an institution of higher education by paying the tuition fee and other fees or charges required for Texas residents without regard to the length of time the teacher or professor has resided in Texas. A teacher or professor of an institution of higher education and the teacher's or professor's family are entitled to the benefit of this section if the teacher or professor is employed at least one-half time on a regular monthly salary basis by an institution of higher education.*

Teachers and professors employed at least half time on a regular monthly salary basis (not an hourly employee) by any Texas public institution of higher education may pay the same tuition as a resident of Texas for themselves, their spouses, and their dependent children, regardless of the length of residence in the state. If the spouse or children attend an institution other than the one employing the teacher or professor, they must provide proof of his or her current employment to the college they attend. It is the intent of this rule that employment be for the duration of the period of enrollment for which a waiver is awarded.

### Students Employed as Teaching or Research Assistants

*Statute: Section 54.063 A teaching assistant or research assistant of any institution of higher education and the spouse and children of such a teaching assistant or research assistant are entitled to register in a state institution of higher education by paying the tuition fees and other fees or charges required for Texas residents under Section 54.051 of this code, without regard to the length of time the assistant has resided in Texas, if the assistant is employed at least one-half time in a teaching or research assistant position which relates to the assistant's degree program under rules and regulations established by the employer institution.*

Students employed as teaching or research assistants employed at least half time by any public institution of higher education in a degree program-related position may pay the same tuition while attending any public institution of higher education as a resident of Texas for themselves, their spouses, and their dependent children, regardless of the length of residence in the state. The institution which employs the students shall

determine whether or not the students' jobs relate to their degree programs. If the spouse or children attend an institution other than the one employing the research or teaching assistant, they must provide proof of his or her current employment to the college they attend. It is the intent of this rule that employment be for the duration of the period of enrollment for which a waiver is awarded.

### Scholarship Recipients

*Statute: Section 54.064(a) A student who holds a competitive scholarship of at least \$1,000 for the academic year or summer for which the student is enrolled and who is either a nonresident or a citizen of a country other than the United States of America is entitled to pay the fees and charges required of Texas residents without regard to the length of time the student has resided in Texas. The student must compete with other students, including Texas residents, for the scholarship and the scholarship must be awarded by a scholarship committee officially recognized by the administration and be approved by the Texas Higher Education Coordinating Board under criteria developed by the board. Section 54.064(b) The total number of students at an institution paying resident tuition under this section for a particular semester may not exceed five percent of the total number of students registered at the institution for the same semester of the preceding academic year.*

*Statute: Section 54.065 A student is entitled to pay the fees and charges required of Texas residents without regard to the length of time the student has resided in Texas if the student: (1) holds a competitive academic scholarship or stipend; (2) is accepted in a clinical and biomedical research training program designed to lead to both doctor of medicine and doctor of philosophy degrees; and (3) is either a nonresident or a citizen of a country other than the United States of America.*

**Competitive Academic Scholarship Recipients.** Certain students receiving competitive scholarships may be exempted from paying nonresident tuition rates.

#### Approved Procedures for Awarding Scholarships.

Each institution awarding nonresident tuition waivers based on competitive scholarships shall have in the appropriate office of the institution a memo from the institution's administration granting the scholarship committee the authority to award scholarships which hold a nonresident tuition waiver option. In addition, the scholarship committee shall maintain records which verify that residents as well as nonresidents were eligible to compete for the scholarship and the criteria used to select scholarship recipients.

To qualify for exemption from paying nonresident tuition rates students nonresidents (including citizens and permanent residents of the U.S. and all foreign students) must be awarded competitive scholarships totaling at least \$1,000 for the academic year, the summer session or both by an official scholarship committee or committees of the public institution of higher education they are attending. If nonresidents or foreign students in competition with other students, including Texas residents, obtain these competitive scholarships, the students may pay the same tuition as a resident of Texas during the registration period in which the competitive scholarship is in effect. In order for a competitive scholarship to qualify a student to pay the resident rate, both the funds and the selection process must be under the control of the institution. At the time the competitive scholarship is made, the institution must designate the term or terms of the current 12-month academic year as defined by the institution in which the scholarship will be in effect. Scholarship funds need not be disbursed in each term covered by the



scholarship and waiver, but documentation for the scholarship must define the relevant time period for the scholarship. The waiver's time period will be the same as that of the scholarship. If the scholarship is terminated for any reason, the waiver shall also cease as of the end of the enrollment period in which the scholarship is terminated. An institution shall not waive non-resident tuition on the basis of competitive scholarship for more than five percent of its total enrollment in the corresponding semester or term of the previous academic year. If the recipient of the scholarship is concurrently enrolled at more than one institution, the waiver of nonresident tuition is only effective at the institution awarding the scholarship.

Beginning with awards for fall 1998, institution of higher education that offer competitive scholarships shall adopt a written policy describing the factors to be used by the institution or unit making an award. A policy adopted under this section shall be published in the institution's or unit's catalog and shall be made available to the public in advance of any deadline for the submission of an application for a competitive scholarship to which the policy applies.

A nonresident or foreign student is eligible to pay the fees and charges required of Texas residents if the student holds a competitive academic scholarship or stipend and is accepted in a clinical biomedical research training program designed to lead to both a doctor of medicine and doctor of philosophy degree.

A nonresident student who is simultaneously enrolled in two or more institutions of higher education under a program offered jointly by the institutions under a partnership agreement and who pays the fees and charges required of Texas residents at one of the institutions as provided by the Texas Education Code, Section 54.064 because the student holds a competitive scholarship is entitled to pay the fees and charges required of Texas residents at each public institution of higher education in which the student is simultaneously enrolled under the program.

### **Economic Development and Diversification Program**

*Section 54.052(h) An individual who has come from outside Texas and registered in an educational institution before having resided in Texas for a 12-month period immediately preceding the date of registration is entitled to pay the tuition fee and other fees required of Texas residents if the individual or a member of his family has located in Texas as an employee of a business or organization that became established in this state as part of the program of state economic development and diversification authorized by the constitution and laws of this state and if the individual files with the Texas institution of higher education at which he registers a letter of intent to establish residency in Texas.*

**Economic Development and Diversification Employees.** Nonresidents, (including citizens and permanent residents of the U.S. and foreign students eligible to domicile in the United States, but excluding foreign students ineligible to domicile in the U.S.) whose families have been transferred to Texas by a company in keeping with the state's Economic Development and Diversification Program are entitled (although still nonresidents) to pay the resident tuition rate as soon as they move to Texas if they provide the college a letter of intent to establish Texas as their home. If a semester begins before the rest of the family moves to the state, the student may register and pay the resident tuition rate if he/she provides the college a letter from the company, indicating the family will move to Texas prior to the end of the given semester. However, in order to pay resident tuition for a second semester, the student will have to give the college a letter from the company, indicating the

family has, indeed, moved to Texas. After the family has resided in Texas 12 months, the student is eligible to apply for reclassification as a resident. A current list of eligible companies is maintained on the Coordinating Board web site at <[www.collegefortexans.com](http://www.collegefortexans.com)>.

## **Special Programs**

### **Residents of a State Bordering Texas**

*Statute: Section 54.060(a) Resident of Bordering State or Nation: Tuition. The nonresident tuition fee prescribed in this chapter does not apply to a nonresident student who is a resident of Arkansas, Louisiana, New Mexico, or Oklahoma and who registers in a public upper-level institution of higher education, Lamar State College-Orange, Lamar State College-Port Arthur, a Texas public junior college or public technical institute that is situated in a county immediately adjacent to the state in which the nonresident student resides. The nonresident tuition fee prescribed by this chapter does not apply to a nonresident student who is a resident of New Mexico or Oklahoma and who registers in a public technical institute that is situated in a county that is within 100 miles of the state in which the nonresident student resides and who is admitted for the purpose of utilizing available instructional facilities. The nonresident student described in this subsection shall pay an amount equivalent to the amount charged a Texas student registered at a similar school in the state in which the nonresident student resides. For purposes of this subsection, "public upper-level institution of higher education" means an institution of higher education that offers only junior-level and senior-level courses or only junior-level, senior-level, and graduate-level courses.*

*Section 54.060(b) The foreign student tuition fee prescribed in this chapter does not apply to a foreign student who is a resident of a nation situated adjacent to Texas, who registers in any general academic teaching institution, as defined in Section 61.003(3) of this code, or component of the Texas State Technical College System in a county immediately adjacent to the nation in which the foreign student resides or who registers for lower division courses at a community or junior college having a partnership agreement pursuant to Subchapter N, Chapter 51, of this code, with an upper-level university and both institutions are located in the county immediately adjacent to the nation in which the foreign student resides, or who registers in Texas A&M University-Kingsville, or Texas A&M University-Corpus Christi, and, except as provided by this subsection, and who demonstrates a financial need after the financial resources of the foreign student and the student's family are considered. The foreign student described in this subsection shall pay tuition equal to that charged Texas residents under Sections 54.051 and 54.0512 of this code. The Coordinating Board shall adopt rules governing the determination of financial need of students under this subsection and rules governing a pilot project to be established at general academic teaching institutions and at components of the Texas State Technical College System in counties that are not immediately adjacent to the nation in which the foreign student resides.*

*Section 54.060(f) The nonresident tuition fee prescribed by this chapter does not apply to a nonresident student who is a resident of a county or parish of Arkansas, Louisiana, New Mexico, or Oklahoma that is adjacent to this state and who registers in an institution of higher education as defined by Section 61.003, the governing board of which has agreed to admit the student at the resident tuition fee prescribed by*

*this chapter. The state in which the student resides must allow a resident of a county of this state that is adjacent to that state to register in a public institution of higher education in that state at the tuition fee charged residents of that state. The student shall pay tuition equal to that charged residents of this state at the institution.*

**Residents of a Bordering State.** Nonresidents who are residents of a state of the United States bordering Texas and who register in a public upper-level institution of higher education, two-year institution in the Lamar University System, or in any Texas public technical college or public junior college situated in a county immediately adjacent to the state in which the nonresident student resides are entitled to pay an amount equivalent to the amount charged a Texas student registered at a similar school in the bordering state. However, the amount paid by the nonresident for tuition may not be less than the amount charged Texas residents to attend the Texas institution.

Nonresidents who are residents of New Mexico or Oklahoma and who register in a public technical college that is situated in a county within 100 miles of the state in which the nonresident student resides are entitled to pay an amount equivalent to the amount charged a Texas student registered at a similar school in the bordering state. However, the amount paid by the nonresident for tuition may not be less than the amount charged Texas residents to attend the Texas institution.

The admitting Texas public junior college, public technical college, public senior upper-level institution, or two-year institution in the Lamar University System must have on file a copy of a letter from the Chief Executive Officer of the comparable neighboring state institution which certifies that eligible Texas residents are entitled to pay in-state tuition at the comparable neighboring institution. To be valid, the certifying letter must have been issued no longer than two years before the start of the involved enrollment period; also, a copy of the letter must be filed with the Texas Higher Education Coordinating Board.

**Citizens of Mexico.** Residents of Mexico are those individuals who currently live in Mexico and individuals who are living outside of Mexico temporarily and with definite plans to return. Students planning to stay in the United States indefinitely are not residents of Mexico. A citizen of Mexico who registers for instruction offered by a general academic teaching institution or component of the Texas State Technical College System in a county bordering Mexico or who registers for lower division courses at a community or junior college having a partnership agreement pursuant to Texas Education Code Subchapter N, Chapter 51, with an upper-level university and both institutions are located in the county immediately adjacent to the nation in which the foreign student resides, or who registers at Texas A&M University-Kingsville or Texas A&M-Corpus Christi is eligible to pay tuition equal to that charged Texas residents provided the student demonstrates a financial need after the resources of the student and the student's family have been considered.

General academic teaching institutions other than Texas A&M University-Kingsville and components of the Texas State Technological College System, located in counties which are not adjacent to Mexico, may allow a limited number of citizens of Mexico who demonstrate financial need to register and pay the Texas resident rate at their institution. The number of such students each institution may enroll in any one term is not to exceed two (2) eligible students per thousand of enrollment of the institution's total enrollment in that term. Institutions with fewer than 5,000 students may enroll up to ten (10) eligible students.

### **Residents of Adjacent Counties of Bordering States.**

A nonresident student who is a resident of a county or parish of Arkansas, Louisiana, New Mexico or Oklahoma that is adjacent to this state and who registers in a Texas public institution of higher education, the governing board of which has agreed to admit the student at the resident tuition fee prescribed by this chapter, shall pay tuition equal to that charged residents of this state at the institution. The state in which the student resides must allow a resident of a county of this state that is adjacent to that state to register in a public institution of higher education in that state at the tuition fee charged residents of that state.

The admitting Texas institution must have on file a copy of a letter from the Chief Executive Officer of a neighboring state public institution which certifies that eligible Texas residents are entitled to pay in-state tuition at the neighboring state institution or, a copy of a memorandum from the board that such a letter has been provided by a Texas institution and is on file at the board. To be valid, the certifying letter must have been issued no longer than two years before the start of the involved enrollment period; also, a copy of the letter must be filed with the Texas Higher Education Coordinating Board. For the Coordinating Board memorandum to justify a waiver, the student's enrollment period must fall within the eligibility period indicated in the memorandum by the board.

If a dependent student's family or an independent student from a bordering state moves to Texas after the student has received a waiver of nonresident tuition based on reciprocity as described in this section, the student is eligible for a continued waiver for the 12-month period after the relocation to Texas. After that time, however, the student shall be reclassified as a nonresident unless he or she applies for reclassification and proves he or she has become a resident in keeping with these rules.

### **Junior College Tuition Waivers for Ad Valorem Tax Payers**

The governing board of a public junior college district may allow a person who resides outside the district and who owns property subject to *ad valorem* taxation by the district, or a dependent of the person, to pay tuition at the rate applicable to a student who resides in the district.

The governing board of a public junior college district may allow a person who resides outside the district and in the taxing district of a contiguous public junior college district to pay tuition and fees at the rate applicable to a student who resides in the district.

The governing board of a public junior college district may allow a person who resides outside the district to pay tuition and fees at a rate less than the rate applicable to other persons residing outside the district, but not less than the rate applicable to a student who resides in the district, if the person:

- (1) resides within the service area of the district;
- (2) does not reside in an independent school district that meets the criteria of the coordinating board for the establishment of a junior college district under the Texas Education Code, Section 130.013 and
- (3) demonstrates financial need in accordance with rules adopted by the Texas Higher Education Coordinating Board.

## Responsibilities of Students and Schools

### Student Responsibilities

Statute: Section 54.0521 Oath of Residency. (a) Before an individual may register at an institution of higher education paying tuition at the rate provided for residents, the individual must affirm under oath to the appropriate official at the institution that the individual is entitled to be classified as a resident for purposes of tuition.

Section 54.0521(b) If the institution later determines that the individual was not entitled to be classified as a resident at the time of the individual's registration, the individual shall, not later than 30 days after the date the individual is notified of the determination, pay to the institution the amount the individual should have paid as a nonresident.

Section 54.0521(c) If the individual fails to make a timely payment as required by this section, the individual is not entitled to receive a transcript or to receive credit for courses taken during the time the individual was falsely registered as a resident student.

**Oath of Residency.** When completing the oath of residency portion of an application for admission process, the student is responsible for registering under the proper residence classification and for providing documentation as required by the public institution of higher education. If there is any question as to the right to classification as a resident of Texas it is the student's obligation, prior to or at the time of enrollment, to raise the question with the administrative officials of the institution in which they are enrolling for official determination. Students classified as Texas residents must affirm the correctness of that classification as a part of the admissions procedure. If the student's classification as a resident becomes inappropriate for any reason, it is the responsibility of the student to notify the proper administrative officials at the institution. Failure to notify the institution constitutes a violation of the oath of residency and will result in disciplinary action.

### Responsibilities of the Public Institutions of Higher Education

#### Review of Enrollment and/or Registration Forms.

Each public institution of higher education is responsible for reviewing enrollment and/or registration applications for errors, inconsistencies or misclassifications of residency status. Institutions should obtain written documentation to resolve any problems noted during the review of forms.

#### Affirmation of Residence for Returning Students.

When independent students classified as residents have been out of school for 12 months or more, an institution may continue the students' classification as residents upon receipt of affirmations from the students that they have not changed their state of residence since their last enrollment at that institution, provided the institution has documentation of residence status on file. When dependent students classified as residents have been out of school for 12 months or more, an institution may continue the students' classification as residents upon receipt of affirmations from the students that their parents or legal guardians have not changed their state of residence since the student's last enrollment at that institution, provided the institution has documentation of residence status on file.

**Oath of Residency.** Each public institution is responsible for incorporating a core of residency questions and an oath of residency into its student application for admission process. The required core of questions will be developed by the Coordinating Board staff with the assistance of an advisory committee.

Answers to the questions should then be reviewed to determine the student's proper residency classification. If any of the answers raise questions as to the appropriateness of classification, the institution must file and maintain a copy of one or more appropriately dated documents which will certify that the student classified as a resident has legal right to such classification as of the official census date of the semester or term for which enrolling. However, documents which cannot legally or conveniently be reproduced should be observed by an official of the institution and pertinent information about the document should be noted and signed by the observing officer. Such notations should be maintained in the school's records for audit purposes. Documents acceptable for this purpose include, but are not limited to:

- (1) Texas high school transcript for the full senior year immediately preceding the full semester enrolled.
- (2) Texas college or university transcript (in conjunction with other documents from the institution).
- (3) Employer statement of date of employment.
- (4) Permanent driver's license (at least one year old). The license expiration date minus date of enrollment should not exceed three years.
- (5) Texas voter registration.
- (6) Lease agreement which includes student's name and period covered.
- (7) Property tax payments for the year preceding enrollment.
- (8) Canceled checks.
- (9) Utility bill for the year preceding enrollment.
- (10) A signed, dated, and notarized comprehensive residence questionnaire.
- (11) (For aliens) Proof of permanent residence classification which is eligible for the establishment of a domicile in Texas.
- (12) An income tax form or, (if current year federal tax form has not been filed) a signed, notarized statement regarding the student's independence or regarding the individual(s) who claim the student as a dependent.
- (13) A current credit report which documents the student's length and place of residence.
- (14) Other third party documentation which confirms residency status for the 12-month period preceding enrollment.
- (15) For a homeless individual, documentation may consist of written statements from the office or one or more legitimate social service agencies located in Texas, attesting to the provision of services to the individual over the previous 12-month period.

### Penalties

*Statute: Section 54.053 The governing board of each institution required by this Chapter to charge a nonresident tuition or registration fee is subject to the rules, regulations, and interpretations issued by the Coordinating Board, Texas College and University System, for the administration of the nonresident tuition provisions of this Act. The rules, regulations and interpretations promulgated by the Coordinating Board shall be furnished to the presidents or administrative heads of all Texas public senior and junior colleges and universities.*

*Section 54.061 The governing board of an institution of higher education may assess and collect from each nonresident student who fails to comply with the rules and regulations of the boards concerning nonresident fees a penalty not to exceed \$10 a semester.*



**Student Compliance with Institutional Rules and Regulations.** Each institution has been authorized by statute to assess and collect from nonresident students failing to comply with the provisions of the tuition statute and with these interpretations concerning nonresident fees a penalty not to exceed \$10 a semester. In addition, if students have obtained residence classification by virtue of deliberate concealment of facts or misrepresentation of fact, they may be subject to appropriate disciplinary action, in accordance with the rules and regulations that may be adopted by the governing boards of the respective institutions of higher education.

## Glossary

The following words and terms, when used in this subchapter, shall have the following meanings, unless the context clearly indicates otherwise:

**Competitive Scholarship.** A scholarship which is designated as competitive by the institution, whose sum either singularly or in combination with other competitive scholarships totals the amount named in Texas Education Code 54.064, that is publicized and open to all students including Texas residents, and which has been selected by the institution to be a basis for the waiver of nonresident tuition charges.

**Conclusive Evidence.** Proof which removes uncertainties. In the case of proving residency, conclusive evidence may include but is not limited to the purchase of a homestead with substantial down-payment, significant employment, and business or personal ties in the state which imply a fixed intent to remain in Texas.

**Dependent.** An individual (minor or 18 years of age or older) who is claimed as a dependent for federal income tax purposes by a parent or guardian the year of enrollment and the tax year prior to enrollment.

**Domicile in Texas.** Physically residing in Texas for at least 12 consecutive months with the intent to make Texas one's permanent home. The burden of proof that a domicile has been established lies with the student.

**Foreign Students.** Aliens who are not permanent residents of the United States or have not been permitted by Congress to adopt the United States as their domicile while they are in this country.

**Gainful Employment.** Lawful activities intended to provide an income to the individual or allow an individual to avoid the expense of paying another person to perform the tasks (as in child care or the maintenance of a home). A person who is self-employed, employed as a homemaker, or who is living off his/her earnings may be considered gainfully employed for tuition purposes, as may an individual whose primary support is the government (for instance, through a public assistance program).

**Homeless Individual.** A homeless individual who resides in Texas for the 12-month period immediately preceding the date of registration, but who does not have a permanent residence in Texas, may enroll in vocational education courses at a public junior college by paying the resident tuition rate. For this purpose, a homeless individual is defined by 42 U.S.C. Section 11302, which states, "the term homeless" or "homeless individual" or "homeless person" includes:

- (1) an individual who lacks a fixed, regular, and adequate night time residence; and
- (2) an individual who has a primary night time residence that is
  - (a) a supervised publicly or privately operated shelter designed to provide temporary living accommodation;

- (b) an institution that provides temporary residence for individuals intended to be institutionalized; or
- (c) a public or private place not designated for, or ordinarily used as, a regular sleeping accommodation for human beings.

Documentation for a homeless individual may consist of written statements from the office of one or more legitimate social service agencies located in Texas, attesting to the provision of service to the homeless individual over the previous 12-month period.

**Independent Student.** A student 18 years of age or older or an emancipated minor who is not claimed by a parent or a guardian as a dependent for federal income tax purposes during the tax year including the enrollment period.

**Minor.** An individual who is 17 years of age or younger.

**Nonresident.** A citizen, national or permanent resident of the United States or an alien who has been permitted by Congress to adopt the United States as his or her domicile while in this country and who has not met the state requirements for establishing residency for tuition purposes.

**Official Census Date.** The official reporting date for enrollments; the date upon which the student (by virtue of having obligated him/herself to pay requisite tuition and/or fees) is considered to be enrolled in the institution. (For 16-week semesters, the 12th class day; for 6-week summer sessions, the 4th class day. For other length programs, consult the Reporting and Procedures Manual, published by the Educational Data Center of the Coordinating Board.)

**Out-of-District Student.** A Texas resident who does not physically reside within the geographic boundaries of the classifying public junior college district.

**Prior to Enrolling.** Prior to or including the official census date.

**Public Institution of Higher Education.** State-supported institutions of higher education, including public junior and community colleges, public senior colleges and universities, public health science centers and the Texas State Technical Institutes.

**Resident.** A citizen, national or permanent resident of the United States, or an alien who has been permitted by Congress to adopt the United States as his or her domicile while in this country, and who has otherwise met the state requirements for establishing residency for tuition purposes.

**Time of Enrollment.** The end of working hours on the official census date for the semester or term for that institution.

**U.S. Armed Forces.** A person who is an officer, enlisted person, selectee, or draftee of the Army, Army Reserve, Air Force, Air Force Reserve, Navy, Navy Reserve, Marine Corps, Marine Corps Reserve, Coast Guard, or Coast Guard Reserve of the United States. Members of the Army and Air National Guard may not qualify for every program directed at members of the U.S. Armed Forces. Where a rule does not explicitly include them, members of the Army or Air National Guard, or spouses or dependents of those members, should present documentation from an appropriately authorized officer that indicates that the individual was acting as a component of the Army or Air Force for the relevant time period.

**Students Enrolled in Radiological Sciences.** United States military personnel stationed outside the State of Texas who are enrolled in the bachelor of science or master of science degree program in radiological sciences at Midwestern State University by instructional telecommunication will be entitled to pay tuition fees and other fees or charges provided for Texas residents if they began the program while stationed at a military base in Texas.

**Appeals to the Texas Higher Education Coordinating Board.** In the event two or more Texas public institutions of higher education determine a different residency status for members of the same family with identical evidence of residency currently enrolled at each institution, the individuals who were the subject of the residency determination may appeal the unfavorable decision to the Commissioner for Higher Education. Before making an appeal to the Commissioner, the student classified as a nonresident must exhaust all appeal processes available at the institution level. A decision by the Com-

missioner as to one family member's residency status will apply to each family member with identical evidence of residency at any institution of higher education he or she attends.

**Students Who Are Beneficiaries of the Texas Tomorrow Fund.** The tuition and required fees charged by an institution of higher education for semester hours and fees that are paid for by a prepaid tuition contract shall be determined as if the beneficiary of that contract is a resident student. If a student is a nonresident, any tuition and fees not paid by the contract will be assessed at the nonresident rate.



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