



A Tradition of Excellence. A Future of Opportunity.

**THE UNIVERSITY OF TEXAS
AT ARLINGTON**

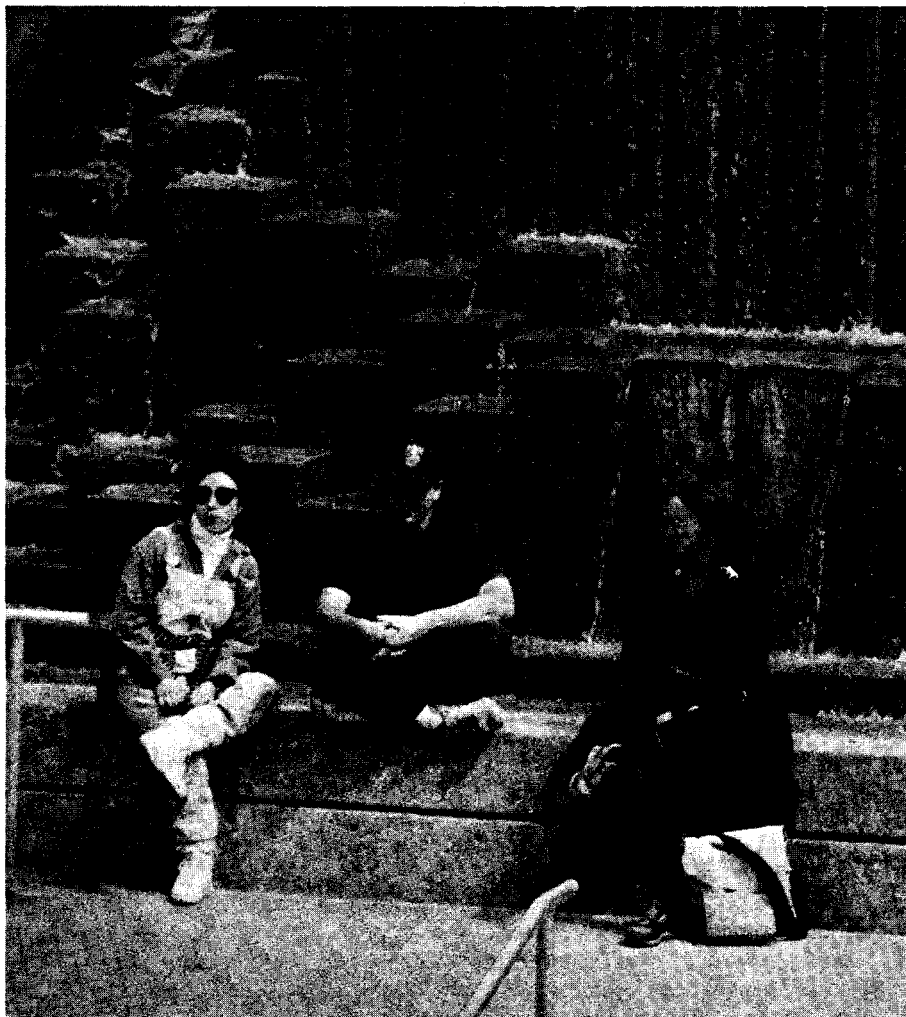
**GRADUATE CATALOG
VOL. LXXVII NO. 3 JUNE 1994**

CAMPUS AND GRADUATE SCHOOL CALENDAR, 1994-1995

Dates of particular importance to graduate students are shown in boldface type. Graduating students should see p. 48 for the final semester checklist. All Graduate School deadlines, unless otherwise stated, are final at 5 p.m. of the date specified (p. 49). The Graduate School may change this calendar if conditions warrant.

SUMMER SESSIONS 1995

	FALL 1994	SPRING 1995	1st 5 Weeks	2nd 5 Weeks	11 Weeks																								
Application Deadlines	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="padding: 2px;">International Student Application and Readmission Deadline</td> <td style="padding: 2px;">April 15</td> <td style="padding: 2px;">Sept. 2</td> <td style="padding: 2px;">Jan. 20</td> <td style="padding: 2px;">Jan. 20</td> <td style="padding: 2px;">Jan. 20</td> </tr> <tr> <td style="padding: 2px;">U.S. Student Application Deadline</td> <td style="padding: 2px;">June 24</td> <td style="padding: 2px;">Oct. 21</td> <td style="padding: 2px;">March 31</td> <td style="padding: 2px;">March 31</td> <td style="padding: 2px;">March 31</td> </tr> <tr> <td style="padding: 2px;">U.S. Student Readmission Application Deadline</td> <td style="padding: 2px;">July 22</td> <td style="padding: 2px;">Nov. 23</td> <td style="padding: 2px;">April 21</td> <td style="padding: 2px;">April 21</td> <td style="padding: 2px;">April 21</td> </tr> </table>					International Student Application and Readmission Deadline	April 15	Sept. 2	Jan. 20	Jan. 20	Jan. 20	U.S. Student Application Deadline	June 24	Oct. 21	March 31	March 31	March 31	U.S. Student Readmission Application Deadline	July 22	Nov. 23	April 21	April 21	April 21						
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U.S. Student Readmission Application Deadline	July 22	Nov. 23	April 21	April 21	April 21																								
Application for Thesis/Dissertation Tuition Reduction	Should be filed no less than one week prior to student's planned registration																												
NEW STUDENT REGISTRATION	Aug. 23-26	Jan. 9-13	May 24-26, 30	July 5-7	May 24-26, 30																								
First Day of Classes	Aug. 29	Jan. 17	May 31	July 10	May 31																								
Late Registration	Aug. 29, 30	Jan. 17, 18	May 31, June 1	July 10, 11	May 31, June 1																								
Census Date: Final Date to Reserve Graduate Courses for Graduate Credit	Sept. 13	Jan. 31	June 6	July 13	June 6																								
Completion of "X" Grade from Previous Semester:																													
Last date to submit work to instructor	Oct. 7	Feb. 24																											
Last date to submit grade change to Dean of the Graduate School	Oct. 21	March 10																											
Midsemester: Last Date to Drop or Withdraw (p. 44)	Oct. 21	March 10	June 19	July 26	July 6																								
Graduation Deadlines	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="padding: 2px;">Deadline For GRADUATION: Last Date to File Application for Graduation, Pay Diploma Fee, and File Final Program of Work</td> <td style="padding: 2px;">Sept. 28</td> <td style="padding: 2px;">Feb. 16</td> <td style="padding: 2px;">June 30</td> <td style="padding: 2px;">June 30</td> <td style="padding: 2px;">June 30</td> </tr> <tr> <td style="padding: 2px;">Final Date to Request Master's Exam/Dissertation Defense, and Submit Copy to Supervising Committee</td> <td style="padding: 2px;">Nov. 14</td> <td style="padding: 2px;">April 3</td> <td style="padding: 2px;">July 14</td> <td style="padding: 2px;">July 14</td> <td style="padding: 2px;">July 14</td> </tr> <tr> <td style="padding: 2px;">Final Date to Hold Master's Examination/Dissertation Defense and to Submit Copy of Thesis/Dissertation to Graduate School for Mechanical Check</td> <td style="padding: 2px;">Nov. 28</td> <td style="padding: 2px;">April 17</td> <td style="padding: 2px;">July 28</td> <td style="padding: 2px;">July 28</td> <td style="padding: 2px;">July 28</td> </tr> <tr> <td style="padding: 2px;">Final Date to Submit Approved Thesis/Dissertation to the Graduate School, and to Submit Report of Final Master's Examination/Dissertation Defense</td> <td style="padding: 2px;">Dec. 5</td> <td style="padding: 2px;">April 24</td> <td style="padding: 2px;">Aug. 4</td> <td style="padding: 2px;">Aug. 4</td> <td style="padding: 2px;">Aug. 4</td> </tr> </table>					Deadline For GRADUATION: Last Date to File Application for Graduation, Pay Diploma Fee, and File Final Program of Work	Sept. 28	Feb. 16	June 30	June 30	June 30	Final Date to Request Master's Exam/Dissertation Defense, and Submit Copy to Supervising Committee	Nov. 14	April 3	July 14	July 14	July 14	Final Date to Hold Master's Examination/Dissertation Defense and to Submit Copy of Thesis/Dissertation to Graduate School for Mechanical Check	Nov. 28	April 17	July 28	July 28	July 28	Final Date to Submit Approved Thesis/Dissertation to the Graduate School, and to Submit Report of Final Master's Examination/Dissertation Defense	Dec. 5	April 24	Aug. 4	Aug. 4	Aug. 4
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Final Date to Submit Approved Thesis/Dissertation to the Graduate School, and to Submit Report of Final Master's Examination/Dissertation Defense	Dec. 5	April 24	Aug. 4	Aug. 4	Aug. 4																								
Final Exams	Dec. 12-16	May 8-12	July 6	Aug. 14	Aug. 14, 15																								
End of Semester Deadline (see in Absentia Registration, p. 49)	Dec. 20	May 16	Aug. 18	Aug. 18	Aug. 18																								
Graduation Exercises:	Dec. 17	May 13	Aug. 19	Aug. 19	Aug. 19																								
HOLIDAYS: Labor Day—Sept. 5	Thanksgiving—Nov. 24-27	MLK Day—Jan. 16	Spring Vacation—March 13-19	Easter—April 14-16																									



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(USPS 620-500.)

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BOARD OF REGENTS

The University of Texas System

OFFICERS

Bernard Rapoport, Chairman
 Ellen Clarke Temple, Vice-Chairman
 Lowell H. Lebermann, Jr., Vice-Chairman
 Arthur H. Dilly, Executive Secretary

MEMBERS

(Terms Expire February 1, 1995)

Robert J. Cruikshank	Houston
Tom Loeffler	San Antonio
Mario E. Ramirez, M.D.	McAllen

(Terms Expire February 1, 1997)

Zan Holmes, Jr.	Dallas
Bernard Rapoport	Waco
Elen Clarke Temple	Lufkin

(Terms Expire February 1, 1999)

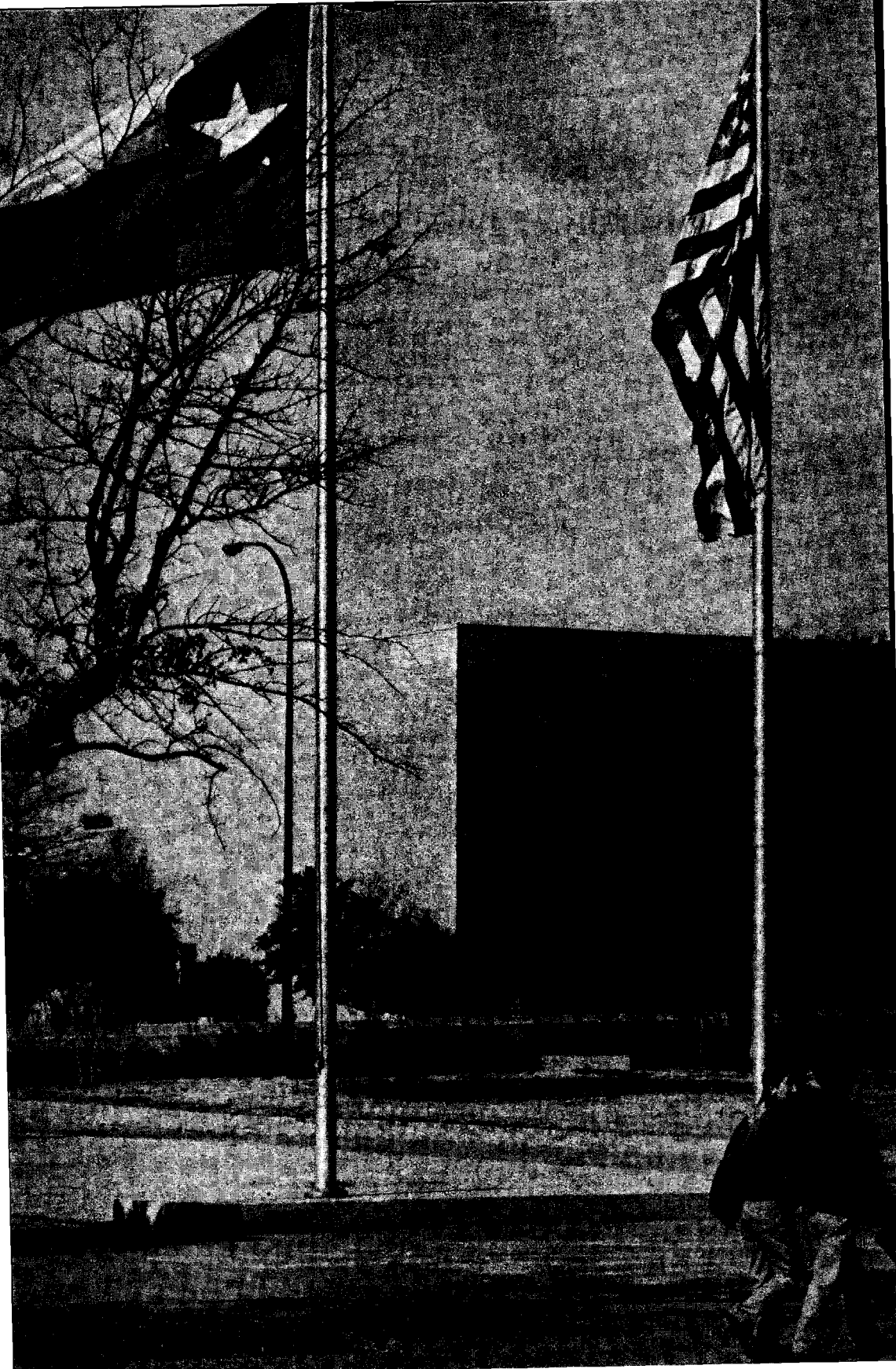
Thomas O. Hicks	Dallas
Lowell H. Lebermann, Jr.	Austin
Martha E. Smiley	Austin

GOVERNMENT

The government of UT Arlington is vested in a nine-member Board of Regents of The University of Texas System, nominated by the Governor, and approved by the Senate. The Office of the Chancellor is the chief administrative office of The University of Texas System and is located in Austin. The chief administrative officer of UT Arlington is the President, under authority of the Office of the Chancellor of the UT System and the Board of Regents. A complete statement of the authority and duties of the Regents and of the several officers, together with an account of the organization of the system, is published in the **Rules and Regulations of the Board of Regents of The University of Texas System.**

EQUAL OPPORTUNITY POLICY

In accordance with the Equal Pay Act of 1963, Titles VI and VII of the Civil Rights Act of 1964, Executive Order 11246, the Age Discrimination in Employment Act of 1967, Title IX of the Educational Amendments of 1972, Sections 503 and 504 of the Rehabilitation Act of 1973, the Americans with Disabilities Act, 1990, the Vietnam Era Veterans Readjustment Act of 1974, and the Rules and Regulations of the Board of Regents of The University of Texas System, it is the policy of The University of Texas at Arlington that to the extent provided by applicable law no person shall, on the basis of race, color, national origin, religion, age, sex, handicap, disabilities, or veteran status be denied employment or admission, be excluded from participation in, be denied the benefits of, or be subject to discrimination under, any program or activity which it sponsors or conducts. The University shall not tolerate any behavior or verbal or physical conduct by any administrator, supervisor, faculty, or staff member which constitutes sexual harassment. Any inquiries concerning the application of this policy should be directed to the University's Equal Opportunity and Affirmative Action Programs located in College Hall. Representatives may also be called at 273-2106.



THE UNIVERSITY

The University of Texas at Arlington is located on a modern, 365-acre campus in the center of the Dallas/Fort Worth metropolplex; the 18-acre RiverBend campus in east Fort Worth houses the Automation and Robotics Research Institute. A rapidly growing library, well-equipped engineering and science laboratories, several specialized research centers, and joint programs with other institutions of The University of Texas System as well as with other regional and national academic and research institutions provide the graduate student at the University with excellent opportunities for advanced study and research. The campus and metropolplex area offer a wide variety of cultural and recreational facilities including art, historical, and science museums, operas, concerts, ballet, theater, amusement parks, professional sports, and several lakes for water sports.

The University of Texas at Arlington is one of the 15 institutions in The University of Texas System. It is fully accredited by the Southern Association of Colleges and Schools. The University comprises the Colleges of Business Administration, Engineering, Liberal Arts, and Science, the School of Social Work, the School of Architecture, the School of Nursing, the School of Urban and Public Affairs, the Center for Professional Teacher Education, and the Graduate School. The bachelor's and master's degree programs in accounting and business administration are accredited by the American Assembly of Collegiate Schools of Business. Baccalaureate programs in engineering are accredited by the Accreditation Board for Engineering and Technology. The graduate program in social work is accredited by the Council on Social Work Education. The professional Master of Architecture degree is accredited by the National Architectural Accrediting Board. The Master of Science in Nursing degree program is accredited by the National League for Nursing. The Master of City and Regional Planning is accredited by the Planning Accreditation Board.

Founded in 1895 as Arlington College, a private liberal arts institution, UT Arlington has changed with the times and its surroundings, undergoing a maturing process and a succession of names, ownerships, and missions. In 1959, it was elevated to senior college rank, and, in 1965, was transferred from the Texas A&M System to The University of Texas System. It is now the second-largest institution within that system. Its final name change came in 1967, when it became The University of Texas at Arlington. The student body has become increasingly diversified with students from 46 states and 84 foreign countries enrolled at the present time. Today the enrollment is almost 20,000 undergraduate and over 4,000 graduate students.

PURPOSE

The primary purpose of The University of Texas at Arlington is the pursuit of truth, knowledge, and excellence. The institution aspires to free people from ignorance and prejudice and to stimulate a lasting attitude of inquiry. The University community is dedicated to the ideals of discovery and criticism, freedom of thought and experimentation, and the dissemination of knowledge for the enrichment of life within an ever-changing social order. The University is committed to fostering, encouraging, and supporting teaching, research, scholarship and creative activities of the highest quality and relevance. The University is also dedicated to providing mechanisms for public service so as to allow its external constituencies, both locally and beyond, to share fully the fruits of its pedagogy and scholarship. As a center for intellectual and humane development and for the discovery, advancement, and preservation of knowledge and truth, the University is committed to serving as a force to shape society at large for the common good.

This catalog is a general information publication only. It is not intended to nor does it contain all regulations that relate to students. The provisions of this catalog do not constitute a contract, express or implied, between any applicant, student, or faculty member and The University of Texas at Arlington or The University of Texas System. The University reserves the right to withdraw courses at any time, change fees, rules, calendar, curriculum, degree programs, degree requirements, graduation procedures, and any other requirements affecting students. Changes will become effective whenever the proper authorities so determine and will apply to both prospective students and those already enrolled.

Students are held individually responsible for complying with all requirements of the rules and regulations of the University and the Board of Regents of The University of Texas System. Failure to read and comply with policies, regulations, and procedures will not exempt a student from whatever penalties he or she may incur.

THE GRADUATE SCHOOL

The goal of graduate study is the development of a student's ability for creative research, critical evaluation, and scholarship in a particular discipline or in interrelated disciplines. Graduate study typically involves students actively in research. By sharing in investigations with their professors, graduate students are expected to acquire the spirit as well as the methods of creative scholarship. Achievement of the goal is demonstrated in reports, theses, and dissertations. In practice-oriented and teaching-oriented graduate programs, emphasis is on preparation for careers in application of existing knowledge in professional practice and teaching.

The Graduate School is the focus of advanced studies and research in the University and in that capacity has the dual but interdependent functions of training scholars and promoting varied research activities. A Graduate Faculty of more than 400 professors makes the Graduate School an important influence in creating high standards for academic accomplishment and in achieving an intellectual environment of highest quality for the University community.

The Graduate School of The University of Texas at Arlington was established in 1966 with the initiation of six master's degree programs. Doctoral degree programs were begun in 1969 with a Ph.D. program in engineering. Today the University offers master's degrees in 56 disciplines or interdisciplinary programs and 19 doctoral degree programs.

DIRECTORY OF OFFICES

All of the offices listed below, unless otherwise indicated, are located in Davis Hall. The telephone numbers are Dallas/Fort Worth metroplex numbers. The area code for all numbers is 817. The University postal zip code is 76019.

Dean of the Graduate School: Rm. 333, 273-2681

Graduate Admissions: Rm. 333, 273-2688

International Student Admissions and Student Visas: Rm. 333, 273-2688

Graduate Advisor: See departmental and program description.

Counseling and Career Development: Rm. 216, 273-3671 or 3672

Financial Aid: Rm. 252, 273-3561

International Office: Lower Level, University Center, 273-2355

Handicapped Student Services Office: Lower Level, University Center, 273-3364

Health Center: 605 S. West Street, 273-2771

Housing: 210 University Center, 273-2706

Office of Multicultural Services: Lower Level, University Center, 273-2099

SOAR—Special Services: Rm. 132, Hammond Hall, 273-3684

Student Affairs: Rm. 241, 273-3361

Transcripts and Records: Rm. 129, 273-3372

Veterans' Administration Representatives: Rm. 129, 273-3373

FACILITIES FOR ADVANCED STUDIES AND RESEARCH

ACADEMIC COMPUTING SERVICES

Academic Computing Services (ACS) provides computing facilities and services for the academic and research needs of the University. ACS's large, centralized computing resources consist of a CONVEX C220 with 512 MB of memory and 12 GB of disk space running ConvexOS, an IBM 4381/T91E with 64 MB of memory and 30 GB of disk space running VM/ESA, a DEC VAX 4000/60 with 72 MB of memory and 6 GB of disk space running VMS, a DECstation 5000/240 with 96 MB of memory and 5 GB of disk space running ULTRIX, and a DECstation 3000/500 with 256 MB of memory and 4 GB of disk space running OSF/1. A graphics computing system consisting of a DEC station 5000/200GPX with 88 MB of memory, 3 GB of disk space, a large digitizing table and X-window terminals is available.

ACS's distributed computing resources consist of a pair of Sun IPX file servers supporting two clusters of Sun IPC workstations and several Novell NetWare file servers supporting IBM-compatible PC and Apple Macintosh client stations. ACS is responsible for UT Arlington's data network which provides 10Mbps data service to nearly every major building on campus and high-speed interconnections to major regional, national and international networks (e.g. Internet, BITNET, THEnet, etc.). ACS will soon start upgrading parts of the campus backbone to a fiberoptic-based network providing 100Mbps data service.

ACS operates four on-campus computing facilities. The Life Science Computing Facility provides networked Apple Macintosh systems which have dot-matrix and laser printer output available. The Library Computing Facility provides networked Apple Macintosh and IBM-compatible PC systems which have dot-matrix and laser printer output available. The Business Computing Facility provides networked IBM-compatible PC systems, Sun workstations, central system interactive terminals and output facilities (both impact and laser printers). The Nedderman Computing Facility provides networked IBM-compatible PC systems, Sun workstations, X-window terminals, central system interactive terminals and output facilities (both impact and laser printers). In a cooperative venture with ACS, UT Arlington's Media Services Center can produce color hardcopy, transparencies and slides from computer files generated on a wide variety of systems. Staff consultants and documentation for supported software packages are available at our main office in B66 Davis Hall.

Most of the major programming languages and packages are available on one or more of the computing systems. With the exception of the CONVEX C220 (which is dedicated to research computing needs), all ACS facilities and resources are available to all UT Arlington faculty, staff and currently-enrolled students. Acting Director of ACS: Robert Carr (817) 273-3666

THE UNIVERSITY LIBRARIES

The Libraries of The University of Texas at Arlington include the Central Library, the Architecture and Fine Arts Library, and the Science and Engineering Library. The libraries contain a rapidly growing collection of more than 2,300,000 books, journals, documents, technical reports, microfilm, microfiche, motion pictures, sound recordings, videotapes, filmstrips, computer disks, and slides. They subscribe to more than 5,000 periodicals and newspapers.

The Central Library is a six-story building in the center of the campus that serves the social sciences, humanities, business, education, law, nursing, and geology. It also houses the government documents collection and a sizeable body of older materials in the sciences and engineering. The Architecture and Fine Arts Library, located in the Architecture Building, has a collection of more than 40,000 volumes in the fields of architecture, art, music, film, and photography. The collection includes books, journals, scores and collected works, audio and video recordings, and computer disks. The Music Listening Laboratory is also located in this library. The Science and Engineering Library, located in Nedderman Hall, has more than 100,000 volumes in the disciplines of biology, chemistry, mathematics, physics, computer science, and engineering. This branch also manages an information center at the Automation and Robotics Research Institute in Fort Worth.

Books throughout the library system are on open shelves and are arranged by subject to facilitate research and browsing. Numerous individual study carrels and a small number of group study rooms are

FACILITIES

available. In the Central Library, a limited number of private carrels may be assigned to faculty and graduate students actively involved in library research. Applications for these carrels may be obtained in the Office of Information Support Services on the first floor.

All the libraries' collections are listed in LUIS, the on-line public access catalog, which provides information on the availability and circulation status of library materials. The LUIS computerized catalog incorporates basic author/title/subject searching as well as keyword/boolean capabilities. It is available through numerous terminals located in the three libraries and through dial access from both on and off campus. In addition to the libraries' catalog, LUIS also provides access to a number of tape-loaded databases covering the core journal literature in the social sciences, humanities, art, education, business, nursing, general science, biology, and engineering. These periodical databases are accessible to anyone through the LUIS terminals located in the three libraries and, for University-affiliated patrons, through dial access.

The libraries also make available the UT Arlington Library Gateway. This service offers patrons direct access to the on-line public catalogs of several other university libraries in Texas. It also provides access to a number of databases of the Colorado Alliance of Research Libraries (CARL). The most important of these is UnCover, a periodical database featuring a table of contents service to more than 14,000 periodicals going back to January, 1989. In addition, the Gateway accesses the complete ERIC database and the Avery Index to Architectural Periodicals. The Library Gateway is available from four dedicated terminals in the three libraries and can be dialed into by UT Arlington-affiliated patrons.

To supplement the libraries' collections, the Interlibrary Loan Office locates and borrows research materials not held by the libraries. The libraries have established an access budget that is used to support interlibrary loan borrowing. As a member of the Alliance for Higher Education (AHE), Interlibrary Loan can make inquiries to locate and obtain materials quickly, often saving travel time to other campuses. Telefacsimile equipment, on-line access to databases, and a daily courier service support this activity.

As an additional service to faculty and graduate students, the AHE Library Courtesy Card, obtained by application to the Circulation Department, enables faculty and graduate students to go directly to the libraries of academic institutions in North Central Texas to borrow materials for their research. A similar card entitling faculty to borrow directly from libraries within The University of Texas System is also available on application to the Circulation Department.

The libraries' collections are particularly strong in several specialized areas. The collection of American fiction of the late 19th Century is one of the finest collections of its type in the country. The Minority Cultures Collection, housed on the second floor of the Central Library, is a circulating and reference collection covering the political, social, cultural, economic, and intellectual history of Native Americans, African Americans, and Mexican Americans in the southwestern United States from U.S. independence to the present, with emphasis on 20th Century problems and progress.

The Government Publications and Maps Collection contains nearly a million publications of the United States government and the government of Texas. In addition, the UT Arlington Libraries house the Comanche Peak Collection, which is the primary depository for documentation of the Nuclear Regulatory Commission relating to the operation of the TU Electric Plant in Glen Rose, Texas.

Another area of distinction is the Special Collections Division, housed in specially designed quarters on the sixth floor of the Central Library. Special Collections includes the extensive body of rare books, graphics, manuscripts, newspapers, and microfilm in the Jenkins Garrett Library. Specializing in Texana relating to the Spanish, Mexican, and American colonization of Texas, the Civil War, ranching, community histories, politics, biography, and literature, the Garrett Library also contains one of the nation's most comprehensive collections of books and documents on the Mexican-American War of 1846-48. A second major division of Special Collections is the Cartographic History Library, a center for the study of the history of five centuries of exploration and mapping of the New World, with emphasis on Texas and the Gulf of Mexico. The library contains thousands of rare maps and atlases featuring the original works of the world's greatest cartographers and a wide variety of journals and reference works. A wealth of historical documents pertaining to early Texas history is also found in the Robertson Colony Collection. These records have been published by the UT Arlington Press in a prize-winning series, *Papers Concerning Robertson's Colony in Texas*, compiled and edited by Dr. Malcolm D. McLean.

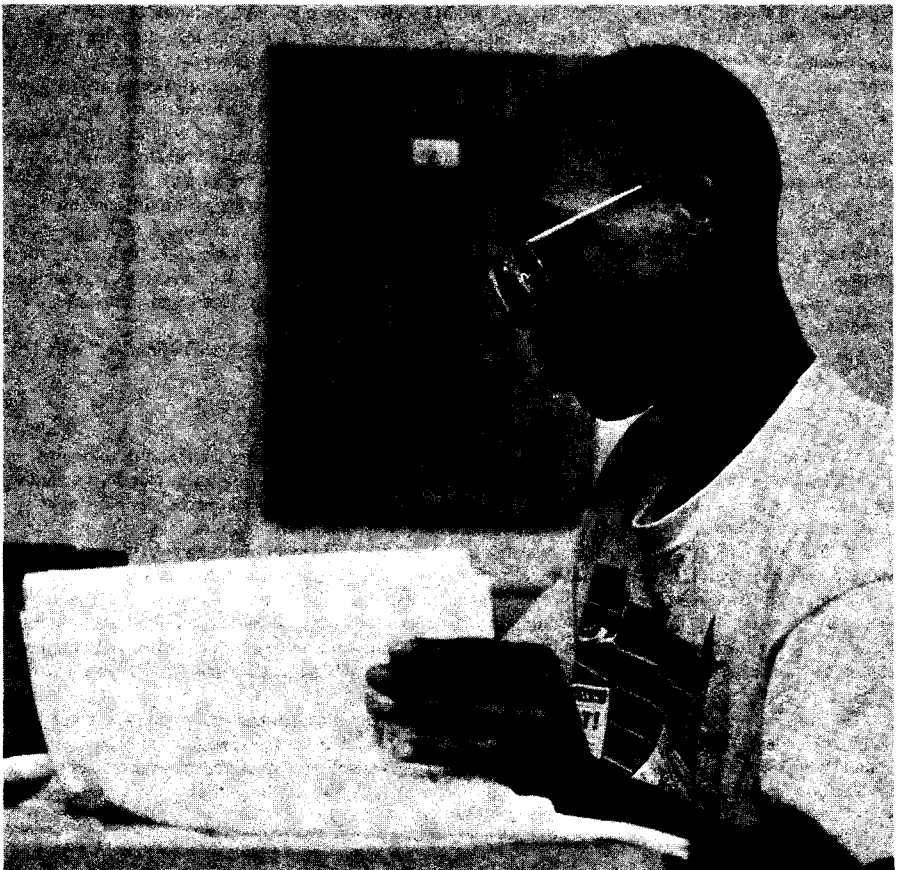
Other collections relate to historical events of the 20th Century. These include the Texas Political History Collection, which consists of the papers of elected officials and private citizens, past and present, who have influenced the course of Texas politics and government. The Texas Labor Archives serve as the official depository of the Texas AFL-CIO and its affiliates. They contain extensive primary records and publications relating to the history of organized labor in Texas and the Southwest. Another group of materials relating to historical events is the Texas Photography Collection, based on the donation to UT

Arlington of more than 450,000 photographic prints and negatives from the *Fort Worth Star-Telegram*. Special Collections also contains the University Archives, which document the history of the campus in publications, photographs, correspondence, and oral history. Also included are extensive collections on microfilm of the state, national, and ecclesiastical archives of Yucatan and Honduras.

The Special Collections Division offers students and faculty many opportunities for advanced research. It also sponsors speakers, conferences, and exhibits related to its areas of specialization. A graduate program, "Principles of Archives and Museums," leading to professional certification, as well as undergraduate and graduate courses in geography and the history of cartography are offered by the UT Arlington Department of History in collaboration with Special Collections.

Computer Search Services provides mediated on-line access to more than 500 bibliographic and factual databases covering all disciplines. This access is obtained by contract with outside vendors or information utilities, including Dialog Information Service, Bibliographic Retrieval Services (BRS), Scientific and Technical Information Network (STN), and the National Library of Medicine. Patrons are asked to reimburse the vendors the cost of telecommunications, connect time, and citations downloaded.

Coin/card-operated photocopy machines for use by patrons are available throughout the Central Library and in the branches. A Photocopy Center that provides mediated copying for patrons on a fee basis is located in the basement of the Central Library. Coin-operated electronic typewriters are also available in the basement. A PC Lab operated by Academic Computing Services on the fifth floor of the Central Library includes both IBM and Apple hardware and a variety of software packages. The ACS Lab is available to UT Arlington students and faculty. Regular and special hours of the Central Library and its branches are posted in each library and are accessible through LUIS.



FACILITIES

TELEVISED INSTRUCTION

The University of Texas at Arlington is a member of a consortium of colleges and universities in the north Texas area called the Alliance for Higher Education (AHE). UT Arlington utilizes a closed-circuit television network operated by AHE to transmit and to receive a limited number of graduate and undergraduate courses. Currently UT Arlington transmits engineering courses to selected industrial sites and business locations in the Dallas/Fort Worth area and to the campuses of certain members of AHE. Selected courses not offered by UT Arlington but which are offered by neighboring colleges and universities can be received via the AHE network.

For further information or for a bulletin of courses available via the AHE closed-circuit television network (formerly TAGER), contact the UT Arlington Engineering Television Office, Rm. 240 Nedderman Hall, Box 19077, Arlington, TX 76019, or (metro) (817) 273-2352, Fax (817) 794-5630.

RESEARCH CENTERS, DIVISIONS, AND SPECIAL FACILITIES

AERODYNAMICS RESEARCH CENTER

The Aerodynamics Research Center at The University of Texas at Arlington was developed to provide modern test facilities for the support of research and graduate educational programs in experimental aerodynamics, aerothermodynamics, and propulsion. When fully operational, experimental simulation capabilities of the Center will span the complete flight spectrum from low to hypersonic speeds.

The Aerodynamics Research Center occupies a 1000 square meter laboratory complex housing experimental test facilities, a supporting control room, a central computer room for data processing, model shop, instrumentation lab, and adjoining staff office complex. The principal laboratories consist of the Low Speed Wind Tunnel Lab; the High Speed Aerodynamics Lab containing transonic, supersonic, and hypersonic wind tunnels; and the Aero-propulsion Lab. The test labs are equipped with microprocessor-based facility control and data acquisition systems, and supported by modern optical flow visualization and diagnostics capability as well as standard force, pressure, and heat transfer measurement systems.

Current research activities at the Center emphasize the experimental investigation of transonic flow phenomena associated with rotor blades on helicopters and aircraft wing planforms, hypersonic shock wave/turbulent boundary layer interactions, and development of experimental techniques for investigating propulsion/airframe integration problems associated with hypersonic flight. Other research areas include testing of high-temperature materials, high temperature gas dynamics, unsteady and transient flows, aeroelasticity and heat transfer.

For information, contact F. K. Lu, D. D. Seath, or D. R. Wilson, P.O. Box 19018, Arlington, TX 76019, 273-2603.

APPLIED PHYSICAL ELECTRONICS RESEARCH CENTER

The Applied Physical Electronics Research Center (APERC) conducts research and development in disciplines that couple electronics with the physical world, such as electric-optics, electro-magnetics, gaseous electronics, and semiconductor electronics. Special emphasis is placed on defining new approaches to problems and developing technology for defense and industrial applications.

In 1994, the APERC is conducting research in the areas of (1) electronic vehicle batteries, (2) high speed power electronics, (3) ultra-wide band radar transmitters and laser diode drivers, (4) effects of the environment on space-based sensors, (5) advanced power generation systems using piezoelectric materials and rotating systems, (6) power grid loading due to transient electric transportation, (7) laser soldering techniques, (8) automotive waste heat utilization, (9) electron-corona processing of exhaust and hazardous chemicals, (10) electrical and optical diagnostics, (11) reconfigurable antennas, and (12) RF identification systems.

The APERC laboratory maintains a number of lasers, electronics diagnostic systems, and machining facilities for use in research. It also conducts an active undergraduate research assistant program. Undergraduate and graduate research assistantships are available for qualified candidates. For more information, contact W.E. Dillon, L.B. Gordon, or W.C. Nunnally, Box 19380, Arlington, TX 76019, (817) 794-5100.

AUTOMATION & ROBOTICS RESEARCH INSTITUTE

The Automation & Robotics Research Institute (ARRI) is the premier manufacturing assistance, automation research, education and technology transfer center in the Southwest. The Institute prides itself on its proven track record of performing world class research for customers, as well as its ability to transfer technology to industry quickly and effectively.

ARRI was conceived through a tripartite agreement among the Fort Worth Chamber Foundation, Newell & Newell (owners of RiverBend Business Park), and The University of Texas System. The Fort Worth Chamber Foundation raised \$6 million to fund construction, furnishings, and equipment of the 48,000 square foot research building and to provide capitalization funds for two endowed chairs. Newell and Newell donated a \$5-million, 18.5-acre tract at RiverBend for a Research Campus for UT Arlington, the first incumbent being ARRI. The facility was completed and occupied in September 1987. The program has received line-item support from the Texas Legislature since 1985. Current total investment exceeds \$30 million.

By utilizing the multi-disciplinary resources of UT Arlington, the major engineering university in the Dallas-Fort Worth metroplex, ARRI's mission is to advance its customers toward world class manufacturing. The vision of the Institute is to be known as a world class applied research institution where innovative ideas, concepts, and philosophies are applied to solve problems for Institute customers. This vision is being accomplished by undertaking contract work for industry, obtaining state and federal grants in manufacturing, conducting research and development programs funded by corporate members, showcasing manufacturing and distribution automation technology and supporting an aggressive education and technology transfer program.

ARRI has established a rich environment of people, equipment, and know-how in manufacturing. It has contractual and membership relationships with a significant number of Texas companies and is now building relationships with out-of-state companies. Significant is the project teaming between Industry Fellows, faculty, ARRI professional staff, and students. The Institute offers students the opportunity to obtain *hands-on* expertise working on projects with experienced engineers. These projects include abrasive water jet cutting, automated surface finishing, enterprise integration, materials handling, information systems, advanced controls and sensors, manufacturing system design and simulation, producibility, shop floor control, continuous enterprise improvement, and others.

In staffing, ARRI's emphasis is placed on the fusion of many talents. Multi-disciplinary faculty and students, ARRI's full-time professional staff, and engineers on loan from industry combine their areas of expertise on specific joint projects with state-of-the-art vendor equipment deployed in a user-type environment.

ARRI has established the following programs to support cooperation with industry: Process Assembly Automation, Advanced Controls and Sensors, Information Technologies, Fabrication Process Automation, Enterprise Integration Frameworks, and the Small Integrated Manufacturing Enterprise.

Director: J.J. Mills, 7300 Jack Newell Blvd. S., Fort Worth, Texas, 76118, (817) 794-5900.

CENTER FOR ACCOUNTING SOFTWARE EVALUATION

The Center for Accounting Software Evaluation (CASE) is a depository for accounting software. It provides a one-stop location where the business community can search for and run a wide variety of accounting packages appropriate for broad horizontal use as well as for specialized industries.

Both single and multi-user packages are supported on MS-DOS, Novell, SCO UNIX, and Macintosh operating systems. In addition to providing facilities for software evaluation, CASE and the accounting software industry jointly sponsor research by faculty and graduate students, published monographs, and continuing education courses. Director: Harley Courtney, Rm. 416 Business, (817) 273-3023

CENTER FOR ADVANCED ELECTRON DEVICES AND SYSTEMS (CAEDS)

The CAEDS is a National Science Foundation Industry/University Cooperative Research Center engaged in research in the areas of high-speed electronic devices and circuits. The Center is actively involved in developing physical models of electron devices for application to circuits and subsystems. Twelve graduate students, six faculty members, and advanced undergraduate students conduct research in the Center. Facilities are available for optical lithography, thin-film deposition, molecular beam epitaxial growth for III-V compound semiconductor devices, on-wafer device measurements, and time and frequency domain microwave and millimeter-wave evaluation (0.1-100 GHz). Graduate assistantships and

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fellowships may be available for qualified candidates. For information, contact Director, CAEDS, P.O. Box 19016, Arlington, Texas 76019-0016, (817) 273-3496.

CENTER FOR ADVANCED ENGINEERING SYSTEMS AND AUTOMATION RESEARCH (CAESAR)

CAESAR is a campus-wide research organization with a Program for Research in Intelligent Systems and Machines (PRISM). Typical PRISM application areas include manufacturing and design; unmanned ground vehicles; health care delivery; education, training, and simulation; environmental monitoring; and emergency management. CAESAR's mission is to link disciplines such as engineering, natural sciences, social studies and apply them to national challenge applications. CAESAR extends each component college, school, and department's academic research arm into large, multi-disciplinary opportunities and cooperative industry interactions by providing infrastructure and visibility in the area of intelligent systems.

Karan Harbison (Executive Director)
Stephen Hufnagel (Technical Director)
Office of the Dean of Engineering 817-273-2571
Box 19019, Arlington, TX 76019-0019 USA

CENTER FOR ADVANCED POLYMER RESEARCH

The Center for Advanced Polymer Research is involved in the development of new polymeric materials for new applications. Research groups are focusing efforts in areas of electrically conductive polymers, ionically conductive polymers, potentially superconductive polymers, electroluminescent polymers and new methods for polymer processing, using graduate students, postdoctoral fellows, and undergraduate students in research positions. Modern experimental facilities have been constructed that give the Center state-of-the-art polymer characterization capabilities in high field nuclear magnetic resonance spectroscopy for solids and liquids, electron paramagnetic resonance, Fourier transform infrared spectroscopy, pyrolysis gas chromatography/mass spectrometry, gel permeation and high pressure liquid chromatography, optical and electron microscopy, thermal analysis, electrochemistry, electronic measurements, x-ray photoelectron spectroscopy, multi-angle laser light scattering GPC detector, Raman spectroscopy, theoretical modelling, and carbon, hydrogen, and nitrogen elemental analyses. Joint research programs exist both internally and with industrial and governmental laboratories. Doctoral candidates spend 4-6 months in industrial research internships as part of their degree requirements. For information, contact Martin Pomerantz (Rm. 300D Science Hall, 273-3811), at the Department of Chemistry and Biochemistry, Box 19065, Arlington, Texas 76019. (FAX 817-273-3808; E-mail D100MP@UTARLG.UTA.EDU)

CENTER FOR THE ADVANCEMENT OF SCIENCE AND MATHEMATICS TEACHING

The Center reflects UT Arlington's concerns for high quality science and mathematics education. The foremost objectives of the Center are to upgrade the qualifications of primary and secondary teachers of science and mathematics, to help degreed persons to become qualified to teach science and mathematics, to promote interest in the teaching of science and mathematics as a career, to promote student interest in the fields of science and mathematics, to develop innovative approaches to teaching and to utilize technological developments in teaching science and mathematics, and to promote public interest in science and mathematics. For information, contact Eddie Warren, Director, at Box 19408, Arlington, Texas 76019 or 273-3261.

CENTER FOR BIOLOGICAL MACROFOULING RESEARCH

The Center for Biological Macrofouling Research enhances ongoing research programs in the biology, physiology, ecology, and macrofouling control of two exotic freshwater pest bivalves, the Asian clam, *Corbicula fluminea*, introduced to North America from southeast Asia in the early 1900s; and the zebra mussel, *Dreissena polymorpha*, introduced from Europe to the Great Lakes in 1986 and now spreading rapidly through United States and southern Canadian inland waterways. Biofouling of water treatment, industrial, and power-generating raw water systems by Asian clams is costing the United States well over a billion dollars a year. Fouling by zebra mussels (a more serious fouler) is conservatively estimated to

eventually cost 3 to 4 billion dollars a year as it spreads throughout North American freshwaters. The Center coordinates research efforts, develops new research initiatives, evaluates the efficacy of control measures and acts as a national clearing house for information on the biology and fouling control by these species to the United States power industry and the U.S. Army Corps of Engineers. The Center receives funding from both these groups and seeks research funding and contract research from both public and private industrial sources for its continued research on these species. Director: Robert F. McMahon, Rm. B28 Life Science Building, 273-2412

CENTER FOR CHILD WELFARE

The Center for Child Welfare is a research center for Texas, the Southwest, and the nation, in the advancement and dissemination of knowledge to improve the conditions of vulnerable children and their families. Research, education, and dissemination efforts of the Center address the basic rights of children to be nurtured and protected by their families with the support of their communities.

Objectives of the Center include the completion of research of a national significance addressing policies and practices which influence the lives of children and families, and the improvement of services to children and families through training, professionalization in child welfare, and dissemination of new practice models. The Center is housed in the School of Social Work.

CENTER FOR COLLOIDAL AND INTERFACIAL DYNAMICS (CCID)

The objective of the Center for Colloidal and Interfacial Dynamics is to facilitate and to coordinate the research efforts of faculty and industrial associates, postdoctoral fellows, and graduate students interested in rate processes in colloidal systems and at interfaces. Such processes are relevant in chemistry, physics, geology, bio- and environmental sciences, and many areas of engineering. Examples of the studies include the investigation of the rate and mechanism of the formation of colloidal particles and thin films, adsorption-desorption at interfaces, and mass transport across membranes. State-of-the-art instrumentation include a dynamic light-scattering apparatus and vapor pressure osmometers; for the rate studies on the nanosecond to millisecond time scale include stopped-flow, temperature-jump, pressure-jump, electric field-jump, laser induced electric birefringence apparatus, and a rapid scan time resolved spectrometer. For information, contact Z.A. Schelly, Department of Chemistry and Biochemistry, Box 19065, University of Texas at Arlington, Arlington, Texas 76019-0065, USA. Phone (817) 273-3803; FAX: (817) 273-3808; E-Mail: SCHELLY@UTARLG.UTA.EDU

CENTER FOR COMPOSITE MATERIALS

The Center for Composite Materials promotes interdisciplinary research in composite materials among faculty, students, postdoctoral fellows, and staff. These materials include polymers, metals, polymeric matrix composites, metal matrix composites, and ceramic composites. Research programs involve multi-disciplinary efforts between the Aerospace Engineering, Civil Engineering, Materials Science and Engineering, Mechanical Engineering, Chemistry, Mathematics, and Physics departments and graduate programs. Much of this research involves mechanics, structural modeling, and design as well as the interrelationships between the processing, structure, and properties of structural engineering materials. Available laboratories include shared composite materials laboratories, as well as laboratories within individual research departments or programs. Equipment and facilities used include servohydraulic mechanical testing systems, materials fabrication and processing facilities, high temperature autoclaves, thermal analysis (DSC, TGA, TMA, DMA) systems, ultrasonic imaging system, optical and SEM/EDS and STEM/EDS electron microscopes, polymer synthesis and electrochemistry, polymer spectroscopy (NMR, FTIR, EPR, mass) and instrumented impact test facilities. For information, Wen S. Chan (Rm. 325G, Engineering Building, 794-5638), at the Mechanical and Aerospace Engineering Department, Box 19023, Arlington, Texas 76019.

CENTER FOR CRIMINAL JUSTICE RESEARCH AND TRAINING

The Center for Criminal Justice Research and Training was established in 1977 with the primary mission of providing technical assistance to law enforcement and criminal justice agencies, governmental institutions, and citizens groups concerned with the administration and operation of the criminal justice system.

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The Center provides assistance when requested in the areas of program evaluation, personnel administration, organizational development, training, staff and program development, and other areas of organizational research. As part of the School of Urban and Public Affairs, the Center works cooperatively with other components of the University to develop effective community crime prevention models and to enhance community awareness of needed changes for the solution of crime problems. Director: James W. Stevens, Rm. 528 UH, 273-3320

CENTER FOR EARTH SYSTEM HISTORY

The Center for Earth System History was established in 1994 to act as a focus for a multidisciplinary approach to studying the history of the earth. The Center is devoted to promoting collaboration and joint research initiatives among faculty in climatology, oceanography, biology, and geology with special emphasis on the use of climate models to integrate and understand the roles of these components. The Center also supports graduate education and post-doctoral research opportunities in earth system history and global climate change. The Center is located in the Geosciences Building. Director: Bette L. Otto-Bliessner, Room 227 Geoscience, 273-2941

CENTER FOR ECONOMIC EDUCATION

The Center for Economic Education was established in 1972 and is affiliated with the Texas Council on Economic Education and the National Council on Economic Education. The major purpose of the Center is to offer pre-service and in-service instruction in economics to elementary, secondary, and college teachers through credit courses and non-credit workshops, conferences, and seminars. Center staff also provides consultant services to teaching and administrative personnel in the school districts of the area. While maintaining a library of economic education instructional materials, Center personnel assist teachers in the location, review, and selection of materials appropriate for the levels to be taught.

The Center is highly involved with the area high schools by providing "The Community Effort Project." This project, through a three-day program offered to high school students, exposes many minority students from local high schools to higher education and the role it plays in determining career choices and wages for the future. The Community Effort Project is sponsored by local businesses who contribute to its efforts by providing employees who interact with the students and monetary support for a one-day visit to the UT Arlington Campus.

The Center also offers non-credit seminars and conferences for business, industrial, and service personnel of the area who wish to acquire a better understanding of the American Economic System. Director: Jill Trask Cardenas, (817) 273-3849

CENTER FOR ELECTRON MICROSCOPY

The Center for Electron Microscopy provides facilities for research and training in electron microscopy and related techniques. Course work and individual training are provided for approved undergraduate, graduate, postgraduate students, and faculty who wish to utilize electron microscopy and/or x-ray analysis in their research. The center is housed in a suite of rooms having three electron microscopes: JEOL JEM-1200EX TEMSCAN equipped with a Link AN10000 x-ray and image analysis system; JEOL JSM-35C SEM with a Tracor Northern x-ray and image analysis system; Zeiss 9 TEM. Two PC-based image analysis systems, utilizing JAVA, SIGMA-PLOT, OPTIMAS, TOPAS and SABLE, are available for use with both light and electron image applications. The center has darkrooms and preparation and ancillary equipment. A scanning tunneling microscope is under development in the Physics Department. Research and training involve faculty, visitors, and students from biology, chemistry, geology, physics, psychology, anthropology, and engineering. Director: Howard J. Arnott, Rms. B24 or 241 Life Science Building, 273-2413 or 273-2427

CENTER FOR ENVIRONMENTAL DESIGN RESEARCH (CEDR)

The Center was established in 1979 as the consolidation of research activities of the School of Architecture. Its objectives are to develop investigative programs and stimulate research related to architecture, landscape architecture, interior design, and land planning. Areas of concentration include design theory, environmental studies, computer applications, energy conservation, historic preservation, housing, building materials, park planning, and resource management. The faculty of the center provide guidance and direction in identifying appropriate governmental agencies, institutions, developers, and builders to facilitate the initiation and execution of research projects. The Center assists students in the

study of theoretical and practical problems and issues, working within a framework for interdisciplinary cooperation. Interested graduate students may serve as research staff and/or receive graduate credit for special projects upon approval of the Graduate Studies Committee and the Dean of the Graduate School. Director: Richard C. Rome, 273-2801

CENTER FOR ENVIRONMENTAL RESEARCH AND TRAINING

The Center for Environmental Research and Training (CERT), one of two centers in the Department of Civil Engineering, is a leader in providing training for professionals in environment-related fields. CERT was founded in 1986 and has become recognized for its national comprehensive environmental training programs. The program has an extensive selection of courses in asbestos abatement, sampling and fiber counting (NIOSH 582 equivalency), air pollution control, air monitoring, bulk sampling, indoor air quality, management and remediation of hazardous materials, environmental assessment techniques, industrial hygiene, and hazard communications. Specialized research projects related to environmental topics are conducted by the Center and graduate education in environmental engineering is offered by the Department of Civil Engineering (see Department Programs). Director: V.K. Argeanto, 273-3694

CENTER FOR FAR EASTERN STUDIES

The Center for Far Eastern Studies serves as a forum for research and exchange of ideas and information on issues and situations—political, economic, and cultural—related to the societies and peoples of the Far East. It purports to create, publish, and disseminate materials and to provide an organizational base upon which scholars from within and without the University may carry out their studies on issues and situations related to the Far East. Director: John J. S. Moon, 273-2991

CENTER FOR FISH STUDIES

The Center for Fish Studies was established to coordinate and promote faculty and graduate student research on fishes. Research sponsored by the Center covers both basic and applied areas in a wide spectrum of field and laboratory investigations. Current research is focused on fish respiration, biochemical genetics, and population structure and dynamics. The Center is housed in the Life Science Building and consists of several laboratories and a large aquatic facility for holding live fish. Director: Donald H. Whitmore, Rm. 343 LS, 273-2425

CENTER FOR FOSSIL FUELS CHEMISTRY

This Center for Fossil Fuels Chemistry brings together faculty, graduate students, postdoctoral associates, and undergraduate students engaged in fundamental and applied research in the chemistry and utilization of fossil fuels. These include coals, oil shales, oil sands, petroleum crudes, and related species. Current projects under investigation include structure elucidation studies of coal and related substances using various reactions and analyses, thermomechanical, thermophysical, and thermochemical changes in fossil fuels on application of heat, study of acoustic, dielectric, and surface properties, and pretreatment of fossil fuels to facilitate processing and use. Research also includes development and evaluation of new catalytic materials for the production of synthetic fuels as well as for the conversion of hazardous organic liquid wastes into useful fuels. Modern, state-of-the-art instrumentation and techniques being used in these studies include gas chromatography/mass spectrometry with laser pyrolysis capability, gas chromatography/Fourier transform infrared spectroscopy, solids and liquids high field nuclear magnetic resonance spectroscopy, thermal, moisture, and elemental analysis equipment, gas, high performance liquid and gel permeation chromatography, and rapid-scanning diode-array ultraviolet/visible spectroscopy. For more information, students may contact Martin Pomerantz in Rm. 300D Science Hall, (273-3811; E-mail: D100MP@UTARLG.UTA.EDU) or Krishnan Rajeshwar (Rm. 300E Science Hall, 273-3810), both at the Department of Chemistry and Biochemistry, Box 19065, Arlington, Texas 76019 (Fax 817-273-3808).

CENTER FOR GEOENVIRONMENTAL AND GEOARCHAEOLOGICAL STUDIES

The Center for Geoenvironmental and Geoarchaeological Studies was established as a research center devoted to bringing geological, geophysical, and geochemical techniques to bear on environmental and archaeological research problems. The Center provides the infrastructure necessary to facilitate studies combining such widely differing disciplines. It is one purpose of the Center to identify areas where these

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disciplines can and should be applied. The Center also supports graduate student research oriented toward solving geoenvironmental and geoarchaeological problems. The Center's office is located in Geoscience, Rm. 147. Director: Brooks B. Ellwood, Rm. 147 Geoscience, 273-2339

THE CENTER FOR GREATER SOUTHWESTERN STUDIES AND THE HISTORY OF CARTOGRAPHY

The primary purpose of the Center for Greater Southwestern Studies and the History of Cartography is to encourage interdisciplinary scholarship, research, and teaching that interprets the people, environment, economy, history, and cultures of the Greater Southwest. The Greater Southwest includes the southwestern quarter of the United States and the northern portion of Mexico, a vast region that has interconnected both countries in times of exploration, conflict, and cooperation. The Center is located in the University Library, which houses a nationally recognized Special Collections (including maps, journals, and photographs) pertaining to the region. The faculty and students of the Center research such topics as the significance of the Age of Discovery, the exploration and settlement of the New World and its impact on indigenous peoples, comparative frontier experiences, and the relationship between Southwestern cultures and environment and their implications for the future of the Greater Southwest.

The Center operates several programs to foster a more complete understanding of the history and cultures of the region among students, scholars, educators, and the general public. Under the guidance of the Center director, the Center will sponsor undergraduate and graduate curricular development; support an endowed chair; award fellowships to support the research of visiting scholars; conduct outreach programs through summer institutes for elementary and secondary public school teachers; and promote community involvement through symposia, exhibits, lectures, and public programs. Director: Richard V. Francaviglia, (817) 273-3000, ext. 4931

CENTER FOR HIGH ENERGY PHYSICS AND TECHNOLOGY

The Center for High Energy Physics and Technology was formed in 1991 with goals of playing a major role in the Superconducting Supercollider and developing a strong involvement in the United States high energy "base program". Since the demise of the Supercollider, the high energy group has taken on additional responsibilities for upgrading the DO hadron collider detector at Fermi National Accelerator Laboratory (Chicago), currently the world's highest energy facility. For the long term, the group is preparing to participate in the large hadron collider facility at Geneva, Switzerland, and in a proton-proton elastic scattering experiment at Brookhaven National Laboratory (Long Island). Center facilities include a high-performance, state-of-the-art computing system, and a well-equipped detector and electronics development laboratory. Work of the Center offers opportunities for research in experimental elementary particle physics ranging from detector design, and software and electronic development through full, high-statistics physics analyses. Director: Andrew P. White, Room 241 Science Hall, (817) 273-2812

CENTER FOR INFORMATION TECHNOLOGIES MANAGEMENT

Rapidly developing information technologies are presenting information systems executives with the opportunity to provide timely, high-quality information to support decision-making and innovation in all areas of managing an enterprise. Major changes in the business environment, including globalization, corporate mergers, flexible manufacturing, cost paring and downsizing, are increasing the importance of information technologies as organizations struggle to compete and survive.

Advances in computer hardware, software, and communications are driving developments in computer applications across the board, including information processing, office automation, data base management, data communications, artificial intelligence, and systems development methodologies. Managers have to carefully gauge these trends, evaluate the implications for their own environment, and manage the harnessing of the appropriate information technologies.

The Center of Information Technologies Management (CITM) is dedicated to helping managers achieve these objectives. Sponsors and clients of the Center benefit from research in a wide variety of important fields, working papers, monographs, workshops, and symposia. Training and consultation for individual clients can be provided. The Center, in conjunction with the Disaster Recovery Institute, sponsors the courses and examination leading to designation as a Certified Disaster Recovery Planner. The Center has also secured several research grants from government and industry. Director: Dr. Sumit Sircar, Rm. 537B, 273-3569

CENTER FOR MARKETING RESEARCH

The Center for Marketing Research fosters research by the academic community on problems and strategic issues impacting the marketing research industry. Research is also undertaken in development and refinement of marketing research methodologies. The Center publishes significant research resulting from these activities. As a vehicle for marketing research projects for organizations, the Center offers opportunities for graduate students in marketing research to conduct and manage marketing research studies. The Center also sponsors continuing education programs for marketing research professionals and conducts conferences which focus on emerging issues in marketing research. Director: Roger Gates, 273-2257

CENTER FOR MEDICINAL CHEMICAL RESEARCH

The purpose of the Center for Medicinal Chemical Research is to develop new medicaments of value to the health professional. The current interests of the Center include (a) antimicrobial/antiviral agents; (b) prophylactic agents for chemical irritants; (c) substances to enhance protection from exposure to various forms of radiation; (d) neuroleptic agents. In addition to research in these areas, the Center is interested in enhancing educational opportunities for individuals interested in the medicine-chemistry interface. The Center includes facilities for synthesis, chemical and biochemical analyses, and microbiological evaluation. For information contact A.L. Ternay, Jr. (Rm. 401 Science Hall, 273-3818) at the Department of Chemistry, Box 19065, Arlington, Texas 76019.

CENTER FOR MEXICAN AMERICAN STUDIES

The Center was established in 1993 within the Department of Political Science in the College of Liberal Arts. Its objectives are to develop faculty and student research programs on the Mexican American people. The Center will promote multidisciplinary curriculum offerings; report on critical issues affecting the ethnic group; offer occasional conferences, symposia, and institutes; encourage research on the ethnic community; and recruit students to study the Mexican American people. The Center will gather archival material and publish findings. Director: Jose Angel Gutierrez, 406 UH, 273-3991

CENTER FOR MEXICO-U.S. STUDIES

The Center for Mexico-U.S. Studies was established in 1988 to develop faculty and student research programs at UT Arlington in areas of Mexico-U.S. relations. The primary objectives of the Center are to encourage scholarly research on issues relevant to Mexico-U.S. relations; to provide current, objective analysis and information concerning the political economy of Mexico and relevant issues in Mexico-U.S. relations; to provide academic and cultural exchanges between Mexico and the U.S. (particularly linking Texas and the Mexican border states); and to coordinate library and other resources on contemporary Mexican affairs. The intent of the Center is to make available to the community the faculty expertise and research materials at UT Arlington focusing on Mexico-U.S. relations. Director: Dale Story, 206 UH, 273-2993

THE CENTER FOR NURSING RESEARCH

The Center for Nursing Research, established in 1987, is involved in facilitating research related to extending the scientific base for nursing practice. In addition, studies related to health services research, nursing administration, and nursing education are supported. Consultation services in grant writing, research methodology, statistical analysis, computer programming and data management are provided for faculty members, nursing students, and collaboratively with health care agencies and/or members of their nursing staff. The students employed in the Center are available for literature retrieval related to research, assistance with word processing, data entry and data analysis. Hardware and software are available for these activities. The Center has access to equipment and personnel in the School of Nursing Learning Resources Center, including artists and photographers, and equipment which allows rapid development of professional quality slides, graphs, and tables for research publications and presentations. Current research foci include rural health care, the economics of health care delivery, nursing practices outcomes, and health promotion/disease prevention. Graduate assistantships are available for qualified candidates. For information, contact Nancy Burnas, Director, Box 19407, Arlington, Texas 76019, 273-2776.

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CENTER FOR PARASITOLOGY

The Center for Parasitology was established within the Department of Biology to promote and develop applied and basic research in Parasitology. Research emphasis is on immunology and biochemistry of parasites of medical and veterinary importance with special focus on trichinosis, and *Acanthamoeba keratitis*. The Center is a focal point for collaborative research involving several other universities in the area and promotes seminars, research retreats, and exchange of graduate students with other institutions. Director: George L. Stewart, Rm. 331 LS, 273-2423

CENTER FOR POSITRON STUDIES

The Center for Positron Studies was established in 1979 as an outgrowth of the positron physics, chemistry, and materials science and engineering research programs in the University. The objective of the Center is to conduct wide-ranging experimental and theoretical studies in the rapidly growing field of low-energy positron research. The full potential of the positron as an extremely powerful, useful, and sensitive probe of matter is only now being generally recognized.

The Center has been the site of positron annihilation studies of gases, liquids, liquid crystals and metals, and measurements of positron scattering by gas molecules and at solid surfaces. Much of this work is supported in part by external funds and in many cases is at the frontiers of the field.

Members of the Center include full-time and visiting faculty, post-doctoral research associates, and graduate and undergraduate students. The Center organized the Sixth International Conference on Positron Annihilation and International Symposium on Positron Annihilation Studies of Fluids, hosted by the University in 1982 and 1987, respectively. Director: Suresh C. Sharma, Rm. 120E SH, 273-2266

CENTER FOR POST-SOVIET AND EAST EUROPEAN STUDIES

The Center for Post-Soviet and East European Studies was established in 1968 to coordinate all activities involving UT Arlington with that portion of Eastern Europe formerly designated as "Other Socialist Countries" as well as with the former USSR, including the three Baltic Republics and the 12 Commonwealth of Independent States. The Center performs five functions:

Research — academic, political, linguistic, and economic activities;

Interdisciplinary Studies — classes have been and are constantly being developed integrating several disciplines such as history, political science, and Russian; or Russian and English;

Translations — English to Russian, Russian to English, or other translations at a reasonable fee are prepared, edited, and computerized at the request of commercial or academic clients;

Exchange programs — Exchanges have been effected between UT Arlington and countries such as Russia, Yugoslavia, Romania, and the Ukraine. In addition, the Director of the Center serves as the official International Research Exchange (IREX) representative. Numerous former republics of the former USSR annually participate in this IREX program.

Study Abroad — Since 1970 annual programs have been developed by the Center. At present, travel/study programs are conducted during the first half of each summer to the former Soviet Union and during the last half of the summer to the Peoples Republic of China.

Director: Charles McDowell, 221 Hammond, (817) 273-2388

CENTER FOR RESEARCH IN CONTEMPORARY ART

The Center for Research in Contemporary Art (CRCA) is devoted to the advanced study of contemporary art, and seeks to facilitate research by contemporary artists. Basic to CRCA's philosophy are the ideas that artistic practice is a form of research which is manifested in the artwork, and that parallel to the artwork is the dialogue that generates the work, and is generated by, and around, the work. Activities include exhibitions, lectures, and publications. For information, contact Director, Rm. 335 Fine Arts Building, Box 19089, 273-2891.

CENTER FOR RESEARCH ON ORGANIZATIONAL AND MANAGERIAL EXCELLENCE

The Center for Research on Organizational and Managerial Excellence is within the Department of Management in the College of Business Administration. The Center's primary purposes are to promote faculty and graduate student basic and applied research addressing the important and complex problems (challenges) faced by managers; to promote greater interaction between the University and industry in

seeking solutions to these managerial problems; to gain support from industry, government, and/or private foundations for critical managerial research. The intent of the Center is to build stronger ties with external constituents, support faculty research and graduate programs, provide a community service, and add to the positive external image of the College of Business Administration and the University. Research is conducted in all areas of management to include corporate strategy, human resource management, international management, labor relations, organizational behavior, organization theory, and production operations management. Examples of current research through the Center are establishment of methods for improving employee motivation; means of effectively managing diversified corporations; means of measuring corporate performance for strategy development and implementation; development of effective leadership approaches; employee participation in the management of a firm; and managerial prevention of stress. Director: Mary E. McLaughlin, 201 Business Building, 273-3166

CENTER FOR RHETORICAL AND CRITICAL THEORY

The Center for Rhetorical and Critical Theory has as its general purpose to stimulate research in the meta-disciplinary connections between rhetorical and critical theories, broadly defined. This research is conducted by faculty and advanced graduate students and is coordinated with off-campus researchers who have demonstrated expertise in rhetorical and critical theory. The Center's specific purposes are (1) to foster an examination and critique of discourses as they are variously informed by practices, values, ideologies, politics, economics, or poetics; and (2) to promote symposia and publications supported by funding from external agencies. Director: Victor Vitanza, 211 Carlisle, 273-2750

CENTER FOR RUSSIAN GEOLOGY AND TECTONICS

The Center for Russian Geology and Tectonics was established within the Department of Geology in November 1992 as a research center for geological studies of the Commonwealth of Independent States (CIS). The purpose of the Center is to develop a plate tectonic model of the former USSR and to facilitate regional studies on geology, tectonics, paleogeography, and evolution of sedimentary basins. The Center is working closely with a team of the PALEOMAP Project (UT Arlington) and Earth scientists from Russian universities and leading geological and geophysical institutes. The Center maintains a detailed database of tectonic units, geological structures, and paleomagnetic data for the CIS.

The Center is supported by international oil companies. For more information, contact Nataliya Y. Bocharova, Acting Director, 146 GB, 273-2956.

CENTER FOR SOCIAL RESEARCH

The Center for Social Research was established in 1977 as a research component of the Department of Sociology. Participants in the Center have doctoral or professional degrees. The purpose of the Center is to stimulate research, especially that which will be both of significance to the field of sociology and of service to various institutions, agencies, and organizations in the community and the state. The Center is the channel through which grants for research can be obtained. It provides funding to support faculty research and graduate student training. Areas of ongoing research activity include: marketing research, welfare policy and research evaluation, substance abuse, crime and corrections, health care delivery systems, and studies in family violence. Director: William A. Stacey, Rm. 443 UH, 273-2661

CENTER FOR SOCIAL WELFARE RESEARCH

The Center for Social Welfare Research (CSWR), a component of the School of Social Work, was established to conduct applied social research to improve the design, delivery, management, and evaluation of human services. Its goals are to further understanding of human behavior and social conditions, to develop methods for analyzing and evaluating human services programs and interventions, and to provide technical assistance to human services providers. The CSWR provides a focus for social welfare research by identifying research issues and identifying and facilitating faculty and graduate students in the conduct of social welfare research. For information, contact Charles H. Mindel (817) 273-3910.

COLLECTION OF VERTEBRATES

The Collection of Vertebrates was established by the Department of Biology in 1956 primarily as a teaching resource to support classroom and field instruction. Since then it has grown into an internationally recognized research facility and serves the needs of faculty and students, as well as national and international scholars. The collection is particularly strong in its herpetological holdings, which include

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some of the world's largest collections from Texas and the countries of Colombia, Guatemala, and Mexico. Various ancillary materials are available, including voice recordings for many species of tropical frogs, publications, color transparencies, field notebooks and catalogues, and maps. The collection houses about 40,000 amphibians and 35,000 reptiles, which include 40 holotype specimens.

Qualified investigators conducting research on vertebrates are welcome to use the collection's facilities and materials which are located in the Life Sciences Building. For information, contact Jonathan A. Campbell, Curator, 337 LS, 273-2406.

COMMUNICATION SERVICE AND RESEARCH CENTER

The Communication Service and Research Center in the Communication Department was established to encourage and support research and service activities for the fields of communication. The Center provides assistance to promote professional development training for media professionals, to aid communication education, and to support funded and non-funded research, workshops, seminars, and other projects. The Center will serve as a channel for grant proposals and as a faculty resource center for research methods and technology.

COMMUNITY SERVICE CLINIC

The Community Service Clinic, established in 1970, is a research, teaching, and service component of the School of Social Work. It serves as a field placement agency for graduate social work students enrolled in the University. Priorities are research and teaching. Counseling services are provided to individuals, couples, families, and groups. In addition to traditional social work treatment services, ongoing research has as its special emphasis the treatment for family violence and biofeedback. Director: Cathleen Jordan, (817) 273-2165

COMMUNITY SERVICES DEVELOPMENT CENTER

The Community Services Development Center is an arm of the School of Social Work providing public service, education, and community research. It provides assistance to civic and professional organizations, community service agencies, and governmental agencies in identifying human services needs (health, welfare, recreational, etc.), determining feasible solutions to such needs, and implementing desired solutions. The Center provides supervised internships for undergraduate, graduate, and postgraduate students, from social work and other fields, interested in learning community organization, human services planning, services and program development, community advocacy, program, policy or planning research, or administration skills. Director: Mary Fulbright, (817) 273-2084

CONSTRUCTION RESEARCH CENTER

The Construction Research Center is engaged in research and educational activities that support the construction industry. The research programs generally include the departments or colleges of Civil Engineering, Architecture, Mechanical Engineering, Industrial Engineering, Geology, Economics, and Business Administration. The specified areas of study range from light foundations to the econometrics of the construction industry. Seminars, special courses, and special programs are held for their educational values and for the purposes of disseminating research.

The Center is supported by the Construction Research Advisory Committee, which is composed of general contractors, home builders, financial institutions, building material manufacturers and suppliers. Director: John H. Matthys, Rm. 439 Nedderman, 273-3701

EARTH RESOURCE AND ENVIRONMENT CENTER

The Earth Resource and Environment Center was established in 1992 to provide research, development, and technical service to business and government for problems related to the geological environment and to the recovery and use of natural resources. The Center consists of 16 faculty and research associates who have had extensive experience in environmental issues and resource recovery. It also provides opportunities for geoscience students interested in working on these problems.

The center is located in the Geoscience Building. For information, contact John Wickham, Director (817) 273-2987.

ENERGY SYSTEMS RESEARCH CENTER

The Energy Systems Research Center (ESRC) sponsors research concerning electrical power generation, transmission, distribution, and storage. The Center's research is pertinent to the utility industry and is readily applicable to the daily concerns of all practicing engineers. Established in 1968, the ESRC is the largest center of its type and is recognized as one of the most important research centers of its kind in the United States. The ESRC offers a three-phase program of study to serve undergraduate, graduate, and continuing education students. On the undergraduate level, six new power courses have been devised and added to the electrical engineering curriculum. The well-established graduate program supports thirty-five full-time students and ten full-time staff members. The ESRC also supports a relatively large postdoctoral program that requires at least some industrial experience for candidacy. Postdoctoral fellows may assist ESRC students in thesis or dissertation and in graduate seminars; fellows may be asked to perform limited teaching on the graduate level. The ESRC also accepts international exchange scholars from programs such as the Fulbright and IREX. Each year, researchers from different countries join the ESRC to aid in the research effort and to share their knowledge and experience in graduate seminar discussions. These researchers also contribute to the ESRC's special non-degree graduate programs as well as the in-plant and on-campus continuing education programs for practicing power system engineers. ESRC has completed the construction of a modern power-system laboratory to demonstrate the concept of total automation of the power industry in the future. This laboratory is being used for the training of system operators for power industry and cogeneration companies. Graduate assistantships, fellowships, and postdoctoral fellowships are available for qualified candidates. Director: Mo-Shing Chen, Rm. 100B, Engineering Annex Bldg., 273-2268

ENGLISH LANGUAGE INSTITUTE

The English Language Institute (ELI) is a center for instruction of English for speakers of other languages (ESOL) and is a part of the Linguistics program. The purpose of the ELI is to enhance this program in the areas of pedagogy and research for English for speakers of other languages. To this end, the ELI offers an intensive English program to international students desiring to prepare themselves for university study. The intensive English program also serves as an ESOL research and teaching laboratory for faculty and graduate students. Moreover, the English Language Institute is active in seeking grants related to ESOL pedagogy and research. As an extension of its concern with ESOL instruction, the English Language Institute provides developmental instruction in ESOL to international students enrolled at UT Arlington. Director: Stephen Lewis, Room 405 Hammond Hall, (817) 273-2730 (ext.4630)

ENVIRONMENTAL INSTITUTE FOR TECHNOLOGY TRANSFER

The Environmental Institute for Technology Transfer (EITT) supports environmental research, education, and training in all colleges at UT Arlington. Funding from federal, state, and industry exceeded \$1 million in 1994. Specific objectives include: (1) provide business and industry with scientific and technical knowledge to comply with environmental regulations; (2) provide industry with a forum to communicate environmental concerns to the regulatory agencies; (3) facilitate University research efforts; (4) accelerate the transfer of environmental technology from invention to application; (5) inform the environmental community of advances in waste reduction, recycling, and control of technology. EITT has an air pollution training center located on the main campus. The Center provides professional training for air pollution practitioners. Graduate studies may be pursued in hazardous materials, air pollution, and environmental planning through various graduate departments and the Interdisciplinary Studies Program. See "Opportunities for Graduate Studies in Environmental Science." Research is supported both by industry and government, providing opportunities for on-site experiences at cooperating institutions. For information, contact Gerald Nehman, Director, Box 19050.

FORT WORTH FEDERAL RECORDS CENTER

The Fort Worth Federal Records Center, a branch of the National Archives, is a valuable resource center for faculty and students in the Department of History. It has voluminous primary sources concerning the Bureau of Indian Affairs, government agencies, and Federal Courts. The Center also has a comprehensive microfilm collection of government records located at the National Archives in Washington, D.C. For other research centers valuable to history students, see the section on the Library, especially the descriptions of the Jenkins Garrett Collection, the Regional Historical Resource Depository, the Division of Archives and

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Manuscripts, the Minority Cultures Center, and the Center for Greater Southwestern Studies and the History of Cartography. For information, contact Kenneth R. Philp, Rm. 344 UH, 273-2861.

FRANK E. LOZO CENTER FOR CRETACEOUS STRATIGRAPHIC STUDIES

The Frank E. Lozo Center for Cretaceous Stratigraphic Studies was established as a research center devoted to the study of Cretaceous stratigraphy, especially in the Gulf and Caribbean Basin. The Center maintains a large reference collection of publications, unpublished field notes, published and manuscript maps, and fossils. The personal collection of these types of materials made by Frank E. Lozo during his lifelong career of Cretaceous stratigraphic research forms the nucleus of the Center's resources. The Center will gladly accept materials of significance to these studies as additions to the permanent collection.

Faculty, graduate students, and others conducting research on Cretaceous problems are invited to use the collection at the Center. Space is available for reading and map study. The Center is located in Rm. 106, Geoscience. Director: Bob F. Perkins, Rm. 115, Geoscience, 273-2987

HUMAN PERFORMANCE INSTITUTE

The Human Performance Institute (HPI) is dedicated to using multidisciplinary scientific bases for human performance measurement, understanding, and enhancement. The Institute was formed to integrate several aspects of ongoing research in human performance measurement and to launch a major effort in response to both clearly identified and emerging needs. HPI developed as an outgrowth of the Center for Advanced Rehabilitation Engineering which was established in 1983. The mission of the Institute is to define a systematic approach to the measurement and understanding of intrinsic parameters and laws which govern the ability of individuals to perform tasks in daily life, as well as to provide education, promote work, and serve as a resource in this area. Basic and applied research address populations ranging from the severely handicapped through normal individuals and super athletes, reflecting a view of performance as a common theme to all human endeavors. Systems performance theory concepts being developed by investigators are being applied to the engineering design process. Human performance engineering methods are being developed to allow optimum design of the devices and tools people use. These tools may include a wide range of items such as a wheelchair, high performance military aircraft, robot, computer system, or intelligent software.

The HPI includes a multidisciplinary team of engineering, life science, and clinical investigators. Graduate students pursuing study in engineering disciplines carry out thesis and dissertation research under faculty supervision. Their efforts are supported by four primary laboratory facilities which include instrumentation and measurement development, a human performance "proving grounds," signal processing and data management, and artificial intelligence/expert systems. For further information, contact G. Koadraske, Director, 273-2335.

INTERNATIONAL LINGUISTICS CENTER

The International Linguistics Center conducts linguistic training and research in cooperation with the linguistics faculty. It is administered by the Summer Institute of Linguistics, Inc. and located near Arlington, one mile west of Duncanville on Camp Wisdom Road. Its purpose is to provide facilities for linguistic training and research. Investigations are conducted pertaining to the world's languages for use by translators, linguists, missionaries, anthropologists, literacy workers, bilingual educators, government officials, and others. A number of competitive graduate Fellowship Grants are provided by the Center each semester. Director: Frank E. Robbins, 214-709-3340

INTER-UNIVERSITY CONSORTIUM FOR POLITICAL AND SOCIAL RESEARCH

The Inter-University Consortium for Political and Social Research (ICPSR) is a data collection and dissemination service sponsored by the University of Michigan and supported by more than 285 universities located in fifteen countries throughout the world. The University's membership in the Consortium provides faculty and students access to the largest accumulation of computer-processed and retrievable data available anywhere in the world. The data resources of the Consortium are developed and maintained by three archival sections. The Survey Research Archive continually adds new data sets from both foreign and domestic studies, permitting longitudinal, cross-cultural analyses that have heretofore been impossible.

The Historical Archive contains computer-processed data of an aggregate nature drawn largely from official and semi-public records, both in the United States and abroad. Likewise, the International Relations Archive provides data from numerous sources for research in this specialized area. In addition to the survey and aggregate data sets, the Consortium makes available to both faculty and students many computer support services, including the development of and instruction in the use of computer programs. For information, contact Dale Story, Rm. 413 UH, 273-3994 or 273-2993.

NASA/UT ARLINGTON CENTER FOR HYPERSONIC RESEARCH

The NASA/UT Arlington Center for Hypersonic Research is one of three centers established at universities in the United States by the National Aeronautics and Space Administration to provide opportunities for graduate-level research and education programs in hypersonic aerodynamics. The UT Arlington Center is co-sponsored by Loral Vought Systems and Lockheed Fort Worth Corporation. The research work conducted at the Center emphasizes high-temperature aspects of hypersonic aerodynamics, propulsion, structures, and materials. Excellent computational and experimental research facilities are available to support the activities of the Center. For information, contact Donald R. Wilson or Dale A. Anderson, Box 19018, Arlington, TX 76019, (817) 273-2603.

NURSE MANAGED CENTER

The focus of the Nurse Managed Center is to promote and support a healthy lifestyle for those associated with the University and others in the community. Health promotion organizations meet in the Center on a regular basis. Health assessments and other screening procedures are offered periodically by nursing faculty members and Advanced Nurse Practitioner students to organizations and/or individuals requesting such services. Faculty members through the Center contract with health care agencies in the area to provide consultation services in the faculty member's area of expertise.

A component of the Nurse Managed Center is the Health Info created in 1990 and located in room 549 of the Nursing Building. The Health Info houses over 1,600 different pamphlets on health-related topics and provides copies of the pamphlets free of charge to persons within the community.

Administration for the Nurse Managed Center is located in Rm. 543, Nursing Building; mailing address is Box 19407, Arlington, Texas, 76019-0407. Director: Josie O'Quinn, 273-2776

THE RYAN/REILLY CENTER FOR URBAN LAND UTILIZATION

The Center was established in 1983 with the aid of a grant from John Ryan and Michael Reilly. The major purpose of the Center is to enhance and support the quality of real estate education in the Dallas/Fort Worth Metroplex. The Center develops and markets real estate and financial seminars for students, faculty, industry members, and the community at large. It sponsors audio-visual programs covering all aspects of real estate and financial matters. The Center assists in the development of real estate courses emphasizing the operational skills involved in property management, asset management, commercial development, construction management and commercial leasing. Opportunities for interaction (such as research and consulting) between the faculty of the College of Business Administration and financial and real estate groups are encouraged. The Center provides graduate placement services to students seeking jobs with real estate and financial firms. Director: Fred A. Forgey, Rm. 106 Business Building, (817) 273-3825, FAX: (817) 273-2252

SOFTWARE ENGINEERING CENTER FOR TELECOMMUNICATIONS

The Software Engineering Center for Telecommunications was established in 1988 to develop advanced research programs at UT Arlington in the formulation and investigation of software engineering technology concepts. It is also to facilitate the transition of software technology to industry and government. Emphasis is placed on carrying fundamental ideas in software engineering from conceptualization through exploration and realization of prototype software engineering environments, and experimental applications in conjunction with industry and government. Research focus is in the area of telecommunication software systems.

Simply stated, university researchers are developing ideas, methods, tools, and architectures to advance the state-of-the-art in the software engineering area. Industry has challenging problems that can provide the basis for student and faculty research. These advances in computer science need to be transitioned into

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the real-world problems faced by industry. The Software Engineering Center for Telecommunications is working to bring these two arenas together.

The Center is within the Computer Science Engineering Department. Research assistantships are available to qualified and interested candidates. Director: Pei Hsia, Box 19015, Arlington, TX 76019, (817) 273-3785

SOLAR ENERGY RESEARCH FACILITY

The College of Engineering's Solar Energy Research Facility (SERF) includes a three-bedroom residential structure of contemporary architectural style with a living area of 1550 square feet. An enlarged mechanical room accommodates much of the heating and cooling equipment including the absorption cooling machine, the heat pump, the fan/coil air handler unit, a commercial water heater, and the domestic water heater. A two-car garage attached via a breezeway houses the thermal storage system, data acquisition equipment, and the remaining mechanical equipment. A cooling tower is located under an exterior stairway to the roof where the concentrating solar collectors and the weather station are located. The building makes extensive use of passive energy conservation measures such as double-paned insulating windows, architectural window shading, insulated doors with face seals, and excellent wall and ceiling insulation.

The solar collectors, two banks of Northrup concentrating solar collectors (21 collectors in each bank with a total area of 420 square feet), are located on the flat roof. The concentrating collectors were designed to operate at temperatures well over 200 degrees F and hence provide adequate input to the absorption cooling machinery. The collectors are facing due south and are tilted at 27 degrees from the horizontal. A tracking mechanism is required to point the collectors continuously toward the sun in order to receive the direct solar radiation. A flat-plate solar collector array subsystem was installed in 1978 for direct solar heating and solar-assisted heat-pump heating of the SERF house. The flat-plate collector subsystem consists of 550 square feet of flat-plate collectors located on the lawn of the house and has an adjustable tilt angle. A 110 square meter 8 Kw pk photovoltaic system is used to supply the electric demands of the SERF house. Excess photovoltaic energy is fed back to the utility during peak demand hours. Director: Chair, Mechanical and Aerospace Engineering, Rm. 204 Engineering Building, 273-2561

STRUCTURAL RESEARCH LABORATORY

The Structural Research Laboratory is engaged in research in the areas of structural testing and experimental mechanics. The Laboratory is actively involved in full scale tests of concrete, masonry, steel, and composite structural components. Graduate students and advanced undergraduate students conduct research in the laboratory. Available facilities include 200-ton hydraulic testing systems, 30-foot high reaction frame, 3000 square feet testing floor, 40 different sizes portable hydraulic rams, two forklifts, and computerized data acquisition systems. The Laboratory also operates two environmental control rooms for use in creep investigation of high strength concrete and structural composites. For information, contact John H. Matthys, Box 19308, Arlington, TX 76019, 273-3701.

SCHOOL OF URBAN AND PUBLIC AFFAIRS

Urban Training and Service

An objective of the Training and Service Programs is to draw on the knowledge and skill of School faculty and staff to provide guidance and assistance to Texas public agencies and other community groups striving to deal with changing political, economic, and social conditions. The faculty provides a variety of services directly to agencies or other groups requesting assistance and facilitates the work of other School faculty and staff members while conducting training or delivering services. For information, contact David Tees, Rm. 501B UH, 273-3304.

WAVE SCATTERING RESEARCH CENTER

This Center was established in 1984 to conduct theoretical, experimental, and computer simulation research in electromagnetic wave scattering and attenuation from area extensive targets such as earth terrains, sea surfaces, ambient air, and artificial canopy models and from objects such as antennas, ships, etc. In addition, the Center also conducts research in air polluting monitoring, radar systems, and microwave imaging of man-made terrains and objects. The Center has an anechoic chamber to conduct controlled bistatic and monostatic measurements of man-made targets. A unique feature of the chamber is that it incorporates a hemispherical structure with 25 receiving horns at the target end of the chamber to

allow bistatic measurements to be acquired without having to change or realign any receiving or transmitting antenna. The transceiver includes a HP 8510 network analyzer for recovery of calibrated amplitude and phase information. The source is a phase locked frequency synthesizer operating from two to 18 GHz. It also has a bistatic laser scattering system operating at a wavelength of 0.63 μ m, a long-path UV spectrometer, a Fourier transform infrared spectrometer (FT-IR), and a millimeter wave spectrometer to monitor air pollution. For information, contact Adrian K. Fung, 252 Nedderman Hall, Box 19016, Arlington, TX 76019, (817) 273-3422.

WOMEN AND MINORITIES RESEARCH AND RESOURCE CENTER

The Women and Minorities Research and Resource Center seeks to support and encourage scholarship about gender and culture, including, but not limited to such topics as: gender and language; literary expressions and representations of women and specific minority groups; ethnographies; psychologies of logic, moral reasoning, and decision making practiced by women; and studies of women in the workplace. The Center also seeks to facilitate the revision of undergraduate and graduate liberal arts curricula, particularly in the core requirements. Women's studies courses and faculty are well-represented in most departments of the College of Liberal Arts. The Graduate Humanities Program Office, located in University Hall 219, provides a complete listing of all graduate faculty areas of expertise, including women's and minority studies.

The Women and Minorities Research and Resource Center was formed in 1989 as a merger of the Women and Work Research and Resource Center and the Center for Women's Studies. The integrated Center provides a clearing house and administrative locus for various activities including a national symposium on women and work, statewide meetings of women's and minorities faculty, lecture series, summer institutes and seminars for faculty, and resources for students interested in focusing on women's or minorities studies. The Center functions as a grant-seeking office and as a resource for individuals and departments seeking grants in women's and minorities studies and sustains affiliations with the National Women's Studies Association, the South Central Women's Studies Association, the Wellesley College Center for Research on Women and the Southwest Institute for Research on Women (SIROW). For information, contact Dana Dunn, Box 19599, Arlington, TX 76019, (817) 273-3131.

PUBLICATIONS

NONLINEAR ANALYSIS—THEORY, METHODS, AND APPLICATIONS and STOCHASTIC ANALYSIS AND APPLICATIONS

These two international journals, *Nonlinear Analysis—Theory, Methods and Applications* (Pergamon Press) and *Stochastic Analysis and Applications* (Marcel Dekker), afford students and faculty the opportunity of a role in an important area of mathematical sciences. The Department of Mathematics also publishes faculty and student research results as technical reports. Approximately 250 American and foreign institutions receive copies of these reports. Editor: G. S. Ladde, 273-3261

PAPERS CONCERNING ROBERTSON'S COLONY IN TEXAS

Beginning in 1974, one volume of the *Papers Concerning Robertson's Colony in Texas*, compiled and edited by Dr. Malcolm D. McLean, has been published each year. In 1976 The University of Texas at Arlington acquired most of the manuscripts that were still in private hands concerning this colony, which occupied an area 100 miles wide and 200 miles long in the heart of Texas, centering around Waco. These documents are now preserved in the Special Collections on the Sixth Floor of the Central Library. These volumes can be ordered from the UTA Press, Box 190929, The University of Texas at Arlington, Texas 76019-0929. For additional information about these volumes, or to consult the manuscripts which have not yet been published, call Gerald Saxon, Assistant Director for Special Collections, (817) 273-3393.

RUDOLF HERMANN'S MEMORIAL COLLOQUIA

These annual colloquia commemorate a University benefactor and bring to the campus a small group of scholars in the humanities. Sponsored by the English Department, each colloquium is organized around a topic of general interest in the humanities. Visiting scholars guide students, faculty, and members of the community in discussions that emphasize the various ways that several significant texts related to the topic

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can be examined. For information, contact Nancy Wood, Chair, Department of English, Box 19035, Rm. 203, Carlisle Hall.

SCHATZKAMMER

Schatzkammer is an annual journal supported in part by the Department of Foreign Languages. It is devoted to the discussion of innovative teaching techniques at all levels of German instruction, to research in contemporary German linguistics, and to historical and cultural contributions to America by German-speaking people. Creative writing of contemporary interest is solicited occasionally. Consulting and Founding Editor: Duane V. Keilstrup, Rm. 313 HH, 273-3161

SUMMER INSTITUTE OF LINGUISTICS PUBLICATIONS IN LINGUISTICS

The *Summer Institute of Linguistics Publications in Linguistics* is a joint University of Texas at Arlington-Summer Institute of Linguistics monograph series published approximately six times a year. The series was begun in 1958 primarily as a publishing outlet for linguistic field workers who collect data concerning heretofore unwritten or undescribed languages and has been expanded to include a wide range of content within the field of descriptive linguistics. Monographs range from descriptive studies of the linguistic structures of little known languages to occasional comparative studies of some of the major languages. Editor: Donald A. Burquest, Rm. 127 HH, 273-3133

WALTER PRESCOTT WEBB MEMORIAL LECTURES

The lectures, inaugurated in 1965, are delivered each spring in honor of Texas' most distinguished historian, Walter Prescott Webb. Now considered among the most prestigious history lecture series in the country, the Webb Memorial Lectures give graduate students and others the opportunity to meet and to hear some of the nation's outstanding historians. The four Webb lectures — along with the winning essay of the Webb-Smith Essay Competition — are then published for the History Department by Texas A&M University Press. Chair: Steven Reinhardt, UH 355, 794-5182

SHORT COURSES, CONFERENCES, AND SPECIAL PROGRAMS

SPECIAL COURSE IN GRANT PROPOSAL DEVELOPMENT

The Office of Sponsored Projects offers through the Graduate School a special, broadly-based introductory course in grant proposal writing. This course includes identification of sources of funding, proposal writing and budgeting, the submission and review process, and post-award project management. Offered as GRAD 5101, it is a regularly scheduled one-hour course open to students in any graduate program at UT Arlington. This course may be applied to degree credit if approved by the Committee on Graduate Studies of the student's program. Introduction to Grant Proposal Development will be offered each Spring semester and, on demand, may be offered in the Fall semester. Those wishing to take this course should register for GRAD 5101. For more information, contact Director of Sponsored Projects, 350 Davis Hall, 273-2105.

GRADUATE STUDIES IN ENVIRONMENTAL SCIENCE AND ENVIRONMENTAL ENGINEERING

Students are provided opportunities to pursue graduate degrees in the areas of environmental science and environmental engineering. Degree plans may be cooperative multidisciplinary programs between several colleges or a specialized department. Graduate courses and research programs provide educational opportunities that focus on resolving a broad array of current and future environmental problems. For general information on degree plans in environmental science, call the Environmental Institute for Technology Transfer (817) 273-2300.

Information on graduate opportunities between the College of Science and College of Engineering can be obtained by calling the advising offices in the Department of Geology (817) 273-2987 or the Department of Civil Engineering (817) 794-2201. Opportunities for studies in geographical information systems and environmental policy and planning are offered through the School of Urban and Public Affairs

(817) 273-3071. Programs of work consisting of courses across many disciplines can be developed through the Program in Interdisciplinary Studies (817) 273-2681.

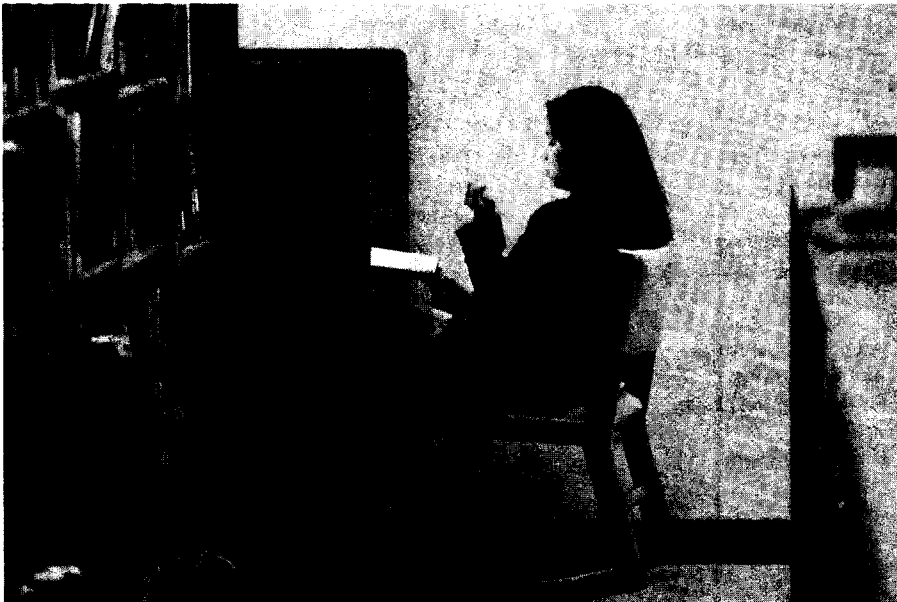
Research opportunities and continuing professional education courses (non-credit) are offered by several centers. These include the Center for Biological Macrofouling Research, Center for Environmental Research and Training, Center for Geoenvironmental and Geoarcheological Studies, and the Environmental Institute for Technology Transfer. Information on these centers can be found under Research Centers, Divisions, and Special Facilities in this catalog.

POWER SYSTEMS SHORT COURSES

The "Modeling and Analysis of Modern Power Systems" short course has been presented annually by the Energy Systems Research Center (ESRC) for more than 30 years. It is the longest-running course of its kind in the power field and has attracted engineers from as many as 40 states, 39 countries, and 329 companies. It is an intensive two-week course which is continually updated to reflect the most advanced concepts and practices in planning, design, and operation of electrical power systems.

The ESRC has recently developed the following courses for Continuing Education: 1. Practical Training in Power System Load Flow Analysis; 2. Practical Training in Power System Operations; 3. Practical Training in Power System Dynamics; 4. Practical Training in Short Circuit Analysis and Protection of an Electrical Power System; 5. Distribution Power System Engineering; 6. Automatic Mapping and Facilities Management; 7. Industrial Power Systems; 8. Power System Reliability; 9. Introduction to Power Electronics; 10. Computer Control of AC & DC Drives; 11. Eleven Operator Training Courses (Fundamental Theory of SCADA System, EMS and Application Software, Reactive Power and Voltage Instability, Protective Relaying, Transient Stability, Dynamic Stability, and Voltage Stability, Normal Operations, Abnormal Operations, Interconnected System Operation, Modern Power System Control Aids, Programmable Logic Controller (PLC) for Engineers, and Field Trips Related to Operator Training); 12. Field Trips; 13. Power System Engineering; 14. Fundamentals of Power Engineering (Designed for Technicians); 15. Fundamentals of Power Systems (Designed for Technicians); 16. Computers, Electronics and Data Communications (Designed for Technicians); 17. Power System Design; 18. Power System Protection.

Dr. Mo-Shing Chen, Professor of Electrical Engineering and Director of the Energy Systems Research Center, is responsible for the courses and is aided by members of the Electrical Engineering Department and the Energy Systems Research Center staff. Director: Mo-Shing Chen, Rm. 100B Engineering Annex Bldg., 273-2268



ADVANCED DEGREES AND REQUIREMENTS

The University of Texas at Arlington offers the following graduate degrees and certificates in the areas of study and through the departments and programs indicated.

DEPARTMENTS AND PROGRAMS	AREAS OF STUDY	DEGREES AND CERTIFICATES
Accounting	<i>Accounting</i> <i>Business Administration</i> <i>Professional Accounting</i> <i>Taxation</i>	M.S. PH.D. M.P.A. M.S.
Aerospace Engineering	<i>Aerospace Engineering</i>	M.S., M.ENGR., PH.D.
Anthropology		M.A.
Architecture	<i>Architecture</i> <i>Landscape Architecture</i>	M.ARCH. M.L.A.
Biology	<i>Biology</i> <i>Quantitative Biology</i> <i>Mathematical Sciences</i>	M.S. PH.D. PH.D.
Biomedical Engineering	<i>Biomedical Engineering</i> <i>Clinical Engineering</i> <i>Biomedical Engineering</i>	M.S., PH.D. CERTIFICATE OF INTERNSHIP CERTIFICATE OF INTERNSHIP
Business Administration	<i>Business Administration</i>	M.B.A., PH.D.
Chemistry	<i>Chemistry</i> <i>Applied Chemistry</i> <i>Mathematical Sciences</i>	M.S. PH.D. PH.D.
City and Regional Planning	<i>City and Regional Planning</i>	M.C.R.P.
Civil Engineering	<i>Civil Engineering</i>	M.S., M.ENGR., PH.D.
Computer Science and Engineering	<i>Computer Science</i> <i>Computer Science</i> <i>and Engineering</i> <i>Mathematical Sciences</i>	M.S., M.C.S., PH.D. M.S., M.ENGR., PH.D. PH.D.
Criminal Justice	<i>Criminal Justice</i>	M.A.
Education	<i>Teaching</i>	M.E.T.
Economics	<i>Economics</i>	M.A.
Electrical Engineering	<i>Electrical Engineering</i>	M.S., M.ENGR., PH.D.
Engineering Mechanics	<i>Engineering Mechanics</i>	M.S.
English	<i>English</i> <i>Humanities</i>	M.A. M.A., M.A.T., PH.D.
Environmental Science and Engineering	<i>Environmental Science and Engineering</i>	M.S., PH.D.
Finance and Real Estate	<i>Business Administration</i> <i>Real Estate</i>	M.B.A., PH.D. M.S.
Foreign Languages	<i>French, German, Spanish</i> <i>Humanities</i>	M.A. M.A., M.A.T., PH.D.
Geology	<i>Geology</i> <i>Mathematical Sciences</i>	M.S. PH.D.

DEGREE OFFERINGS/REQUIREMENTS

History	<i>History</i>	M.A.
	<i>Humanities</i>	M.A., M.A.T., PH.D.
	<i>Archival Administration</i>	CERTIFICATE OF ARCHIVAL ADMINISTRATION
Humanities	<i>Humanities</i>	M.A., M.A.T., PH.D.
Industrial Engineering	<i>Industrial Engineering</i>	M.S., M.ENGR., PH.D.
Information Systems and Management Sciences	<i>Business Administration</i>	M.B.A., PH.D.
	<i>Information Systems</i>	M.S.
	<i>Mathematical Sciences</i>	PH.D.
Interdisciplinary Studies	<i>Interdisciplinary Studies</i>	M.A., M.S.
Landscape Architecture	<i>Landscape Architecture</i>	M.L.A.
Linguistics	<i>Linguistics</i>	M.A.
	<i>Humanities</i>	M.A., M.A.T., PH.D.
Management	<i>Business Administration</i>	M.B.A., PH.D.
	<i>Personnel and Human Resource Management</i>	M.S.
Marketing	<i>Business Administration</i>	M.B.A., PH.D.
	<i>Marketing Research</i>	M.S.
Materials Science and Engineering	<i>Materials Science and Engineering</i>	M.S., M.ENGR., PH.D.
Mathematics	<i>Mathematics</i>	M.S.
	<i>Mathematical Sciences</i>	PH.D.
Mathematical Sciences	<i>Mathematics, Applied Mathematics</i>	PH.D.
Mechanical Engineering	<i>Mechanical Engineering</i>	M.S., M.ENGR., PH.D.
Nursing	<i>Nursing</i>	M.S.N.
Physics	<i>Physics</i>	M.S.
	<i>Radiological Physics</i>	M.S.
	<i>Physics and Applied Physics</i>	PH.D.
	<i>Mathematical Sciences</i>	PH.D.
Political Science	<i>Political Science</i>	M.A.
	<i>Humanities</i>	M.A., M.A.T., PH.D.
Psychology	<i>General Experimental Psychology</i>	M.S., PH.D.
	<i>Mathematical Sciences</i>	PH.D.
Public Administration	<i>Public Administration</i>	M.P.A.
Radiological Physics	<i>Radiological Physics</i>	M.S.
Real Estate	<i>Real Estate</i>	M.S.
Social Work	<i>Social Work</i>	M.S.S.W., PH.D.
Sociology	<i>Sociology</i>	M.A.
	<i>Humanities</i>	M.A., M.A.T., PH.D.

REQUIREMENTS FOR THE MASTER'S DEGREE

The following minimum requirements apply to all master's degrees including the MA, MS, MArch, MAT, MBA, MCRP, MCS, MEngr, MET, MLA, MPA (Accounting), MPA (Public Administration), MSN, and MSSW offered by UT Arlington. Additional requirements may be imposed for specialized or professional degree programs, or by individual departments or interdepartmental or intercampus graduate studies committees. The additional requirements are given in the descriptions of the individual degree programs.

DEPARTMENTAL, PROGRAM, AND COLLEGE PROGRAM MANUALS FOR STUDENTS

Many departments and programs issue program manuals, procedures and policy manuals, graduate student handbooks, and other informational publications for students and faculty in graduate programs. These publications may provide detailed and useful information; however, they are not statements of official policy of The University of Texas at Arlington nor of The University of Texas System. In all matters the Rules and Regulations of the Board of Regents of The University of Texas System, *The Handbook of Operating Procedures* of The University of Texas at Arlington, and the Graduate Catalog of The University of Texas at Arlington shall supersede departmental, program, or college publications.

GRADUATE PROGRAM DEGREE REQUIREMENTS AND ACADEMIC PERFORMANCE STANDARDS FOR MASTER'S DEGREES

The degree requirements and academic performance standards given in this section entitled "Requirements for the Master's Degree" are the minimum required by general Graduate School and University policy. Satisfying these general requirements and standards does not imply that all degree and program requirements have been met. Many programs set special course requirements and may require higher grade-point averages or other academic standards than those given in this section. Such program requirements and standards are given under the individual program descriptions in this catalog and in departmental, program, and college program manuals or policy statements for students. These special course requirements and higher grade-point or other academic standards published in departmental, program, or college program manuals or policy statements for students shall not be considered in conflict with this catalog and shall have the same force as this catalog.

UNDERGRADUATE PREPARATION

The minimum undergraduate preparation acceptable for graduate concentration in most areas is 12 semester hours of advanced undergraduate work in that area; however, this requirement varies widely, and the individual department and program descriptions should be consulted for specific requirements. The appropriate Committee on Graduate Studies may administer an oral, written, or both oral and written examination to an applicant in order to assess undergraduate preparation for graduate work in the chosen area. The committee may require the student to eliminate deficiencies in undergraduate preparation before the student may be granted unconditional acceptance into the graduate program.

RESIDENCE

Master's degree candidates are expected to spend the equivalent of two semesters of full-time study in residence at The University of Texas at Arlington.

SUPERVISING COMMITTEES

The Dean of the Graduate School will appoint each master's program student a supervising committee upon the recommendation of the Graduate Advisor and the appropriate Committee on Graduate Studies. The committee will consist of at least three members or associates of the Graduate Faculty and is responsible for the design of the student's program. The supervising committee conducts the final thesis examination for thesis degree plan candidates and determines the scope, content, and form of the final master's comprehensive examination for thesis substitute and non-thesis degree plan candidates.

DEGREE PLANS AND HOURS REQUIRED

Three degree plans (thesis, thesis substitute, and non-thesis) leading to the master's degree are available. All programs except Humanities, Education, and Public Administration offer the thesis degree plan. In certain departments and programs a student may follow a thesis substitute or non-thesis degree plan upon the recommendation of the appropriate Committee on Graduate Studies and the approval of the Dean of the Graduate School. The plans available in each department or program are listed in the catalog section on departmental and program descriptions.

The *thesis degree plan* requires a minimum of 30 semester hours of which at least 24 hours must be in coursework and six hours in a thesis course. The thesis must be approved by the thesis advisor and by a supervising committee of three or more members appointed by the Dean; the thesis is subject to final approval by the Dean. A student receiving advice and assistance from a faculty member in the preparation of a thesis must register for the appropriate course even if the student is not present on the campus. Each semester after consulting with his Graduate Advisor, the student should register for the amount of thesis credit commensurate with the effort to be expended by the student and the thesis advisor in the preparation of the thesis. Once the student is enrolled in the thesis course, continuous enrollment is required. The student must be enrolled in six hours of thesis the semester he or she finishes the thesis requirements and files for graduation. The degree candidate must defend the thesis in a final oral examination open to all members of the faculty.

The *thesis substitute degree plan* requires a minimum of 33 semester hours of which at least 27 hours must be in coursework and three hours in an appropriate project or research course. The thesis substitute may include (1) internship reports in programs in which the internship has been determined by the Dean to be an essential component, (2) reports prepared in certain graduate seminar, conference, or research courses, or (3) a design thesis in Architecture and Landscape Architecture. The internship substitute requires a minimum of six semester hours in the internship course.

The *non-thesis degree plan* requires a minimum of 36 semester hours of coursework, of which at least 24 hours must be in the major area(s) of study.

The *thesis substitute or non-thesis degree plans* are available in all departments or programs with the exceptions of Geology and Radiological Physics.

APPROVAL OF PROGRAM OF WORK

A Tentative Program of Work listing all transfer courses, courses in progress, and courses required by the student's committee or department must be filed in the Graduate School during the student's first semester of full-time work on the master's program, but not later than the completion of the first 12 hours of graduate work. If the student desires to apply up to nine semester hours of transfer credit to his or her degree program, the Tentative Program of Work must be filed during the student's first semester whether or not the student is engaged in full-time graduate work.

In all degree plans the entire degree program must be approved by the appropriate Committee on Graduate Studies and the Dean of the Graduate School.

CANDIDACY

A student will be admitted to candidacy for the master's degree only when the requirements listed previously have been met. The student must file a Final Program of Work and Application for Candidacy with the Dean of the Graduate School no later than 30 days after the first day of classes of the semester in which he or she plans to receive the degree (see Graduate School calendar for specific date). A student planning to receive a degree at the end of the summer session must file the Final Program of Work and Application for Candidacy with the Dean of the Graduate School no later than 30 days after the first class day of the 11-week summer session (see Graduate School calendar for specific date).

FINAL MASTER'S EXAMINATION

A final program examination is required for all master's degree candidates. The final master's examination can result in 1) pass with a recommendation to the Dean of the Graduate School that the candidate be certified to receive the earned degree, 2) a conditional pass with the requirement that additional conditions be met which may include further work on the thesis or thesis substitute, additional coursework with a minimum specified grade-point average, or both, but in all cases the final master's examination must be repeated within a specified period, or 3) failure and recommendation to the Dean of the Graduate School that the candidate be dismissed from the program. Most programs limit the number of repeats of

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with a minimum specified grade-point average, or both, but in all cases the final master's examination must be repeated within a specified period, or 3) failure and recommendation to the Dean of the Graduate School that the candidate be dismissed from the program. Most programs limit the number of repeats of the final master's examination for a student to two times. Additional repeats require the specific approval in advance in writing by the Dean of the Graduate School. For *thesis degree plan* candidates the examination will be an oral defense of the thesis. The examination will be conducted by all members of the student's supervising committee, but will be open to all members of the faculty. The thesis examining committee must have copies of the thesis at least two weeks prior to the thesis defense.

For *thesis substitute* or *non-thesis degree plan* candidates the final examination will be a comprehensive examination that is written, oral, or both. The scope, content, and form of the examination(s) shall be determined and administered by all members of the student's supervising committee. Students in the Master of Business Administration program fulfill the comprehensive examination requirement upon the successful completion of Business Administration 5333. Students in the Master of Science in Social Work program fulfill the comprehensive examination requirements upon successful completion of Social Work 6305. Students in the Master of Science in Information Systems program fulfill the comprehensive examination requirement upon successful completion of INSY 5345. Students in the Master of Architecture program fulfill the comprehensive examination requirement upon successful completion of six hours of advanced design studio (non-thesis) or design thesis (thesis substitute).

The student's Graduate Advisor must submit a request for the thesis defense or comprehensive examination to the Graduate School no later than two weeks before the proposed examination date. The request must indicate the time, place, and form (oral and/or written) of the examination and the signatures of the examining committee, confirming each member's intention to be present at the indicated time and place.

The Final Master's Examination Report must be filed in the Graduate School no later than three weeks before the date on which the candidate expects the degree to be conferred. Thesis degree plan candidates must deposit three unbound copies of the final approved thesis with the Graduate School by that date and pay the required thesis binding fee.

MASTER'S THESIS AND INTERNSHIP REPORT

The final copies of the master's thesis must be prepared according to the regulations described in the current edition of the *Thesis and Dissertation Manual of Style* available from the UT Arlington Bookstore. Manual has been deposited in the reference section of the Library. Thesis binding fees are listed in the Tuition and Fees Section of this catalog.

All theses and dissertations must conform to University requirements regarding placement in the University Library, microfilming, publication of abstracts in *Masters Abstracts International* or *Dissertation Abstracts International*, and access and citation for scholarly purposes. The three copies of the thesis or dissertation which are required to be submitted to the Dean of the Graduate School are University property and a student may make no private agreements with employers, funding sources, or others which restrict or infringe upon University rights. Thesis copyrights, where applicable, should be held by the student author.

Each semester the Graduate School offers to all students enrolled in thesis or dissertation the opportunity to attend a seminar on thesis and dissertation preparation. The requirements described in the *Thesis and Dissertation Manual of Style* are explained, and general Graduate School procedures of particular importance to degree candidates are outlined.

The Assistant Dean of the Graduate School examines each thesis and determines whether or not the thesis meets Graduate School requirements for format and mechanical presentation. In order to reduce the number of last minute inconveniences for the student, the student is required to submit the master copy of the final draft of the thesis before having additional required copies prepared. The master copy must be received no later than ten working days in advance of the final deadline to allow at least three days for Graduate School examination, time for the student to make necessary corrections, and time to have the final required copies made. After the Graduate School receives the master copy of the final draft, the student will be given a written format evaluation 72 hours later (excluding weekends, holidays, and graduate registration periods).

TIME LIMIT

Programs for the master's degree must be completed within six years (time in military service excluded) from initial registration in the Graduate School.

FOREIGN LANGUAGE REQUIREMENT

A reading knowledge of at least one foreign language (classical or modern) is required by some departments or programs for master's degree candidates. Specific language requirements, if any, are given in the individual departmental and program degree descriptions.

MASTER OF ARTS (MA)

The University of Texas at Arlington offers the MA degree in the following areas:

Anthropology	German	Political Science
Criminal Justice	History	Sociology
Economics	Humanities	Spanish
English	Interdisciplinary Studies	Urban Affairs
French	Linguistics	

MASTER OF SCIENCE (MS)

The University of Texas at Arlington offers the MS degree in the following areas:

Accounting	Information Systems
Aerospace Engineering	Interdisciplinary Studies
Biology	Marketing Research
Biomedical Engineering	Materials Science and Engineering
Chemistry	Mathematics
Civil Engineering	Mechanical Engineering
Computer Science	Personnel and Human Resource Management
Computer Science and Engineering	Physics
Electrical Engineering	Psychology
Engineering Mechanics	Radiological Physics
Environmental Science and Engineering	Real Estate
Geology	Taxation
Industrial Engineering	

SPECIALIZED AND PROFESSIONAL MASTER'S DEGREES

The University of Texas at Arlington offers the following specialized and professional master's degrees:

Master of Architecture	Master of Engineering
Master of Arts in Teaching (see Humanities)	Master of Landscape Architecture
Master of Business Administration	Master of Professional Accounting
Master of City and Regional Planning	Master of Public Administration
Master of Computer Science	Master of Science in Nursing
Master of Education in Teaching	Master of Science in Social Work

Requirements for each of these degrees, with the exception of the Master of Engineering are listed under the appropriate department or program.

MASTER OF ENGINEERING DEGREE REQUIREMENTS

The Master of Engineering degree is offered by the Graduate Programs in Aerospace Engineering, Civil Engineering, Electrical Engineering, Industrial Engineering, Materials Science and Engineering, Mechanical Engineering, and Computer Science and Engineering. The degree is a practice-oriented program requiring 36 semester hours.

The required distribution of coursework is as follows:

One-third of total credit hours—engineering design, analysis, synthesis courses.

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One-third of total credit hours—combination of advanced mathematics, basic science, engineering science or design.

One-third of total credit hours—to complement the specified portions of the program and provide a meaningful total program in keeping with the educational objectives of the student and the College.

CERTIFICATES

The University of Texas at Arlington offers the following certificates through the Graduate School:

Archival Administration (History)

Internship in Clinical Engineering (Biomedical Engineering)

Internship in Biomedical Engineering (Biomedical Engineering)

Requirements for each of these certificates are described under the department or program specified in parentheses after the certificate title.

DUAL DEGREE PROGRAMS

Students may pursue dual degree programs other than those specifically defined in the catalog with prior approval of the appropriate Committees on Graduate Studies and the Dean of the Graduate School. Students wishing to pursue dual degree programs other than those specifically defined in the catalog should contact the Office of the Dean of the Graduate School for details.

Students in any dual degree program must be admitted to each program concerned. Students who are accepted into dual degree programs must submit separate Programs of Work for each degree, showing only courses which meet requirements for the specified degree, including those joint courses which meet requirements for both degrees.

Admission to and enrollment in the programs concerned in a dual degree program must be concurrent.



REQUIREMENTS FOR THE DOCTOR OF PHILOSOPHY DEGREE

The Doctor of Philosophy (PhD) is the highest degree offered by The University of Texas at Arlington. The degree is awarded only for academic work of distinction through which the student demonstrates superior scholarship and a capacity for original work. The general requirements for the doctoral degree listed below set the minimum standards required by the Graduate School. The meeting of all of these requirements does not result automatically in the awarding of the doctoral degree. All departments and programs have additional requirements for a high level of scholarly achievement that must be met by successful doctoral candidates. In all doctoral programs the basic requirements are that a student (1) attain mastery of a field of knowledge as determined by the appropriate Committee on Graduate Studies and demonstrated in a general examination and (2) give evidence of a capacity to complete a significant program of original research by preparation of a dissertation.

DEPARTMENTAL, PROGRAM, AND COLLEGE PROGRAM MANUALS FOR STUDENTS

Many departments and programs issue program manuals, procedures and policy manuals, graduate student handbooks, and other informational publications for students and faculty in graduate programs. These publications may provide detailed and useful information; however, they are not statements of official policy of The University of Texas at Arlington nor of The University of Texas System. In all matters the Rules and Regulations of the Board of Regents of The University of Texas System, *The Handbook of Operating Procedures of The University of Texas at Arlington*, and the Graduate Catalog of The University of Texas at Arlington shall supersede departmental, program, or college publications.

GRADUATE PROGRAM DEGREE REQUIREMENTS AND ACADEMIC PERFORMANCE STANDARDS FOR DOCTORAL DEGREES

The degree requirements and academic performance standards given in the section entitled "Requirements for the Doctor of Philosophy Degree" are the minimum required by general Graduate School and University policy. Satisfying these general requirements and standards does not imply that all degree and program requirements have been met. Many programs set special course requirements and may require higher grade-point averages or other academic standards than those given in this section. Such program requirements and standards are given under the individual program descriptions in this catalog and in departmental, program, and college program manuals or policy statements for students. These special course requirements and higher grade-point or other academic standards published in departmental, program, or college program manuals or policy statements for students shall not be considered in conflict with this catalog and shall have the same force as this catalog.

RESIDENCE

Residence requirements vary widely among the doctoral programs. For specific requirements, consult the Degree Requirements section under the individual departments and programs offering the doctoral degree.

COURSES AND SEMESTER HOUR REQUIREMENTS

The doctoral degree cannot be earned solely on the basis of passing a certain group of courses and accumulating a specified number of hours; however, a department or program may require a core group of courses for all of its doctoral students. Coursework is generally concentrated in the student's major field, but some work is normally taken in one or more complementary minor fields. In interdepartmental programs the major work may be divided among two or more primary fields.

The Graduate School imposes no specific semester hour requirements for the doctoral degree except the residence requirements given in the individual degree program descriptions.

FOREIGN LANGUAGE REQUIREMENT

Prior to scheduling the doctoral comprehensive examination the Graduate School requires satisfactory evidence that the student has a reading knowledge of one foreign language applicable to the student's field

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of study or has attained proficiency in a research-tool area such as computer sciences or experimental statistics or other suitable foreign language substitute approved by the Dean of the Graduate School. Foreign language competency is specifically required for the PhD degree programs in Humanities and Chemistry, but a substitute is permitted in the PhD program in Psychology. There is no foreign language requirement for the PhD in the various engineering fields, but a research tool may be required as determined by the student's committee.

The foreign language requirement may be met by (1) successfully passing an examination prepared by an appointee of the Dean of the Graduate School, (2) making an acceptable score on the Educational Testing Service Graduate School Foreign Language Test, or (3) earning a grade of B or better in French, German, or Russian 4331 and 4332, or equivalent. The foreign language substitute requirement may be met by a method determined by the appropriate Committee on Graduate Studies and approved by the Dean of the Graduate School.

DIAGNOSTIC EVALUATION

During the student's first year of doctoral program work, the student must demonstrate the potential to pursue and successfully complete a degree program. The method of assessing the student's potential will be determined by the appropriate Committee on Graduate Studies and may be in the form of a written or oral examination, personal interviews with faculty members, successful completion of certain courses in the first semester of residence, or by any combination of these methods. The result of the diagnostic evaluation may be (1) approval to continue in the doctoral program, (2) approval to continue with specified remedial work, (3) failure but with permission for assessment through a second diagnostic evaluation after a specified period, or (4) failure and termination in the program.

The diagnostic evaluation report must be filed in the Graduate School by the student's Graduate Advisor during the student's first year of doctoral program work but no later than the completion of the first 18 semester hours of coursework beyond appropriate master's level coursework or the equivalent.

DOCTORAL COMMITTEES

After the student successfully completes the diagnostic evaluation, the Dean of the Graduate School will assign the student an examining committee upon the recommendation of the Graduate Advisor and appropriate Committee on Graduate Studies. The committee will consist of at least five members. Four of the members must be from the student's major area and at least one from each minor field. In interdisciplinary programs at least two members must represent each field concerned, but in no case is the committee to consist of fewer than five members; the PhD in Administration committee will include one or more representatives from each of the five academic areas included in the student's program. The committee is responsible for design and direction of the student's program. After the student has successfully passed the comprehensive examination (see next paragraph) the doctoral supervising committee may be altered or expanded to accommodate the dissertation research needs of the student, but the committee must continue to include at least five members.

COMPREHENSIVE EXAMINATION

A student is eligible to take the comprehensive examination after giving evidence to his or her doctoral committee of adequate academic achievement by having completed all or most of the coursework requirements and by having met the language or language substitute regulation if required in the degree program. The comprehensive examination usually marks the end of formal coursework and the beginning of a period of concentrated work on dissertation research and preparation. The student must be enrolled in the Graduate School in the semester in which he or she takes the comprehensive examination.

The comprehensive examination may be written or oral or both written and oral. Its scope, content, and form shall be determined by the student's examining committee with the approval of the appropriate Committee on Graduate Studies. The student's Graduate Advisor must submit a Request for the Comprehensive Examination to the Graduate School no later than two weeks before the proposed examination date. The request must indicate the time, place, and form (oral and/or written) of the examination and include the signatures of the examining committee.

In some departments and programs the comprehensive examinations are given semi-annually, and in these areas students should consult the Graduate Advisor in that program for regulations and procedures governing the comprehensive examinations.

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The comprehensive examination may result in (1) approval and recommendation to proceed to the next phase of the program, (2) approval to remain in the program but meet certain specified additional requirements, (3) failure but with permission to retake the examination after a certain period as specified by the examining committee, or (4) failure with recommendation not to continue in the program.

ADMISSION TO CANDIDACY

Upon passing the comprehensive examination the student becomes eligible for admission to candidacy. The Application for Candidacy and Final Program of Work must be filed in the Graduate School and approved by the Dean of the Graduate School at least one semester prior to awarding of the degree.

TIME LIMIT

All requirements for the doctoral degree must be completed within four years after passing the comprehensive examination.

DISSERTATION

Once the student is enrolled in the dissertation course, continuous enrollment is required. A student receiving advice and assistance from a faculty member in the preparation of a dissertation must register for the appropriate course even if the student is not present on the campus. Each semester after consulting with his Graduate Advisor, the student should register for the amount of dissertation credit commensurate with the effort to be expended by the student and the dissertation advisor in the preparation of the dissertation. The student must be enrolled in nine hours of dissertation (6999) the semester in which he or she finishes the dissertation requirements and files for graduation.

The dissertation represents the culmination of the student's academic efforts and so is expected to demonstrate original and independent research activity and be a significant contribution to knowledge.

The final copies of the doctoral dissertation must be prepared according to the regulations described in the current edition of the *Thesis and Dissertation Manual of Style* available from the UT Arlington Bookstore. A copy of the *Manual* has been deposited in the reference section of the Library. The catalog section on Tuition and Fees lists dissertation binding, microfilming, and copyrighting fees.

All theses and dissertations must conform to University requirements regarding placement in the University Library, microfilming, publication of abstracts in *Master Abstracts International* or *Dissertation Abstracts International*, and access and citation for scholarly purposes. The three copies of the thesis or dissertation which are required to be submitted to the Dean of the Graduate School are University property and a student may make no private agreements with employers, funding sources, or others which restrict or infringe upon University rights. Dissertation copyrights, where applicable, should be held by the student author.

Each semester the Graduate School offers to all students enrolled in thesis or dissertation the opportunity to attend a seminar on thesis and dissertation preparation. The requirements described in the *Thesis and Dissertation Manual of Style* are explained, and general Graduate School procedures of particular importance to degree candidates are outlined.

The Assistant Dean of the Graduate School examines each dissertation and determines whether or not the dissertation meets Graduate School requirements for format and mechanical presentation. In order to reduce the number of last minute inconveniences for the student, the student is required to submit the master copy of the final draft of the dissertation before having additional required copies prepared. The master copy must be received no later than one week in advance of the final deadline to allow at least three days for Graduate School examination, time for the student to make necessary corrections, and time to have the final required copies made. After the Graduate School receives the master copy of the final draft, the student will be given a written format evaluation 72 hours later (excluding weekends, holidays, and graduate registration periods).

DISSERTATION DEFENSE

An application for the dissertation defense must be filed in the Graduate School by the student no later than three weeks before the final date for submission of approved dissertations and dissertation defense reports and at least two weeks before the scheduled defense. The dissertation supervising committee must have copies of the dissertation at least two weeks prior to the dissertation defense.

The dissertation defense will be a public, oral examination open to all members (faculty, students, and invited guests) of the University community. The questioning of the candidate will be generally directed

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by the student's dissertation supervising committee, but any person attending the defense may participate in the examination.

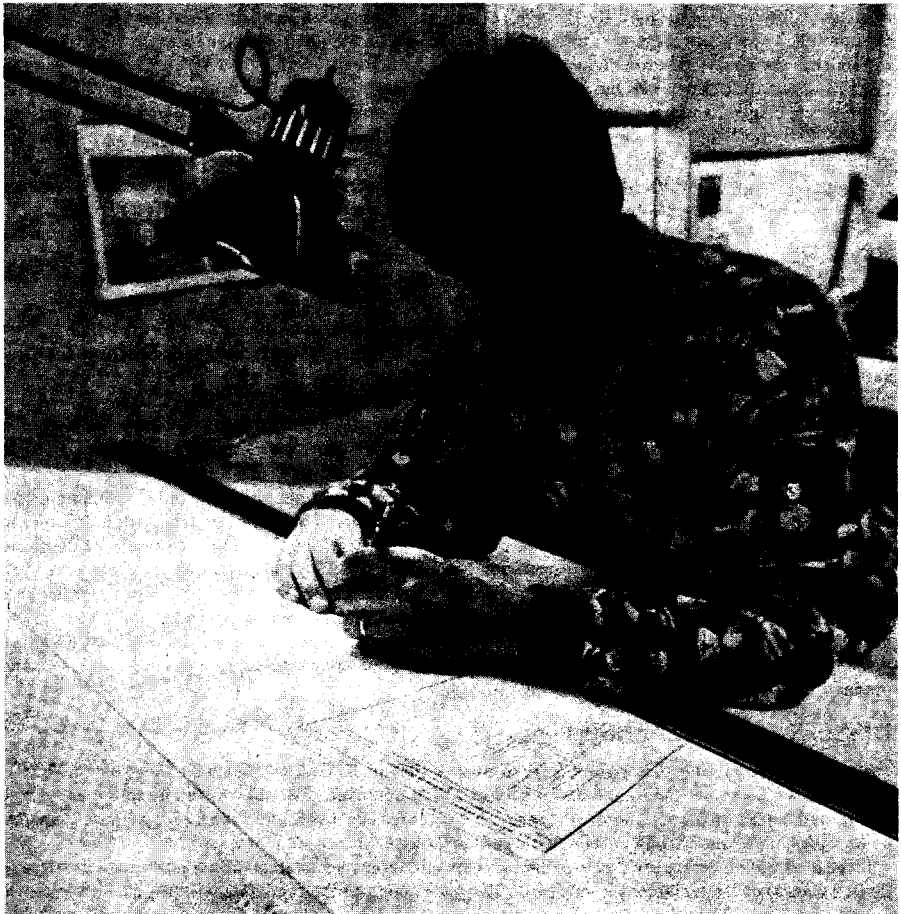
Although the defense is concerned primarily with the dissertation research and content, the examining committee may explore the student's knowledge of areas interrelated with the core of the dissertation problem.

The dissertation defense may result in a decision that the candidate has (1) passed unconditionally; (2) passed conditionally with remedial work specified by the Committee; (3) failed with permission to be re-examined after a specified period; or (4) failed and dismissed from the program.

The dissertation must be approved unanimously by the student's dissertation supervising committee and by the Dean of the Graduate School.

Regardless of the outcome of the defense, the dissertation defense report must be submitted to the Dean of the Graduate School within five working days after the examination. When a scheduled defense is postponed or cancelled, the Dean of the Graduate School must receive written notice of this postponement or cancellation and a new application for the dissertation defense must be filed in the Graduate School in accordance with the Graduate School requirements specified above.

Three unbound copies of the final, approved dissertation must be submitted to the Dean of the Graduate School by the date specified in the Graduate School Calendar on the inside covers of the current Graduate Catalog. When the final three copies are deposited with the Graduate School, the student must pay the required binding and dissertation microfilming fees listed in the catalog section on Tuition and Fees.



GENERAL GRADUATE SCHOOL REGULATIONS AND INFORMATION

STUDENT RESPONSIBILITY

Graduate students assume full responsibility for knowledge of all Graduate School and University rules, regulations, and deadlines published in the Graduate Catalog and of all departmental and program requirements concerning their degree programs.

ADMINISTRATION OF THE ADVANCED DEGREE PROGRAMS

COMMITTEES ON GRADUATE STUDIES

Each graduate program is governed by a Committee on Graduate Studies. The committee is composed of all the Full Members of the graduate faculty in the program. Graduate faculty from allied fields may serve on the committee, when appropriate. In an interdepartmental program the Committee on Graduate Studies is appointed by the Dean of the Graduate School.

GRADUATE ADVISORS

Each graduate program has a Graduate Advisor. The Graduate Advisor represents the Dean of the Graduate School and the Committee on Graduate Studies in matters pertaining to advising graduate students about their academic areas. Specifically, the Graduate Advisor's functions include: registering graduate students and acting upon requests for drops, adds, section changes, and special examinations; keeping graduate student records; and advising graduate students about their degree plans and programs of work. The name, office location, and telephone number of each Graduate Advisor is listed at the beginning of each departmental or program description in this catalog.

OBSERVANCE OF RELIGIOUS HOLY DAYS

A student who misses an examination, work assignment, or other project because of an observance of a religious holy day will be given the opportunity to complete the work missed within a reasonable time after the absence, provided that the student has properly notified each instructor. To meet the proper notification requirements, the student must notify each instructor in writing of classes scheduled on dates he/she will be absent in observance of a religious holy day. Notification must be made within the first 15 class days and either personally delivered, acknowledged, and dated by the instructor or sent certified mail, return receipt requested. The student may not be penalized for these excused absences, but the instructor may appropriately respond if the student fails to complete satisfactorily the missed assignment or examination within a reasonable time after the excused absence.

A "religious holy day" means a holy day observed by a religion whose places of worship are exempt from property taxation under Section 11.20 of the Tax Code.

COURSE GRADES

GRADES OF SCHOLARSHIP

Subject to the following conditions, graduate credit will be given for grades of A, B, or C (as well as P) for work done at The University of Texas at Arlington:

1. The student must maintain a B average on all work in the major.
2. The student must maintain a B average on all work in the minor or minors.
3. The student must maintain a B average on all advanced work.

With the exception of research, thesis, and dissertation courses, only those courses so designated in this Catalog are offered on a pass-fail (P/F) basis. The grade P is not included but the F grade is included in calculation of grade-point average.

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No student will be allowed to repeat a course in order to change a passing grade. A student may repeat a course only if that course is specifically designated in this catalog as one that can be repeated for credit. A student who fails to receive credit (grade of D or F) may repeat a course in order to obtain credit, in which case both grades will count in computing the student's average.

Personal improvement courses including, but not limited to, individual or group music or art lessons and exercise and sports studies activities courses will not be used for the following: (1) to satisfy graduate degree requirements; (2) in the computation of graduate grade point averages or in the determination of academic probation or academic good standing in Graduate School; or (3) in the calculation of grade point averages for the purpose of admission to a Graduate Program or certification for graduation from a Graduate Program.

For work completed at other institutions, graduate credit may be granted only for grades of A or B. Courses taken on a pass/fail basis, or for which a grade lower than B was assigned, may not be considered for transfer to a graduate degree program at The University of Texas at Arlington. Courses with grades of A or B from other institutions may be submitted for approval as transfer work according to the procedure described in this Catalog under the section entitled "Transfer Credit." Grades received in transfer courses are not included in the calculation of the graduate grade point average.

VALID GRADES AND "N" DESIGNATION

The types of grades (Valid Grades) which may be assigned in a course are determined generally by the policies outlined in the above paragraphs. However, Valid Grades for independent study, conference, seminar, and readings courses vary widely among departments; therefore, a statement on Valid Grades and special grading policies, if any, is given at the beginning of the course descriptions for each program in this catalog. If the student is uncertain about Valid Grades for a course in which he or she is registered, he or she should consult the instructor at the beginning of the semester for that information. The Valid Grades for a course are given on the instructor's copy of the class roll issued at the beginning of the semester and on the form on which the instructor reports the students' grades at the end of the semester.

If an instructor assigns a grade that does not correlate with one of the valid grades for the course, the student's grade report from the Registrar will show a designation of N, meaning that no valid grade was received from the instructor. Because N grades are automatically converted to F at midsemester of the next regular semester, a student receiving an N designation on a grade report should contact the instructor immediately and request that a change from N to a valid grade be initiated by the instructor.

INCOMPLETE GRADE

A graduate student who has been unable to complete all the class or laboratory assignments in a regular semester or summer session may, at the discretion of the instructor, receive an X designating a temporary grade. The following deadlines for completing an incomplete grade X apply to all graduate students regardless of the level of the course in which the incomplete grade is received: an incomplete grade X must be removed no later than the official midsemester date of the following regular semester; an incomplete grade received in the Fall semester must be removed by the following Spring midsemester date; an incomplete grade received in the Spring semester or Summer sessions must be removed no later than the following Fall midsemester date. See the official Graduate School Calendar printed inside the covers of this catalog for midsemester dates. An incomplete grade not removed by the specified deadline will be changed automatically to an F. All incomplete grades must be removed from the student's record before a graduate degree will be awarded.

CREDIT FOR RESEARCH, INTERNSHIP, THESIS, OR DISSERTATION COURSES

All research, internship, dissertation, and thesis courses will be graded on a pass-fail basis. If a student undertakes a research, internship, thesis, or dissertation course and does not complete the course in the semester for which he or she is registered in the course, a grade designation of R (research in progress) will be given instead of an X. A student who receives a grade of R in a research, internship, thesis, or dissertation course must re-register for the course and complete it with a grade of P in order to obtain academic credit. See paragraph below on "R" Grade. The Valid Grades for three-hour thesis and three- and six-hour dissertation courses are R, F, and W only. The grade of P can be given only in six-hour thesis courses and nine-hour dissertation courses and, accordingly, the student must be enrolled in a six-hour

thesis course or a nine-hour dissertation course the semester in which he or she defends the thesis or dissertation and applies for graduation.

"R" GRADE

The grade of R (research in progress) is a permanent grade, but it is not included in any academic evaluation and does not carry any credit value. This grade may be issued to students only for research, internship, thesis, dissertation, or other specifically designated courses. For these courses which carry R as the valid grade for incomplete progress (rather than the temporary grade of X), the student may receive a final grade only when completing the work within a semester in which the student is enrolled in the course. In order to receive academic credit in an R-graded course, a student must re-register for the course and successfully complete the course with a grade of P or a letter grade, whichever is the designated valid passing grade for the course. Grading policy in some courses may change during the period covered by this catalog. Grading policy for each course each semester is printed on the instructor's class roll. Students should verify grading policy with the instructor at the beginning of each semester.

GRIEVANCES RELATED TO GRADES

It is the obligation of the student, in attempting to resolve any student grievance regarding grades, first to make a serious effort to resolve the matter with the individual with whom the grievance originated. Individual course instructors retain primary responsibility for assigning grades. The instructor's judgment is final unless compelling evidence shows discrimination or preferential treatment or procedural irregularities. If students wish to appeal, their requests must be submitted in writing on an appeal form which is available in departmental or program offices. The normal academic channels are: department chairman or program director, academic Dean, Provost. However, before considering a grievance, the department chairman or program director will refer the issue to a departmental or program committee of faculty. If the committee cannot reach a decision acceptable to the parties involved, the matter will follow the remaining academic channels. If students are dissatisfied with the chair or director's decision or the decision of the academic dean, they may appeal the case to the Provost. (For grievances other than those related to grades, see instructions under "Grievances Other Than Grades.")

GRADE REQUIREMENTS

GOOD STANDING AND SATISFACTORY SCHOLASTIC PROGRESS (SSP)

A graduate student is considered to be in good academic standing and making satisfactory progress in a degree program if he/she (1) is absolving any admission conditions within the time required and (2) maintains a 3.0 grade-point average on all coursework undertaken while in Graduate School. In addition, for financial aid purposes, a student must complete the following minimum number of hours in the last semester in which the student enrolled for six or more hours:

Enrollment as of Census Date	Minimum Completion
9+	6
6-8	3
0-5	0

ACADEMIC PROBATION

If a graduate student fails to maintain an overall 3.0 grade-point average on his or her first six hours of graduate coursework taken as a graduate student, he or she must during the subsequent six semester hours of graduate coursework raise his or her grade-point average to a 3.0 on all graduate work taken as a graduate student. During the period following the first six hours of graduate coursework in which the student failed to meet the 3.0 grade-point average the student will be placed on *academic probation*. The student's record will be evaluated at the completion of each semester while on probation. Failure to meet the grade-point requirement at the completion of the first 12 hours of graduate coursework taken as a graduate student will result in automatic dismissal from the Graduate School. If a student's overall grade-point average falls below 3.0 at any time after the completion of the first 12 hours of graduate work, the student will be placed on *academic probation* and must achieve an overall 3.0 GPA at the end of the following semester. Failure to meet the 3.0 grade-point average at that point will result in automatic dismissal from the Graduate School. A student who has been dismissed from the Graduate School for

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failure to meet the 3.0 grade-point average requirement may be readmitted for further graduate study in the same or in a different program only if a petition (accompanied by a complete record of all college or university work previously taken) has been approved by the appropriate Committee on Graduate Studies and the Dean of the Graduate School.

Personal improvement courses including, but not limited to, individual or group music or art lessons and exercise and sports studies activities courses will not be used for the following: (1) to satisfy graduate degree requirements; (2) in the computation of graduate grade point averages or in the determination of academic probation or academic good standing in Graduate School; (3) or in the calculation of grade point averages for the purpose of admission to a Graduate Program or certification for graduation from a Graduate Program.

GRADUATION

A student must meet all requirements specified under Grades of Scholarship in this Catalog in order to receive a graduate degree from The University of Texas at Arlington.

COURSE AUDITING, CHANGES, AND LOAD

AUDITING

Any person who has credit in a particular course or who has a demonstrated need for the course content may be eligible for auditing that course if space is available. An auditor has the privilege of hearing and observing only; no University credit is granted for auditing. Audit applications may be secured from the Registrar's Office. A student may audit a graduate course only with the permission of the instructor and approval of the Registrar. When the form has been completed and approved, the applicant, if currently enrolled, pays a fee of \$20 per course; if not enrolled, the applicant pays \$100 per course.

ADDING AND DROPPING COURSES

A graduate student who wishes to change a schedule by either dropping or adding a course must first consult with his or her Graduate Advisor. The following regulations pertain to adds and drops:

1. A student may not add a course after the end of late registration.
2. A graduate student dropping a course after the Census Date but on or before the midsemester date will receive a grade of W only if at the time of dropping the student is passing the course (has a grade of A, B, or C); otherwise an F will be received.
3. A graduate student who desires to drop all courses for which he or she is enrolled is reminded that such action constitutes a withdrawal from the University. The graduate student should indicate the intention to withdraw and drop all courses by filing a properly executed resignation form in the Office of the Registrar.
4. In most cases, a graduate student may not drop a course or withdraw from the University after midsemester. Under extreme circumstances, the Dean of the Graduate School may consider a petition to withdraw after midsemester, but in no case may a graduate student selectively drop a course after midsemester and remain enrolled in any other course.

WITHDRAWAL

A student who wishes to withdraw (resign) voluntarily from the University before the midsemester date must execute the proper resignation form in the Office of the Registrar. After midsemester, a graduate student or an undergraduate student enrolled in a graduate course is not permitted to withdraw or to selectively drop courses; however, in exceptional cases, a graduate student may submit to the Dean of the Graduate School a Petition to Withdraw after midsemester. (Students should use the special Petition to Withdraw for this purpose.) If the petition is not approved, the student remains responsible for all coursework requirements. Therefore, a student should not discontinue class attendance or course assignments unless the student has been notified in writing that the Dean of the Graduate School has approved the petition to withdraw.

COURSE LOAD

The maximum course load for full-time graduate students is 15 semester hours in a semester or 12 hours in the summer sessions; registration in excess of this maximum will be approved by the Dean of the

Graduate School only in exceptional circumstances. International students must be enrolled for a minimum of nine semester hours.

COURSE DESIGNATION SYSTEM

The course listing shown below will serve as an example for the following explanation of the course numbering system, credits, and theory and practice hours at The University of Texas at Arlington.

5342 PALEOBIOLOGY (2-3)

1. The four digit number (5342) is the departmental unique numerical designation for the specific course listed.
 - a. The first digit (5) in the above example denotes the level of the course. Graduate courses are designated 5 or 6.
 - b. The second digit (3) denotes the semester hour credit of the course.
 - c. The third and fourth digits (4 and 2) are departmental designations and may or may not have sequential significance.
2. The first number in parentheses following the course title indicates the clock hours per week devoted to lecture and the second number indicates the clock hours per week devoted to laboratory, practice, or field work for the fall or spring semester.

Each department or program has been assigned a unique two, three, or four character prefix for use in course designations on registration documents, transcripts, and other University records. For example, the Paleobiology 5342 course described above is taught in the Department of Geology and appears on student records as GEOL 5342. The two, three, or four character prefix is given in parentheses after the department or program name in the catalog section describing the academic departments and programs.

RESERVATION OF COURSES FOR GRADUATE CREDIT

Students previously dismissed from or denied admission to the Graduate School may not enroll in and reserve courses for graduate credit.

An undergraduate student may not use graduate courses (numbered 5000 and above) to fulfill undergraduate degree requirements. However, an undergraduate at The University of Texas at Arlington needing no more than 12 hours in one semester (six semester hours in one summer session) to complete all of the requirements for a bachelor's degree may register for graduate courses for graduate credit under the following conditions:

1. All work for undergraduate credit must be completed during that semester or summer session.
2. Total registration for all work may not exceed 15 semester hours in a semester (or 12 semester hours in the summer sessions).
3. The student must submit to the Graduate Advisor a "Reservation of Courses for Graduate Credit by Undergraduate Students" (available from Graduate Advisors). The reservation must be approved by the Graduate Advisor and the Dean of the Graduate School, and the Registrar must certify that the reserved credit is not to apply to the student's undergraduate degree requirements. This form must be submitted in accordance with the deadlines printed in the Graduate School Calendars on the inside covers of this catalog.
4. The student must have at least a 3.0 undergraduate GPA to be eligible to enroll in a graduate course and to reserve it for graduate degree credit.
5. Credit is officially accepted for application to a graduate program only upon achievement of unconditional admission to graduate school.

A student who is enrolled as an undergraduate but who does hold a bachelor's degree and who has a 3.0 undergraduate grade point average may also reserve graduate courses for graduate credit upon approval of the Graduate Advisor and the Dean of the Graduate School. Such a student may reserve graduate courses by completing and submitting to the Graduate Advisor a "Reservation of Graduate Courses by Student Holding an Undergraduate Degree" (available from Graduate Advisors). Credit is officially accepted for application to a graduate program only upon achievement of unconditional admission to the graduate school. Some departments and colleges (e.g., the College of Business Administration) do not permit students to enroll in graduate courses unless the students have been admitted to Graduate School. Graduate courses in these departments and colleges may not be reserved for graduate credit.

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In order for graduate courses to be reserved, completed reservation forms, with the approval of the Graduate Advisor, must be submitted to the Dean of the Graduate School by the Census Date of the semester or session in which the student registers for graduate courses to be reserved. A maximum of 12 hours of credit may be reserved and may be applied to a graduate degree only if approved as part of the degree program. Only grades of A and B may be so applied, although all grades in reserved courses will be considered in computing a student's grade-point average. The student should consult with the Graduate Advisor before registering for graduate courses he or she wishes to reserve for graduate credit.

COURSE AND TRANSFER CREDIT

MAXIMUM UNDERGRADUATE CREDIT

No more than nine hours of advanced baccalaureate coursework may be used for graduate degree credit. Such work may be applied to a graduate degree program only with the approval of the appropriate Committee on Graduate Studies and the Dean of the Graduate School.

APPLICABILITY OF COURSES TO MORE THAN ONE DEGREE

No course applied to any one degree, graduate or undergraduate, may be applied to any other degree, either directly or by substitution.

TRANSFER CREDIT

Transfer credit for no more than nine hours of equivalent coursework completed at other institutions of recognized standing may be accepted in master's degree programs only, upon evaluation and approval by the appropriate Committee on Graduate Studies and the Dean of the Graduate School. Transfer credit can be accepted only for organized courses in which the student received a grade of B or higher; however, grades received in transfer courses are not included in the calculation of a student's UT Arlington graduate grade point average. Transfer work completed prior to a student's admission into a UT Arlington master's program will be reviewed and its applicability to the master's degree will be determined by the Committee on Graduate Studies and the Dean of the Graduate School at the time the student submits a program of work.

Transfer work taken after a student has been admitted into a master's program at UT Arlington must be approved in advance by the appropriate Committee on Graduate Studies and the Dean of the Graduate School. Prior to enrolling in transfer courses, the graduate student must file an approved Program of Work listing the proposed transfer work, or a Request to Change Program of Work if the transfer work represents an amendment to the approved Program of Work on file with the Dean of the Graduate School.

All work submitted for transfer credit must have been completed no more than five years before enrollment in a graduate program at The University of Texas at Arlington.

Transfer work is not accepted in doctoral programs. However, formal graduate-level coursework completed in the student's major area of doctoral study at other institutions granting doctoral degrees in the student's major may serve to establish the student's competency in those subject areas and may provide a basis for waiving some UT Arlington course requirements in those areas. Such waivers must be shown on the Program of Work, recommended by the student's advisory committee and approved by the Committee on Graduate Studies of the student's major and by the Dean of the Graduate School.

EXTENSION WORK AND CORRESPONDENCE COURSES

Extension—Work done in extension classes may be applied toward an advanced degree under the same conditions as apply to transfer work, except that credit for extension work is limited to six credit hours.

Correspondence courses—Courses done by correspondence are not accepted for graduate credit.

REGISTRATION AND ORIENTATION FOR INTERNATIONAL STUDENTS

International graduate students are required to purchase The University of Texas at Arlington Student Health Insurance Plan or show proof of owning equal or better insurance coverage than that provided by the UT Arlington plan. International students will be expected to show proof of the insurance coverage at the time of each registration or to purchase insurance coverage at that time.

All entering international graduate students are required to attend an orientation program at the beginning of their initial semester of attendance at The University of Texas at Arlington. Those who do not attend the International Student Orientation on the Monday before registration will not be allowed to register during the regular registration period and must attend a make-up orientation program before registering during late registration.

REGISTRATION REQUIREMENTS AND CREDIT FOR THESIS AND DISSERTATION

A student may not register for dissertation or thesis unless he or she is in good standing academically. After initial enrollment in the thesis or dissertation course, a student must maintain continuous enrollment in thesis or dissertation (summers excluded unless summer enrollment in thesis/dissertation is required by student's program) until the thesis or dissertation has been accepted by the Dean of the Graduate School. Failure to maintain continuous enrollment may invalidate any previous thesis or dissertation work.

A student receiving advice and assistance from a faculty member in the preparation of a thesis or dissertation must register for the appropriate course even if the student is not present on campus. Each



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semester after consulting with his Graduate Advisor, the student should register for the amount of thesis or dissertation credit commensurate with the effort to be expended by the student and the thesis or dissertation advisor in the preparation of the thesis or dissertation.

Thesis and dissertation courses will be graded on a Pass/Fail basis. A grade designation of R (Research in Progress) will be given for thesis or dissertation courses prior to the semester in which the thesis or dissertation is accepted by the Dean of the Graduate School. The grade of R is a permanent grade which does not carry any credit value; therefore, since all master's programs require six credit hours of thesis and doctoral programs require nine credit hours of dissertation, the student must register for a six-semester hour course in thesis or a nine-semester hour course in dissertation for the semester in which the student expects to submit and defend the final thesis or dissertation. (See Credit for Research, Internship, Thesis, or Dissertation Courses.)

GRADUATION PROCEDURES

GRADUATION

Each graduate student must complete degree requirements in accordance with the catalog in force at the time the student entered the graduate program in which the degree will be awarded or, at the student's option, the catalog of any subsequent year in which the student was a resident graduate student. If a student chooses to complete degree requirements in accordance with the catalog of a year subsequent to that in which the student entered the graduate program, the student must indicate that intention by filing a petition with the Dean of the Graduate School before the beginning of registration for the semester in which the student expects to receive the degree. A special petition form is available in the Office of the Dean of the Graduate School and should be used for this purpose.

Changes in graduate school regulations and policies become effective for all enrolled students in the year for which the catalog is in force, regardless of the year of initial enrollment. Therefore, each candidate for graduation must observe graduate school regulations and follow graduation procedures prescribed in the graduate catalog in force in the intended semester of graduation.

Degrees are awarded at the end of the Fall semester (December), the Spring semester (May), and the summer session (August). Formal commencement ceremonies are held within the college or school, in which the degree is earned. Candidates should contact the office of the dean of their appropriate unit for instructions concerning participation in the commencement ceremonies.

No honorary degree will be conferred by The University of Texas at Arlington.

FINAL SEMESTER REQUIREMENTS

The student must be enrolled in the Graduate School for the semester in which the student completes all graduate degree requirements and applies for graduation. Enrollment in courses outside the major and minor fields will not satisfy final semester enrollment requirements. In addition, the following items must be filed in the Graduate School and the required fees paid by the deadlines given in the Graduate School calendars published inside the covers of this catalog:

1. All graduating students must file an Application for Graduation and pay the Diploma Fee in the Office of the Dean of the Graduate School. The application is not transferable to a subsequent semester; therefore, if a student does not graduate at the time indicated in the initial application, that application will be cancelled and a new one must be filed for the semester of graduation. The Diploma Fee also is non-transferable and non-refundable.
2. Master's program students must:
 - enroll in
 - a. the six-hour thesis course if a thesis plan student;
 - b. the master's comprehensive course or equivalent if required by the student's program;
 - c. at least one graduate course in the student's program if not enrolled in a or b above;
 - file
 - d. the Application for Graduation;
 - e. the Application for Candidacy and Final Program of Work;
 - f. three unbound copies of the final approved thesis and a completed Thesis and Dissertation Data Sheet (not applicable for non-thesis degree plan);

- g. a request for the final master's examination;
- h. the Final Master's Examination Report;
- i. the University Microfilm agreement;
- j. the Copyright authorization (optional);

pay

- k. the thesis binding, microfilming, and (optional) copyright fees;
- l. the Diploma fee.

3. Doctoral degree candidates must:**enroll in**

- a. the nine-hour dissertation course;

file

- b. the Application for Graduation;
- c. the Application for Candidacy and Final Program of Work;
- d. three unbound copies of the final approved dissertation and a completed Thesis and Dissertation Data Sheet;
- e. a request for the dissertation defense;
- f. the Dissertation Defense Report;
- g. the University Microfilm agreement;
- h. the Copyright authorization (optional);
- i. the National Research Council Survey of Earned Doctorates form;

pay

- j. the dissertation binding, microfilming, and (optional) copyright fees;
- k. the Diploma fee.

For more information about the submission of acceptable theses and dissertations, consult the *Thesis and Dissertation Manual of Style* available from the UT Arlington Bookstore.

GRADUATE SCHOOL DEADLINES

All Graduate School deadlines, as indicated on the calendar or in explanation of policies and procedures, unless otherwise stated, are final at 5:00 p.m. of the date specified, by which time all transactions must be completed and documents received in the Office of the Dean of the Graduate School. Transactions and documents requiring the action or approval of Graduate Advisors, committees, instructors, department chairmen, academic deans, or others prior to receipt by the Graduate School should be initiated by the appropriate person (student, instructor, Graduate Advisor, or other) sufficiently in advance of the Graduate School deadline for the required actions to be taken and approvals made before the deadline.

IN ABSENTIA REGISTRATION

A candidate for a degree who has completed *all* requirements for graduation by the last date to qualify for *in absentia* registration (see Graduate School calendars inside the covers) and who needs to register in the University for the sole purpose of having a degree conferred may be qualified to register *in absentia* in the semester or summer session consecutive to his last enrollment in coursework and/or thesis/dissertation. A student registered *in absentia* may not enroll for courses. No refund is made for the cancellation of an *in absentia* registration. In addition to paying the cost of *in absentia* registration, the candidate must file an application for graduation and pay the diploma fee for the semester of graduation. *In Absentia* registration requires the permission of the Graduate Advisor and the Dean of the Graduate School. Students may obtain the Request to Register *In Absentia* form in the Graduate School.

CHANGE OF GRADUATE MAJOR OR PROGRAM

Students wishing to change their graduate major or program to one other than that in which they are enrolled currently or in which they were enrolled during their most recent semester at UT Arlington must initiate the change by completing the appropriate form available in the Office of the Dean of the Graduate School. Students are encouraged to consult the Graduate Advisor of the new program regarding program admission and degree requirements before requesting a program change.

PETITIONS

Students may request exceptions to published rules by filing a proper petition to the Dean of the Graduate School explaining the basis for the request. Limited exceptions to some rules may be approved if the facts presented by the petitioner fully justify that exception, as regarded by the appropriate Committee on Graduate Studies and the Dean of the Graduate School. All petitions must be submitted on petition forms available in the Graduate School Office. Special forms for withdrawal and *in absentia* registration are available in the Graduate School and must be used by students petitioning for withdrawal or requesting *in absentia* registration.

GRIEVANCES OTHER THAN GRADES

In attempting to resolve any graduate student grievance, it is the obligation of the graduate student first to make a serious effort to resolve the matter with the individual with whom the grievance originated. Grievances involving matters other than grades are appealed to the department chairman, or office director, then to the Dean of the Graduate School (except in personnel matters in which cases the appeal is to the Provost unless questions regarding a graduate assistant or graduate associate are involved), Vice President for Business Affairs, or Vice President for Student Affairs, as determined by the nature of the grievance. If the matter remains unresolved at this level, the student may appeal to the Provost. The decision of the Provost is final. (For grievances involving grades, see instructions under "Grievances Related to Grades.")

ACADEMIC DISHONESTY

All students are expected to pursue their academic careers with honesty and integrity. Academic dishonesty includes, but is not limited to, cheating on a test or other coursework, plagiarism (offering the work of another as one's own), and unauthorized collaboration with another person. Students found guilty of dishonesty in their academic pursuits are subject to penalties which may include suspension from the University.

In accordance with the Rules and Regulations of the Board of Regents of The University of Texas System (Part One, Chapter VI), institutional procedures regarding charges of academic dishonesty are outlined in Part Two, Chapter 2, of the *Handbook of Operating Procedures* of The University of Texas at Arlington. Copies of the Handbook are available at over 75 locations on campus including the Student Congress office, the Library, and departmental offices.

GRADUATE ASSISTANTSHIP/ASSOCIATESHIP POLICY

Graduate teaching and research assistantships and associateships are funded through state appropriations and federal, state, local, and private grants for at least three principal reasons. First, the employment of graduate students in teaching and in research positions during their graduate education encourages and supports their participation in these two major functions of a University and thereby strengthens the quality of the students' educational experience. Second, assistantships and associateships provide direct financial support to those outstanding students who are essential to the development of quality graduate programs. Third, graduate students provide valuable and necessary services to the University in their roles as teaching and research assistants and associates.

In order to assure the appointment of the most highly qualified students available to the positions of graduate research assistant and graduate teaching assistant and in order to realize best the principal objectives for which graduate assistants are employed, The University of Texas at Arlington has adopted the following policies and regulations, all provisions of which apply to both graduate assistantships and graduate associateships.

The University of Texas at Arlington supports the "Resolution Regarding Graduate Scholars, Fellows, Trainees, and Assistants" of The Council of Graduate Schools in the United States. A copy of the resolution and list of signatory institutions is available in the Office of the Dean of the Graduate School.

ADMISSION STATUS

A student must have an unconditional admission status in order to be eligible to hold a graduate assistantship.

ENGLISH PROFICIENCY

Before being appointed to an assistantship at UT Arlington, a student whose native language is not English must submit an acceptable score on the Test of Spoken English (TSE-A). An applicant who is a non-native speaker of English and who may wish to be considered for an assistantship should take the TSE before arriving in the United States and have the score sent to UT Arlington. Score reports which are submitted directly by the student or those marked "Student Copy" or "Applicant's Copy" are not considered official and will not be accepted by the University. The holding of a degree(s) from a U.S. college or university does *not* exempt from this requirement assistantship applicants who are non-native speakers of English. The TSE is administered at TOEFL test centers around the world. Applicants should register for TSE-A (for teaching and research assistant applicants). See "Documentation and Evaluation Charges Required" for further information.

DEVELOPMENTAL ENGLISH PROGRAM

Students who do not achieve scores on the TSE-A or SPEAK sufficient to satisfy the English proficiency requirements for graduate teaching assistants must enroll in the Developmental English Program and be certified for English proficiency before becoming eligible to hold a teaching assistantship. This 10-week program offered by the UT Arlington English Language Institute emphasizes accent reduction and oral presentation skills needed by teaching assistants. Registration is in 402 Hammond Hall, and the present charge is \$330 payable at the time of registration. Contact the English Language Institute at (817) 273-2730 or 273-4630 for details including the current class schedule and charges.

CONTINUATION OR RENEWAL OF APPOINTMENT

Although a student may be initially appointed to a graduate assistantship for a full academic year, reappointment beyond the first semester is at the discretion of the department and is subject to the following conditions:

1. The student must be in good standing in the University. A student on academic probation is not in good standing and, therefore, is not eligible to hold an assistantship.
2. The student must be progressing toward an advanced degree in a satisfactory manner.
3. The student must have performed assigned assistantship duties satisfactorily in the preceding semester(s) as determined by the department in which the assistantship is held.

A department may limit the number of semesters during which a graduate student may hold an assistantship.

TUITION RATES

Graduate teaching and research assistants employed at least 20 hours per week in positions related to their degree programs are entitled to Texas resident tuition rates. Eligibility for the resident rate must be certified by the Dean of the College in which the assistantship is held prior to registration; otherwise, full tuition will be assessed.

Non-resident or international students holding less than full assistantships (full=20 hours employment per week), i.e., one-half assistantship (10 hours employment per week) or one-quarter assistantship (five hours employment per week), are not eligible for Texas resident rates.

COURSE LOAD

Graduate assistants may register for and must complete no more than 12 semester hours and no fewer than nine semester hours per semester. They may register for and must complete no more than 12 semester hours and no fewer than six semester hours for the three summer sessions. Upon written recommendation of the department and approval of the Dean of the Graduate School the minimum registration limit may be reduced to six semester hours for students who have completed all coursework, are registered for thesis or dissertation only, and have filed an approved program of work. A load of more than 12 semester hours must be approved in advance by the Dean of the Graduate School.

ADDITIONAL EMPLOYMENT

In accepting a graduate assistantship, students agree to devote their effort to their graduate studies and assistantship responsibilities and therefore agree to hold no employment other than the assistantship.

In very rare circumstances additional employment may be justified. Any graduate assistant wishing to hold employment in an off-campus job or in any University position outside the assistantship appointment is required to file a Request for Approval of Outside Employment, available in the office of the Dean of the Graduate School.

A graduate student cannot hold an assistantship or a combination of assistantships or other University positions in excess of one-half time employment (20 hours per week) without permission of the department or program in which the student is enrolled and written approval of the Dean of the Graduate School.

ASSIGNMENT OF DUTIES

Graduate assistants are under the direction of the appropriate department chairman with regard to assistantship responsibilities and assignments.

STUDENT EDUCATIONAL RECORDS POLICY

Students may have access to their own educational records during regular office hours by contacting the person or the office that maintains these records. A student must appear in person or mail directly to the Dean through the U.S. mail a written request for a copy of the record. Another person may not see a student's educational records unless written permission has been given by that student. One exception to that rule allows a parent or guardian who is providing one-half or more of the student's financial support to obtain the educational record. Faculty and staff members of the University have access to student educational records in the performance of their regular duties. If an educational record contains information on more than one student, then a student desiring access may review only the parts relating to that student.

Students may have official copies of their UT Arlington transcripts mailed to other institutions or they may obtain copies for their own use. A student must sign a request form in the Registrar's Office or mail a signed, written request to release the transcript. Requests will not be accepted by telephone or from persons other than the student without that student's written permission by mail.

The "Family Educational Rights and Privacy Act of 1974" provides that a university may release directory-type information about students. The information released may include the following items: the student's name, address, telephone number, date and place of birth, major field of study, participation in officially recognized activities and sports, weight and height if a member of an athletic team, dates of attendance, degrees and awards received, and the last educational institution attended. Each year UT Arlington publishes a Student Directory that is available to students and the public. It contains the following information: the student's name, major field of study, address, and telephone number. The Act states that a student has the right to withhold this information from the public and other students. A form to withhold this information is available in the Registrar's Office; unless this form is completed before the Census Date of the semester, the data about a student will be released as public information.

Students have the right to challenge the content of their educational records to insure that the records are not inaccurate, misleading, or in violation of other rights of the students. This allows students an opportunity for the correction of inaccurate or misleading information, or permits written explanation from students concerning the content of the records. Any evidence regarding an inaccurate or misleading record should be presented to the individual in charge of the office where the record is maintained.

For admission, an applicant must submit his or her Social Security number which serves as the basis for identification of various University records. The usage will vary according to the requirements of the office in which the record is located.

ADMISSION REQUIREMENTS AND PROCEDURES

The requirements set forth in the following pages are minimal for admission to the Graduate School. Meeting them does not necessarily insure acceptance into a departmental degree program, because most departments have established admission standards more stringent than the minimum. Applications for admission must be made on the official forms available upon request from the Office of the Registrar and Director of Admissions and from the Office of the Dean of the Graduate School. In addition to the following requirements, most departments recommend that potential applicants arrange a personal interview with the appropriate Graduate Advisor before applying to the Graduate School.

Official notification of the admission decision is issued by the Office of the Dean of the Graduate School and is sent by the Graduate School directly to the applicant. While information received from the graduate program to which an individual has applied may be important and useful, such information does not constitute official notice of admission into Graduate School or into a graduate program at The University of Texas at Arlington.

This catalog is a general information publication only. It is not intended to nor does it contain all regulations that relate to students. The provisions of this catalog do not constitute a contract, express or implied, between any applicant, student, or faculty member and The University of Texas at Arlington Graduate School or The University of Texas System. The University reserves the right to withdraw courses at any time, change fees, rules, calendar, curriculum, degree programs, degree requirements, graduation procedures, and any other requirements affecting students. Changes will become effective whenever the proper authorities so determine and will apply to both prospective students and those already enrolled.

Students are held individually responsible for complying with all requirements of the rules and regulations of the University and the Board of Regents of The University of Texas System. Failure to read and comply with policies, regulations, and procedures will not exempt a student from whatever penalties he or she may incur.

ADMISSION OF UNITED STATES STUDENTS

Admission into the Graduate School requires: (1) a bachelor's degree from an accredited college or university with a satisfactory grade-point average; (2) satisfactory academic standing at the last institution attended; (3) an acceptable and current score on the aptitude tests of the Graduate Record Examination or the Graduate Management Admission Test, as specified by the department or program to which application is being made; (4) demonstration through previous academic performance of the potential for graduate work in the chosen field; (5) acceptance into a departmental program. Some departments have additional requirements such as a score on the subject portion of the Graduate Record Examination or an additional test such as the Miller Analogies Test; see the departmental requirements for this information.

An applicant holding a degree or degrees from a United States university should file an application form (available from the Dean of the Graduate School) and the following credentials at least 60 days prior to the beginning of the semester or summer session in which he or she plans to register: (1) *official transcripts* (as defined in the section entitled *Official Transcripts, Records and Test Scores*) of all undergraduate and graduate college work previously taken [an applicant who has attended UT Arlington previously as an undergraduate or special student must submit in person or by mail a request to the UT Arlington Registrar to forward to the Graduate School an official UT Arlington transcript and copies of all previous college transcripts which are on file in the Registrar's Office]; (2) scores on the aptitude tests of the Graduate Record Examination, or Graduate Management Admission Test if required in place of the GRE; (3) three letters of recommendation completed according to the instructions accompanying the official application form; and, a nonrefundable application evaluation charge of \$25 submitted with the original application. Without exception, this charge must be received before processing of admission materials can begin.

As required by Texas state law, the grade point average for graduate school admission decisions is calculated on the last two years of advanced undergraduate academic course work. This means that the last 60 hours of undergraduate course work taken at senior colleges or universities are used in the grade

ADMISSION

point calculation. Neither courses taken at junior colleges nor personal improvement courses such as physical education activity courses are used in computing the grade point average for admission purposes.

Some graduate programs may set deadlines for admission or for consideration of applicants for graduate assistantships that are earlier than the general deadlines established by the Graduate School. In particular, the School of Social Work has set March 15th as the deadline for considering new applicants for the upcoming fall semester. New applicants to social work are considered only for admission to fall semesters. For any other potential deadlines, the individual graduate programs should be consulted.

U.S. applicants who have enrolled in academic institutions outside the United States are required to pay the international application evaluation charge of \$50 (U.S.).

ADMISSION OF INTERNATIONAL STUDENTS AND PERMANENT RESIDENTS

An applicant who is not a U.S. citizen or who does not hold a bachelor's degree from an accredited U.S. college or university must provide the following at least 120 days prior to the beginning of the semester or summer session in which the student plans to register: (1) a complete and accurate chronological outline of all previous college-level work; (2) authorized school or university records including transcripts, rating sheets, and certificates of degrees or diplomas showing all courses taken and all grades received; (3) a degree equivalent to a U.S. bachelor's degree from an accredited college or university, with a satisfactory grade-point average; (4) an acceptable and current score on the aptitude tests of the Graduate Record Examination or Graduate Management Admission Test, as specified by the department or program to which application is being made; (5) if his or her native language is not English and he or she does not hold a bachelor's or master's degree from an accredited U.S. institution, an acceptable score (normally, at least 550) on the Test of English as a Foreign Language (TOEFL) or an acceptable score on the Test of Spoken English (TSE-A); (The University of Texas at Arlington subscribes to the TOEFL Examinee Identification Service); (6) acceptance into a departmental program; (7) certification on an official Graduate School Financial Statement form (available from the Dean of the Graduate School) that the student has adequate funds to finance his or her graduate studies; (8) an affidavit supporting the Financial Statement completed by parents, guardian, financial sponsor or bank and submitted with the Financial Statement; and (9) an application evaluation charge of \$50 (U.S.) submitted with the original application. The application



evaluation charge must be in the form of an International Money Order made payable in U.S. dollars to The University of Texas at Arlington. This evaluation charge is required and is not refundable.

International applicants should consult the section on Registration and Orientation for International Students in this catalog and the International Student Advisor in the UT Arlington International Office for registration regulations applicable to international students.

READMISSION

A student previously enrolled in The University of Texas at Arlington Graduate School and wishing to resume graduate work after an absence of a fall or spring semester or longer (summer excluded) should file through the Graduate School an application for readmission at least 40 days before the beginning of registration for the semester in which the student wishes to resume graduate work. If the student has taken any course work at another institution during concurrent enrollment at The University of Texas at Arlington or during the time he or she was not enrolled in the Graduate School, official transcripts showing all such courses must be submitted to the Graduate School. Former students wishing to change graduate major or program upon readmission should consult the section entitled "Change of Graduate Major or Program" in this catalog.

DOCUMENTATION AND APPLICATION EVALUATION CHARGES REQUIRED

GRADUATE RECORD EXAMINATION (GRE)

A student applying for admission to The University of Texas at Arlington Graduate School is required to submit scores on the aptitude tests of the Graduate Record Examination unless the Graduate Management Admission Test is required in place of or as a substitution for the GRE (see below). Some Programs also require a score on the GRE subject test in the major field; this requirement, if applicable, is stated under the individual departmental or program requirements included in this catalog.

Information bulletins and test application forms can be obtained from Educational Testing Service, Box 955, Princeton, New Jersey 08541 U.S.A. or from the Office of Counseling and Career Development of The University of Texas at Arlington. The GRE is administered several times each year (usually in January, February, April, June, October, and December) at testing centers in the United States and abroad. The University of Texas at Arlington is an approved testing center. Applications must be received by Educational Testing Service approximately one month in advance of each test; therefore an applicant should secure the information bulletin and application form at least six weeks in advance. A minimum of six weeks should be allowed for the examination results to reach the University. ETS retains GRE scores through September 30 following the fifth anniversary of the test date. Although scores up to five years old may be available, some programs will not accept scores more than two years old.

GRADUATE MANAGEMENT ADMISSION TEST (GMAT)

The Graduate Management Admission Test score is required for admission to graduate work in The College of Business Administration. An exception to this requirement is the graduate program in economics which accepts the GRE as well as the GMAT. Information bulletins and test application forms can be obtained from Educational Testing Service, Box 966, Princeton, New Jersey 08541 U.S.A. or from the Office of Counseling and Career Development of The University of Texas at Arlington. The GMAT is administered four times a year (usually in November, January, March, and July). The University of Texas at Arlington is an approved testing center for the GMAT. The GMAT application procedures are the same as those described above for the GRE.

TEST OF ENGLISH AS A FOREIGN LANGUAGE (TOEFL) AND TEST OF SPOKEN ENGLISH (TSE)

An applicant whose native language is not English must submit a score of at least 550 on the Test of English as a Foreign Language (TOEFL) or an acceptable score on the Test of Spoken English (TSE-A). The graduate program in Biology requires a minimum score of 575 on the TOEFL. Official TOEFL scores more than two years old are not released by the Educational Testing Service; therefore, an applicant who has taken the TOEFL more than two years before the semester for which he is applying must retake the

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TOEFL in order to provide a valid current score. TOEFL score reports bearing the designation "Applicant's Copy" are not considered official scores for admission purposes. An applicant holding either a bachelor's or a master's degree from an accredited U.S. college or university is not required to submit a TOEFL score. Any other waivers of the TOEFL score requirement must be recommended by the applicant's Graduate Advisor and approved by the Dean of the Graduate School. The Test of Spoken English (TSE-A) can be substituted for the TOEFL. The TOEFL and the TSE-A are administered at various centers in the United States and abroad several times each year. The University of Texas at Arlington is an approved testing center for the TOEFL. UT Arlington subscribes to the TOEFL Examinee Identification Service.

Before being appointed to an assistantship at UT Arlington, a student whose native language is not English must submit an acceptable score (250 or higher) on the Test of Spoken English-A (TSE-A). An applicant who is a non-native speaker of English and who may wish to be considered for an assistantship should take the TSE-A before arriving in the United States and have the score sent to UT Arlington. Score reports which are submitted directly by the student or those marked "Student Copy" or "Applicant's Copy" are not considered official and will not be accepted by the University. The holding of a degree(s) from a U.S. college or university does *NOT* exempt from this requirement assistantship applicants who are non-native speakers of English. The TSE is administered at TOEFL test centers around the world. Applicants should register for TSE-A (for teaching and research assistant applicants). Note: If the TSE-A is taken and an acceptable score is achieved, the TOEFL is not required.

The SPEAK examination is offered on the UT Arlington campus at various times during the year. A satisfactory score on this examination may be used for the Test of Spoken English-A (TSE-A) requirement. This examination may be taken in cases in which the student has come to UT Arlington without having taken the TSE-A and subsequently wishes to be considered for a graduate assistantship. Cost and time necessary for scoring the SPEAK examination are comparable to those for the TSE-A. The Office of Counseling and Career Development should be contacted for administration dates and other details.

Application forms and information bulletins for the TOEFL and the TSE-A may be obtained from the Educational Testing Service, Box 899, Princeton, New Jersey 08541 U.S.A., from American embassies and consulates and offices of the United States Information Service, or from the Office of Counseling and Career Development at The University of Texas at Arlington. The application procedure is the same as that described above for the GRE.

DEVELOPMENTAL ENGLISH PROGRAM

Students who do not achieve scores on the TSE-A or SPEAK sufficient to satisfy the English proficiency requirements for graduate teaching assistants must enroll in the Developmental English Program and be certified for English proficiency before becoming eligible to hold a teaching assistantship. This 10-week program offered by the UT Arlington English Language Institute emphasizes accent reduction and oral presentation skills needed by teaching assistants. Registration is in 402 Hammond Hall, and the present charge is \$330 payable at the time of registration. Contact the English Language Institute at (817) 273-2730 or 273-4630 for details including the current class schedule and charges.

OTHER ADMISSION TESTS

Other tests such as the Miller Analogies Test (MAT) and the Test of Spoken English (TSE) are required in addition to the GRE, GMAT, or TOEFL for admission to certain graduate programs. Individual departmental and program descriptions should be consulted for this information.

OFFICIAL TRANSCRIPTS, RECORDS, AND TEST SCORES

An applicant must report any and all studies attempted at another college, university, or professional school prior to actual enrollment at The University of Texas at Arlington. This information must be submitted whether or not credit was earned, and no portion of an applicant's previous academic record can be disregarded.

Official transcripts of the applicant's academic record must be received by the Graduate School before the application can be reviewed. Official transcripts are those issued by the Registrar or responsible head of the institution at which the work was attempted or completed and sent by mail directly to the Graduate School by that official. In those rare instances in which international applicants are unable to provide official transcripts, certain certified documents may be acceptable.

Official test score reports for the Graduate Record Examination, Graduate Management Admission Test, and Test of English as a Foreign Language are those issued by Educational Testing Service (ETS) and sent by ETS directly to the Graduate School.

Uncertified or notarized copies of transcripts or other academic records or of test score reports and copies of records or test score reports bearing the designation "student copy," "issued to student," "applicant's copy," "unofficial copy," or other similar designations are not acceptable. Hand-delivered transcripts, records, and score reports or copies received from a third party regardless of the origin are not acceptable except in rare instances in which international applicants are unable to provide official transcripts as indicated above.

RETENTION OF APPLICATION RECORDS

All application materials upon submission become the property of The University of Texas at Arlington and cannot be returned to the applicant. Completed applications, transcripts, test scores, and all application records for applicants who do not register in the semester for which they applied are retained by the Graduate School for one year only. An applicant failing to enroll in the semester for which he or she applied may request an "update" form from the Graduate School entitled "Request to Change Admission Date" for use at any time within one calendar year from the registration date for which the applicant initially applied. Please see the section below on the International Application Evaluation Charge for information on charges for re-evaluation of records of international students.

U.S. APPLICATION EVALUATION CHARGE

A non-refundable evaluation charge of \$25 is required of all applicants eligible to be considered as U.S. applicants. This payment must be received before processing of admission materials can begin. *There are no exceptions to this policy.* An applicant failing to enroll in the semester for which he or she applied may request to change the admission date as described above within one calendar year from the registration date for which the applicant originally applied without further charge.

INTERNATIONAL APPLICATION EVALUATION CHARGE

All international applicants and all applicants who have attended graduate or undergraduate academic institutions outside the United States are required to pay a non-refundable International Application Evaluation Charge of \$50 (U.S.).

After payment of the Evaluation Charge and after the initial evaluation of an admission application an international applicant is entitled to request that his or her admission records be re-evaluated one additional time for the purpose of changing the admission date or program from the date or program for which the student initially applied. A request for further changes in admission date or program will require a second non-refundable payment of the Evaluation Charge of \$50 (U.S.). Each repayment of the Evaluation Charge entitles the applicant to no more than two application re-evaluations.

TYPES OF ADMISSION

After evaluation of an applicant's credentials by the Graduate Advisor in the applicant's major area and by the Dean of the Graduate School, the applicant will be notified by letter from the Dean of the Graduate School of (1) acceptance under one of the categories of admission listed below, or (2) denial of application, or (3) deferral for reasons listed in the notice. A registration permit will be issued by the Dean of the Graduate School stating the conditions of admission and period of validity for the permit. Admission letters and registration permits are not mailed to U.S. addresses during the last week prior to the registration period. Therefore, an applicant who has not received an admission, denial, or deferral notice 48 hours prior to the beginning of registration should contact in person the Graduate School for information concerning the review and status of his or her application.

UNCONDITIONAL ADMISSION

An applicant who meets all the requirements stated above is normally granted unconditional admission.

ADMISSION

PROBATIONARY ADMISSION

An applicant who does not meet all of the admission requirements listed above nevertheless may show promise for successful graduate study and upon the recommendation of the appropriate Committee on Graduate Studies and approval of the Dean of the Graduate School may be granted probationary admission. Special course requirements or other conditions may be imposed by the Committee on Graduate Studies in the student's major area and/or the Dean of the Graduate School. A student in probationary status may not hold an assistantship or be admitted to candidacy for any graduate degree without first achieving unconditional admission status.

PROVISIONAL ADMISSION

An applicant unable to supply all of the required documentation prior to the admission deadline but who otherwise appears to meet the admission requirements may upon the recommendation of the appropriate Committee on Graduate Studies and approval of the Dean of the Graduate School be granted provisional admission. Complete and satisfactory credentials must be received by the Graduate School before the end of the semester in which the student has registered in a provisional status. *A student will not be permitted to enroll in the Graduate School with a provisional status for more than one semester.* Provisional admission does not guarantee in any way subsequent admission on an unconditional basis. A student admitted on a provisional basis may not hold an assistantship until unconditional admission status has been achieved. International students not residing in the United States at the time of application may not be admitted on a provisional basis.

SPECIAL STUDENTS

A person who wishes to take graduate courses at The University of Texas at Arlington but who does not plan to pursue a graduate degree program may be admitted as a special student with the approval of the Dean of the Graduate School and the concurrence of the Committee on Graduate Studies in the area in which the applicant wishes to study. In most cases, admission as a special student will be granted only for the purpose of participating in special graduate course offerings, or for taking courses to transfer to another institution. Under normal circumstances, a student who has been denied admission to or dismissed from the Graduate School will not be permitted to enroll as a special student.

An applicant for special student admission must submit a completed "Special Student Application" form available from the Graduate School, and official transcripts of previous college work showing evidence of an undergraduate degree and graduate degree if applicable. Special student admission status is granted for the semester for which the application is submitted. Any further enrollment as a special student must be approved on a semester-by-semester basis. Special students may not hold graduate assistantships or enroll in research, thesis, internship, or dissertation courses.

A former or currently enrolled special student who wants to apply for admission to a graduate degree program must submit a regular Graduate School Application for Admission and all supporting documents as listed in this catalog under the section "Admission Procedures, New Students." Admission as a special student in no way guarantees subsequent unconditional admission into a graduate program or into the Graduate School. Credit earned as a special student may be applied to a degree program only with the approval of the appropriate Committee on Graduate Studies and the Dean of the Graduate School; however, no more than nine semester hours of work earned as a special student may be applied to a graduate degree at The University of Texas at Arlington and only grades of A and B may be so applied, although a grade in any course taken as a special student will be considered in computing a student's graduate grade-point average.

DEFERRED ADMISSION

If an applicant does not present adequate evidence of meeting the admission requirements, the admission decision may be deferred until the records are complete. The applicant will be sent an Admission Deferral Notice specifying the data that must be provided or the work that must be completed before the application will be reconsidered. The application may be reactivated within one calendar year from the date for which the original application was submitted by returning the Request to Reactivate Application sent to the applicant with the Admission Deferral Notice. International students should consult the section on International Application Evaluation Charge for charges for re-evaluation of application records.

DENIED ADMISSION

If an applicant is denied admission to Graduate School, he or she may not take and reserve graduate courses for graduate credit. The applicant may again apply for admission if the deficiencies in credentials which led to the denial are remedied satisfactorily. An applicant denied admission may inquire of the Graduate Advisor in the program to which he or she applied or of the Graduate School regarding the deficiencies which led to the denial.

GRADUATE STUDENT ADVISEMENT

After being admitted, the student should confer (preferably in person) with the Graduate Advisor of the proposed major area in order to become acquainted with specific departmental regulations, particularly in areas that require additional examinations upon entrance. After receiving registration materials, the student should consult with the Graduate Advisor in the proposed major area at the time and place indicated in the registration instructions concerning the details of registration, course program, and other procedures. It is important that a student wishing to take courses for graduate credit consult with the appropriate Graduate Advisor before registering, as each student's program of work for an advanced degree must be approved eventually by the Graduate Advisor, the Committee on Graduate Studies, the student's supervising committee, and the Dean of the Graduate School. Failure to consult with the Graduate Advisor could result in the student's enrolling for courses which are not applicable toward meeting graduate degree requirements.

REGISTRATION SCHEDULE

Students should be familiar with all dates on the Graduate School calendars printed inside the covers of this catalog. Specific registration instructions are published by the Registrar several times each year and should be consulted for procedures, dates, and deadlines.

RESTRICTIONS ON ADMISSION

GENERAL RESTRICTION

In certain areas the University may need to limit the number of students accepted for graduate work if the number of applicants exceeds the capacity of available facilities.

FACULTY MEMBERS

Members of The University of Texas at Arlington faculty holding an appointment at the rank of instructor or above may not pursue a graduate degree at The University of Texas at Arlington.

TUITION AND FEES

Tuition and fees are subject to change by legislative action. Changes in tuition or fees will be effective upon date of enactment and will be reflected in fees and tuition charged.

TUITION AND MANDATORY FEES

Colleges of Liberal Arts and Science Only

REGULAR SESSIONS AND 11-WEEK SUMMER SESSION

Tuition rates shown in the table below will be charged to students taking graduate courses in the Colleges of Liberal Arts and Science. The tuition and mandatory fees given below include a \$10 per hour Building Use Fee, a \$9 per semester hour Student Services Fee (up to a \$108 maximum), and a \$3.25 per semester hour Student Union Fee (up to a \$39 maximum).

Semester Hours	Texas Residents (Valid 94-95)	Texas Residents (Valid 95-96)	Non-Texas Residents (Valid 94-95*)
1	\$122.25	\$122.25	\$193.25
2	144.50	144.50	386.50
3	166.75	166.75	579.75
4	201.00	209.00	773.00
5	251.25	261.25	966.25
6	301.50	313.50	1159.50
7	351.75	365.75	1352.75
8	402.00	418.00	1546.00
9	452.25	470.25	1739.25
10	502.50	522.50	1932.50
11	552.75	574.75	2125.75
12	603.00	627.00	2319.00
13	641.00	667.00	2500.00
14	679.00	707.00	2681.00
15	717.00	747.00	2862.00
16	755.00	787.00	3043.00
17	793.00	827.00	3224.00
18	831.00	867.00	3405.00
19	869.00	907.00	3586.00
20	907.00	947.00	3767.00
Each Additional Hour	38.00	40.00	181.00

5-WEEK SUMMER SESSIONS

Tuition rates shown in the table below will be charged to students taking graduate courses in the Colleges of Liberal Arts and Science. The tuition and mandatory fees given below include a \$10 per hour Building Use Fee, a \$9 per semester hour Student Services Fee (up to a \$54 maximum), and a \$3.25 per semester hour Student Union Fee (up to a \$19.50 maximum).

Semester Hours	Texas Residents (Valid 94-95)	Texas Residents (Valid 95-96)	Non-Texas Residents (Valid 94-95*)
1	\$72.25	\$72.25	\$193.25
2	100.50	104.50	386.50
3	150.75	156.75	579.75
4	201.00	209.00	773.00
5	251.25	261.25	966.25
6	301.50	313.50	1159.50
7	339.50	353.50	1340.50
8	377.50	393.50	1521.50
Each Additional Hour	38.00	40.00	181.00

*The Coordinating Board will set by May, 1995 the non-resident tuition and fees for the 95-96 academic year.

Colleges of Business Administration and Engineering, Schools of Architecture, Nursing, Social Work, and Urban and Public Affairs and Center for Professional Teacher Education Only

REGULAR SESSIONS AND 11-WEEK SUMMER SESSION

The tuition and fees given below include a graduate tuition differential of \$28 per hour in 1994-95 and \$30 per hour in 1995-96. This tuition rate will be charged to students taking graduate courses in the Colleges of Business Administration and Engineering, the Schools of Architecture, Nursing, Social Work, and Urban and Public Affairs and the Center for Professional Teacher Education. The tuition and mandatory fees given below also include a \$10 per hour Building Use Fee, a \$9 per semester hour Student Service Fee (up to a \$108 maximum), and a \$3.25 per semester hour Student Union Fee (up to a \$39 maximum).

Semester Hours	Texas Residents (Valid 94-95)	Texas Residents (Valid 95-96)	Non-Texas Residents (Valid 94-95*)
1	\$122.25	\$122.25	\$221.25
2	156.50	164.50	442.50
3	234.75	246.75	663.75
4	313.00	329.00	885.00
5	391.25	411.25	1106.25
6	469.50	493.50	1327.50
7	547.75	575.75	1548.75
8	626.00	658.00	1770.00
9	704.25	740.25	1991.25
10	782.50	822.50	2212.50
11	860.75	904.75	2433.75
12	939.00	987.00	2655.00
13	1005.00	1057.00	2864.00
14	1071.00	1127.00	3073.00
15	1137.00	1197.00	3282.00
16	1203.00	1267.00	3491.00
17	1269.00	1337.00	3700.00
18	1335.00	1407.00	3909.00
19	1401.00	1477.00	4118.00
20	1467.00	1547.00	4327.00
Each Additional Hour	66.00	70.00	209.00

5-WEEK SUMMER SESSIONS

The tuition and fees given below include a graduate tuition differential of \$28 per hour in 1994-95 and \$30 per hour in 1995-96. This tuition rate will be charged to students taking graduate courses in the Colleges of Business Administration and Engineering, the Schools of Architecture, Nursing, Social Work, and Urban and Public Affairs and the Center for Professional Teacher Education. The tuition and mandatory fees given below also include a \$10 per hour Building Use Fee, a \$9 per semester hour Student Service Fee (up to a \$54 maximum), and a \$3.25 per semester hour Student Union Fee (up to a \$19.50 maximum).

Semester Hours	Texas Residents (Valid 94-95)	Texas Residents (Valid 95-96)	Non-Texas Residents (Valid 94-95*)
1	78.25	82.25	221.25
2	156.50	164.50	442.50
3	234.75	246.75	663.75
4	313.00	329.00	885.00
5	391.25	411.25	1106.25
6	469.50	493.50	1327.50
7	535.50	563.50	1536.50
8	601.50	633.50	1745.50
Each Additional Hour	66.00	70.00	209.00

*The Coordinating Board will set by May, 1995 the non-resident tuition and fees for the 95-96 academic year.

TUITION AND FEES

TUITION EXCEPTIONS

State law provides for several exceptions to the tuition rates. Students qualified for a reduced rate in any of the following categories must have that eligibility certified prior to registration.

1. Teaching assistants and associates, research assistants and associates employed at least half-time in positions which relate to their degree programs and their spouses and children will be charged the same rate as a Texas resident.
2. Holders of certain competitive academic scholarships in the amount of \$200 per year or more awarded through The University of Texas at Arlington scholarship committee will be charged the same rate as a Texas resident.
3. Non-Texas residents may be eligible for tuition exception as described under the Academic Common Market entry in this Tuition and Fees section.
4. Article 54.003 of the *Texas Education Code* provides an exemption from tuition and some fees. Texas veterans may qualify for this exemption provided they:
 - a. Had Texas resident status at the time they entered the service and are currently on Texas resident status for tuition assessment;
 - b. Had active military duty (for purposes other than training) for more than 180 days beginning after 1 February, 1955; or served between 7 December, 1941 and 31 January, 1955;
 - c. Are honorably discharged from active service; and,
 - d. Are not eligible for Pell Grant, SEOG (Supplemental Education Opportunity Grant), or Veterans Educational Benefits under federal legislation.
5. Article 54.204 of the *Texas Education Code* provides an exemption from tuition for children of certain disabled firemen and peace officers. To qualify for this exemption, the applicant must:
 - a. be a child of a disabled (1) full-paid or volunteer fireman; or (2) full-paid municipal, county, or state peace officer or custodian of the Department of Corrections or game warden; and
 - b. be under 21 years of age.
6. An exemption from tuition and some fees is provided for Texas residents who are blind or whose sense of hearing is nonfunctional as provided under Article 54.205 of the *Texas Education Code*.
7. Children under 25 years of age who receive a majority of support from a parent who has been classified by the Defense Department as a prisoner of war or missing in action at the time of their registration may be exempt from tuition and some fees as provided by Article 54.209 of the *Texas Education Code*.
8. Individuals or a member of a family who have located to 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 will be charged the same tuition rate as a Texas student if such individual meets the terms and conditions set forth in Article 54.052(h) and 54.052 of the *Texas Education Code*.
9. Children of members of the armed forces who were killed in action in World War II, the Korean Conflict, or the Cold War, and orphans of the Texas National Guard killed since January 1, 1946 while on active duty, who are not eligible for federal educational benefits may be exempt from tuition and some fees.

Application forms and instructions for the above tuition exemptions are available at the undergraduate admission counter.

IN ABSENTIA REGISTRATION FEE

A candidate for a degree who has completed *all* requirements for graduation by the last date to qualify for *in absentia* registration (see Graduate School calendars inside covers) and who needs to register in the University for the sole purpose of having a degree conferred may register *in absentia* with the permission of the Graduate Advisor and the Dean of the Graduate School. To obtain permission the student should file a Request to Register *In Absentia*. A student registered *in absentia* may not enroll for courses. The *in absentia* registration fee is \$15; no refund is made for the cancellation of an *in absentia* registration. In addition to paying the cost of *in absentia* registration, the candidate must file an application for graduation and pay the diploma fee for the semester of graduation.

INSTALLMENT TUITION AND FEE PROGRAM

For Fall and Spring terms, students may elect to use Installment Tuition and Fee Program to pay for part of their tuition and fees. A \$10 service charge which covers the cost of handling will be assessed each student who makes this choice. All scholarships, grants and other loans will be applied to tuition and fees due before an installment tuition payment is calculated. No prior arrangements are necessary to participate in the Installment Tuition Program.

An initial payment of 1/2 of tuition, mandatory fees, and lab fees, plus all other fees must be paid by the date printed on the student's class schedule. One-half of the remaining balance will be due October 1 (Fall)/March 1 (Spring) and the final payment will be due November 1 (Fall) /April 1 (Spring). A student who fails to meet the payment schedule will not receive grades, degree, or official transcript and will be assessed monthly late charges of \$10 until all debts have been cleared. For further information, contact the Business Office, Box 19136, Arlington, TX 76019, (817) 273-2181, in Rm 421, Davis Hall.

CONCURRENT ENROLLMENT

UNIVERSITY OF TEXAS COMPONENTS

A student concurrently enrolling at two or more of the three University of Texas North Texas components (UT Arlington, UT Dallas, and UT Southwestern) may register and pay tuition and fees for all courses through the student's home campus. Detailed procedures may be obtained from the Registrar of the student's home campus. The concurrent enrollment agreement and waiver of specified fees applies only to students following the concurrent enrollment procedures specified by the Registrar of the home campus.

The charges for the following will be assessed and collected at the home institution for the other institution:

1. Tuition at an appropriate rate;
2. Applicable laboratory fees; and
3. Building Use Fee at the rate of \$10 per semester credit hour for courses taken at UT Arlington.

Student services at the second institution will be made available to concurrently enrolled students paying the appropriate student services fees at the second institution.

The three institutions have a reciprocal agreement for honoring parking permits. Details may be obtained from the police office of the home campus, or by calling the UT Arlington Registration Center.

Concurrently enrolled students should report any problems concerning registration, payment of fees, or other matters related to concurrent enrollment procedures to the Registrar of the home institution.

OTHER PUBLIC INSTITUTIONS OF HIGHER EDUCATION

When a student registers at more than one public institution in Texas, the student shall pay the full tuition charges to the first institution at which he or she is registered. A student who is first registered at another institution must present a copy of the fee receipt from that institution when registering at UT Arlington. Tuition and fees at UT Arlington as the second institution will be assessed as follows:

1. If the minimum tuition at the first institution is the same as or *greater* than the UT Arlington minimum, the amount charged for tuition will be the UT Arlington hourly rate.
2. If the minimum tuition at the first institution is *lower* than the UT Arlington minimum, the amount charged for tuition will include the difference in the minimum charges; in no case will the amount charged for tuition be less than the UT Arlington hourly rate.
3. All other applicable fees will be charged.

FEES

In addition to the tuition and mandatory fees in the preceding section, students must pay the following fees, if applicable:

1. General Property Deposit
2. Photo Identification Card Fee
3. Parking Fee
4. Laboratory Fees for courses as indicated in course descriptions
5. Supplemental Fees for courses as indicated in course descriptions

TUITION AND FEES

6. International Studies Fee
7. Registration Fee
8. Medical Service Fee
9. International Student Service Fee

Graduation fees are paid in the semester in which the student graduates and include those listed below. Deadlines for paying these fees are listed in the Graduate School calendars printed inside the covers of this catalog.

1. Diploma Fee
2. Thesis or Dissertation Binding Fee
3. Dissertation or Thesis Microfilming Fee
4. Dissertation or Thesis Copyright Fee (optional)

GENERAL PROPERTY DEPOSIT

Every student registering at The University of Texas at Arlington will be required to make and maintain a property deposit of \$10. The records will be reviewed periodically, and if charges have been made against the deposit, the student will be required to bring the deposit up to \$10.

The deposit is refundable upon request to the Bursar's Office when the student withdraws from school or graduates. The refund will be mailed as soon as possible. Property deposits which are dormant for a period of four years are forfeited into the Student Deposit Endowment Fund.

PHOTO IDENTIFICATION CARD FEE

Each student at The University of Texas at Arlington is required to pay a \$5 Photo Identification Card Fee upon registration for the Spring and Fall semesters and a \$2.50 fee upon registering for the summer session. A valid Photo Identification Card is needed along with the Permanent Student Academic Use Card, issued at the time of initial registration in the University, for identification when checking books from the library, or when cashing checks at the University Bookstore, University Center, or Bursar's Office, and for admission to various University activities such as athletic events, and for other situations in which personal identification is required. The replacement charge for lost Photo Identification Cards is \$10.

PARKING FEE

Students will register their cars in a single payment for the entire school year or the balance of the school year in which they register, whichever is applicable (school year is September 1 through August 31). The following fees will be charged for autos at the initial period of registration:

		Remote
Fall Semester	\$36	\$24
Spring Semester	24	15
First Summer Session	15	9
Second Summer Session	9	6

Commuting students may choose to car pool. However, if the car pool rotates cars, each vehicle must be registered with The University of Texas at Arlington Police Department and only one of the pool's vehicles may be parked on campus at any given time.

In the event that a student wishes to register two motor vehicles in his or her own name, proof of ownership of both vehicles, plus a receipt from the Business Office for the required amount of registration for the first car and a receipt for \$1 for registration of the second vehicle must be presented. The campus police office is open Monday through Thursday from 7:30 a.m. to 7 p.m. and from 7:30 a.m. to 5 p.m. on Friday. Complete parking regulations are available at the office.

Refunds will be made, upon request, to students who withdraw from the University at the end of the Fall Semester, but refunds will not be made to students who withdraw from the University after January 31. A request for a refund will not be honored when a person's privilege to park and drive on campus has been suspended or if outstanding charges or other debts remain unpaid.

LABORATORY FEES

Laboratory fees are charged for various science and engineering lab courses. Courses for which these fees are charged and the amounts of the fees are listed in the course description section of this catalog.

INSTRUMENT USERS AND COMPUTER USAGE FEES

Students who are enrolled in certain biology and geology courses which require extensive use of microscopes and related equipment will have an instrument users fee assessed as part of the fee for that course. Students enrolled in certain chemistry courses which require use of chemical instrumentation equipment will have an instrument users fee assessed as part of the fee for that course. Students who are enrolled in courses that require the use of computer resources will be assessed a fee of \$5 to \$40 based on the amount of computer usage in that course. Courses for which these fees are charged and the amounts of the fees are listed in the course description section of this catalog.

STUDENT SERVICES FEE

The Student Services Fee is compulsory. It provides free copies of the campus newspaper and either free admission or reduced fees to intercollegiate events at home, formal convocation events, activity programs, and services of the Student Health Center (does not cover charges for medication, laboratory, or x-rays, if needed).

STUDENT UNION FEE

The Student Union Fee is compulsory. Its sole purpose is financing, constructing, operating, maintaining, and improving the student union building.

INTERNATIONAL STUDIES FEE

Each student will be charged a \$1 per semester fee. Proceeds will be used to fund study abroad for UT Arlington students.

INTERNATIONAL STUDENT HEALTH INSURANCE

International graduate students are required to purchase The University of Texas at Arlington Student Health Insurance Plan or show proof of owning equal or better insurance coverage than that provided by the UT Arlington plan.

INTERNATIONAL STUDENT SERVICE FEE

A \$50 per semester fee is charged any student classified as a "foreign" or international student. Proceeds from this fee fund the International Office which provides such services as international student record keeping, travel I-20s, change of educational level, practical training, and other services in support of international students.

REGISTRATION FEE

Students attending The University of Texas at Arlington are required to pay a Registration Fee of \$5 at the time of each enrollment. This fee is used to offset the cost of registration.

MATH CLINIC FEE

Certain math courses require laboratory instruction. To cover the cost, a \$15 Math Clinic Fee will be charged.

MEDICAL SERVICE FEE

Each student is required to pay a \$25 Medical Service Fee each semester. This fee is compulsory and funds the Student Health Center.

LATE REGISTRATION FEE

There shall be a fee for late registration of \$25 per late registrant.

DIPLOMA FEE

Upon application for graduation each student will be required to pay a \$10 Diploma Fee. If a student fails to receive the degree in the semester for which he has filed the Diploma Application and paid the Diploma Fee, the fee must be paid again in the semester in which the student does graduate.

TUITION AND FEES

BINDING FEE

Students who write theses or dissertations are required to pay a \$19.50 Binding Fee at the time the three copies of the final approved thesis or dissertation are submitted to the Graduate School. If the thesis or dissertation is larger than one volume, an additional \$19.50 per volume of three copies each will be charged. One copy of the thesis or dissertation is deposited in the University Archives, one in the Library, and the third in the departmental or college library.

MICROFILMING FEE

The Microfilming Fee (\$40 thesis; \$50 dissertation) includes the cost of microfilming one official copy of the thesis or dissertation by University Microfilms, Ann Arbor, Michigan, and the publication of the thesis or dissertation abstract. University Microfilms deposits one positive microform copy of the thesis or dissertation in the Library of Congress.

LIBRARY PROCESSING FEE

Students who write theses or dissertations are required to pay a Library Processing Fee of \$15 at the time the final three copies of the thesis or dissertation are submitted to the Graduate School.

DISSERTATION COPYRIGHT FEE (optional)

If the student wishes to secure copyright of the dissertation, copyright arrangements will be completed for a total fee of \$35 payable at the time the final dissertation copies are submitted to the Graduate School.

THE ACADEMIC COMMON MARKET

Fourteen Southern states participate in the Academic Common Market, an interstate agreement for sharing uncommon programs. Residents of these states who are accepted for admission into selected out-of-state programs can enroll on an in-state tuition basis. In order to qualify, an applicant must (1) be accepted in a program to which his or her state has made arrangements to send its students, and, (2) submit proof to that university of legal residence in the home state.

The following degree programs at The University of Texas at Arlington are available through the Academic Common Market at in-state tuition rates for qualified applicants of the states indicated: Master of Architecture (Alabama, Arkansas, Kentucky, Tennessee, West Virginia); Master of City and Regional Planning (Arkansas, West Virginia); Master of Landscape Architecture (Tennessee); Master of Science in Personnel and Human Resource Management (Arkansas); Master of Science in Real Estate (Kentucky); Master of Science in Taxation (Kentucky); Child Health Nursing (West Virginia); Nursing Administration (Arkansas); Master of Arts in the Humanities (Tennessee); Doctor of Philosophy in the Humanities (Kentucky, Tennessee, Virginia); Master of Arts in Teaching in the Humanities (Kentucky, Tennessee, Virginia); Doctor of Philosophy in Mathematical Sciences (Kentucky); Master of Science in Radiological Physics (South Carolina, Tennessee); Doctor of Science in Applied Chemistry (Kentucky); Master of Arts in Urban and Regional Affairs (Kentucky); Doctor of Science in Applied Physics (Kentucky); Doctor of Philosophy in Social Work (Kentucky).

Further information on the Academic Common Market may be obtained from the Texas State Coordinator for the Academic Common Market: Texas Higher Education Coordinating Board, Box 12788, Capitol Station, Austin, Texas, 78711.

RESIDENCY REGULATIONS

All students attending The University of Texas at Arlington who are not residents of Texas will be charged non-resident tuition in accordance with the state law.

All residence determinations will be made pursuant to Sections 54.052 *et seq.* of the *Texas Education Code* and the "Rules and Regulations for Determining Resident Status" of the Coordinating Board, Texas College and University System. Generally, the following information pertains: "An individual who is 18 years of age or is a dependent who lives away from 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 non-resident student; or an individual 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 non-resident student."

A non-resident 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 living in Texas for at least 12 months, however, it is possible that a non-resident student may be reclassified as a resident student as provided in the rules and regulations adopted by the Coordinating Board. The student must demonstrate an unequivocal intent to remain indefinitely in Texas and must demonstrate financial independence.

An exception to the payment of nonresident tuition is included in the *Texas Education Code* as follows: Usually, members of the United States Military Forces and commissioned Public Service officers are entitled to pay the resident tuition fee for the member and the member's dependents, providing that each semester he or she submits a letter from his or her commanding officer or personnel officer stating that he or she is currently on assignment in the state. See "Tuition Exceptions" under TUITION AND FEES for additional exemptions from the payment of non-resident tuition rates.

The responsibility of registering under and maintaining the proper residence classification rests on the student. If there is any question concerning his or her classification as a resident of Texas at the time of registration, or any time thereafter, it is the student's obligation to consult with the residence advisor in the Office of the Registrar and have his or her classification officially determined. All requests for reclassification should be submitted to the Registrar's Office at least 30 days prior to the registration period in question.

AUDIT OF STUDENT'S SCHEDULE

A computerized audit is made approximately six weeks into the semester which compares a student's schedule and the tuition and fees associated with that schedule to original tuition and fees charged. Residency status and any applicable tuition exceptions are also input items to the audit. The resulting charges or credits will be added to the student's accounts receivable account. Statements are mailed on the fifth of the month with charges due the first of the following month. Accounts receivable refunds are mailed weekly. Students are able to mail their remittance to a designated address or place it in a secured "drop box" near the Bursar's Office on the first floor of Davis Hall. In addition, students wishing to pay using a credit card may do so by telephone at 817/273-2726 (SAM). Cash transactions must be made in person at the Bursar's Office. Do not mail cash.

REFUNDS

TOTAL WITHDRAWAL FROM SCHOOL

A student who officially withdraws through the Student Administration section of the Registrar's Office will receive a refund according to the schedule indicated below.

1. A student who withdraws prior to the first class day will receive a 100% refund.
2. If the foregoing condition is not met, then the refund shall be as indicated below.*

Fall and Spring Semesters

During class days 1 through 5	80%
During class days 6 through 10	70%
During class days 11 through 15	50%
During class days 16 through 20	25%
After 20th class day	no refund

Summer Sessions

During class days 1 through 3	80%
During class days 4 through 6	50%
After sixth class day	no refund

* Class days noted are official University Class days — they are not the individual student's class meeting days.

3. Parking Refunds must be applied for separately at the Parking Office, 106 University Police Building.

In accordance with the Higher Education Act of 1965 as amended, all or part of any refund produced for continuing UT Arlington students who received financial aid will be returned to the source programs. The portion to be returned will be the lesser of:

- a. the total amount of Title IV aid received (excluding Work-Study); or
- b. the amount of the refund calculated in Steps 1 or 2 above multiplied by the fraction of total Title IV aid received (excluding Work-Study) divided by total aid received (excluding Work-Study).

TUITION AND FEES

The following priority will be used for distribution of refund proceeds:

1. Federal Family Student Loans
 - a. Federal Stafford
 - b. Federal SLS
 - c. Federal PLUS
2. Federal Perkins Loan
3. Federal Pell Grant
4. Federal SEOG
5. Institutional debt (including short-term loans)
6. Scholarships, grants, and sponsors
7. Student

DROPPING COURSE(S) BUT CONTINUING ENROLLMENT

All the additional costs that apply to courses dropped before the Census Date, when the student continues enrollment in other course(s), will be refunded.

REFUNDS FOR FIRST-TIME ENROLLEES RECEIVING TITLE IV FUNDS

As an institution participating in programs under Title IV of the Higher Education Act of 1965 as amended, UT Arlington is required to refund unearned tuition, fees, room and board, and other charges to students attending the institution for the first time who have received a grant, loan, or work assistance under Title IV of the Act or whose parents have received a loan on their behalf under 20 U.S.C. Section 1087-2. The refund is required if the student does not register for, withdraws from, or otherwise fails to complete the period of enrollment for which the financial assistance was intended. No refund is required if the student withdraws after 60 percent of the period of enrollment for which the charges were assessed has passed. A student who withdraws prior to that time is entitled to a refund of tuition, fees, room and board, and other charges that is the larger of the amount provided for in Section 54.006, Texas Education Code, or a pro rata refund calculated pursuant to Section 484B of the Act. Accordingly, UT Arlington will use the pro rata method for determining refunds of tuition and fees based on the following:

Fall and Spring Semesters		Short Summer Sessions		Long Summer Session	
Week	% Refund	Week	% Refund	Week	% Refund
1	90	1	80	1	90
2	80	2	60	2	80
3	80	3	40	3	70
4	70			4	60
5	60			5	50
6	60			6	40
7	50				
8	50				
9	40				
10	30				

The same procedure specified for continuing students will be followed in the disposition of refunds for first-time enrollees as will the priority of distribution.

PAYMENT OF REFUNDS

Refunds cannot be made until a computerized audit of fees has been performed; thus, refunds normally cannot be issued until approximately six weeks after a semester begins. Refunds are credited to the student's accounts receivable account with any residual credit being mailed to the student's designated mailing address.

Refunds for recipients of certain types of financial aid administered through the University will be applied to the accounts from which the funds were received. In addition, refunds are applied to outstanding bills owed by the student.

Inquiries concerning refunds should be directed to the University Business Office, Room 421, Davis Hall.

STUDENT SERVICES AND FINANCIAL AID

HOUSING

The University owns and operates residence halls, apartments, and houses for students. Because of the demand for housing, students should make application as early as possible. Applications and information are available at Housing/University Center Office, E.H. Hereford University Center, 273-2706.

The Housing Office also has information concerning off-campus housing.

STUDENT HEALTH SERVICES

Student Health Services, which is located at 605 S. West Street, 273-2771, is staffed and equipped to care for most routine health needs of students. Financial support is provided primarily by a student health fee. Many services are free of charge. A reasonable fee is assessed for services such as medications, x-rays, laboratory tests, etc.

Staffing—The staff includes full-time physicians and registered nurses, registered pharmacists, registered laboratory technologists, clinical psychologists, a health educator, a substance abuse specialist, and related personnel. The Student Health Center provides medical services for the students during those times when the University is open. Hours of operation are posted at the entrance. Services are not available during scheduled University holidays. During these periods, medical care received by the student from another source will be his/her financial responsibility.

Services—Students are eligible to receive medical services of the staff physicians, nursing services, routine laboratory procedures and diagnostic x-ray studies as ordered by staff physicians. Consultations on matters related to health and illness, psychological counseling, HIV/AIDS information, and HIV antibody testing are also available.

Services not currently available are obstetrical care, dental care, and specialized diagnostic services. In cases beyond the center's scope, referral advice will be given.

HIV Infection/AIDS—Student Health Services is the University resource center for AIDS education/prevention. The University of Texas at Arlington has adopted a written policy on HIV infection and AIDS, and a copy of this policy statement and the educational pamphlet on HIV infection and AIDS developed by the Texas Department of Health are available at the Health Center. Student Health Services also provides HIV/AIDS education to individuals and campus groups. HIV antibody testing/counseling/referral is available upon request to faculty, staff and students.

Substance Abuse Prevention—Health Services houses the office for substance abuse prevention which is open to all faculty, staff, and students needing assistance in addressing alcohol and other drug-related issues. All services are free and include education, programming, support intervention, short-term counseling and referral. The University Policy Statement on Illicit Drugs and Alcohol Abuse is available at the Student Health Center.

Education—In the spirit of this educational community, it is hoped that students will also use Student Health Services as a resource for information on health related issues and preventive medicine.

Health Records—Prior to registration, a student should submit a Report of Medical History to the Health Center. A physical examination is required only if the student is medically unfit to participate in exercise and sport activities (EXSA). Confidentiality of medical records will be in accordance with state and federal law.

Transportation—Each student is responsible for his/her transportation to the Health Center. For major emergencies or when the seriousness of the victim's condition is uncertain, a call to 911 should be made. This will summon city police and/or an ambulance, depending on the nature of the emergency. A second call to the University Police at 273-3003 should also be made. The University Police are trained in CPR and first aid and can stabilize the patient until the ambulance arrives.

Indebtedness—It is the student's responsibility to satisfy indebtedness to Student Health Services with reasonable promptness. Upon payment, receipts will be issued which can be used by the student for submitting claims to personal insurance companies.

SERVICES AND FINANCIAL AID

Health Insurance — Student Health Services is an outpatient facility, and, as such, is not equipped to perform the more extensive diagnostic procedures and services offered by a general hospital. Therefore, all students are strongly urged to have adequate medical insurance coverage.

Students on non-immigrant visas enrolled at UT Arlington are required to carry health insurance and must show proof of coverage at the time of registration.

An optional system-wide student health insurance plan is available through an insurance carrier by contract with the University. The Health Center will directly bill this insurance company for the covered charges that are incurred by the student. In addition, the deductible is waived when treatment is received at the Student Health Center.

Those wishing more information about the Student Health Insurance Plan should contact Student Health Services at 273-2771. Insurance applications and claim forms are available at the Student Health Center, corner of Third and S. West Streets, and at the Office of Student Affairs, 3rd floor, Davis Hall.

Blood Reserve Fund Plan—The University of Texas at Arlington, in cooperation with Carter Blood Center, sponsors a blood reserve fund plan for UT Arlington faculty, staff, and students. To participate in the reserve fund, members are requested to donate regularly during semi-annual blood drives held on campus. The release of blood units and the reserve fund drives are coordinated through Student Health Services and Student Governance and Organizations.

COUNSELING AND CAREER DEVELOPMENT

The Office of Counseling and Career Development is located at 216 Davis Hall, 273-3671.

COUNSELING SERVICES

Individual and group counseling assistance is provided in the following areas:

Personal counseling— developing new life skills and perspectives, decision-making, dealing with extraordinary life events;

Academic counseling— advisement, counseling, and skill building (a full range of academic skills seminars is offered on subjects such as reading improvement, test taking, study skills, and time management); and

Career counseling— exploration of interests and aptitudes, decision making, career preparation, and skill-building seminars on interview, resume preparation, and job search.

TESTING SERVICES

The following tests are given on national test dates: Graduate Record Examination, Graduate Management Admission Test, Law School Admission Test, and the Test of English as a Foreign Language. The Miller Analogies Test is scheduled once per month. Specialized tests of aptitudes, interests, and abilities are also given in conjunction with counseling.

CAREER SERVICES

Approximately 300 recruiting companies and agencies schedule interviews on campus primarily during the months of October, November, February, and March. Any graduate student may take advantage of the campus interviews. After graduation the alumni have the opportunity to use the Career Classifieds service to learn about immediate job openings for experienced graduates.

RESOURCES

A career library, career development materials, academic skills materials, and computerized guidance are some of the office resources of value to graduate students.

STUDENT EMPLOYMENT SERVICE

The Student Employment Service, located on the first floor of the University Center, assists students and their spouses in finding full- or part-time off-campus employment. Any student currently enrolled or accepted for admission at UT Arlington for the following semester may register for assistance from this employment service. The Student Employment Service actively develops jobs for graduate students interested in positions that offer an opportunity for quality, on-the-job, professional development and interaction.

INTERNATIONAL OFFICE

The International Office serves the particular needs of the 1400 international students and scholars at UT Arlington. The staff handles all immigration procedures and provides information, advice, and counseling on a wide variety of issues affecting international visitors. Numerous cultural events and informational workshops are sponsored by the office throughout the year, and the office publishes a newsletter each semester informing students of immigration issues, deadlines, and events of special interest. All new international students are required to attend international student orientation, hosted by the International Office, before matriculation.

UT Arlington now offers opportunities for study in UT Arlington programs or exchanges in Mexico, Norway, England, Italy, Germany, Spain, France, Russia/Eastern Europe, China, and Australia. New programs are being developed every year. Any students interested in study abroad opportunities, scholarships, travel, and work opportunities abroad will find information about these topics at the International Office.

The office is located in the Lower Level of the University Center. The telephone number is (817) 273-2355.

OFFICE OF MULTICULTURAL SERVICES

The Office of Multicultural Services is committed to fostering the full participation of ethnic minorities at UT Arlington by helping to create an academic, social, and cultural atmosphere conducive to the presence and responsive to the needs of African-American, Native American Indian, Mexican American, and Pacific Island students. It is important that prospective students receive orientation to the diverse and numerous offices designed to assist students at the University. While the Office of Multicultural Services is committed to facilitating full participation of ethnic minorities in every aspect of university life, its doors are open to each and every student at The University of Texas at Arlington.

Special academic assistance services are available to promote a successful learning experience. In addition, seminars and workshops are available to provide leadership training and to enhance the social skills and positive self-concepts necessary for successfully living. Rich cultural diversity is also reflected in the number and variety of minority student organizations available on campus.

The Center for Multicultural Cooperation (C.M.C.) is a comprehensive, campus-wide outreach initiative for attracting, orienting, and retaining minority students. The CMC seeks to recruit minority students in various ways, including volunteer UT Arlington students, staff recruiters, and Project Access.

The CMC provides an orientation program for minority students. Students are given a thorough overview on how the campus operates, who to see for a particular problem, and what is required of them if their campus experience is to be successful. The program stresses the values of good class attendance, establishing new friendships, participating in campus activities, and helping students to accept their opportunities and responsibilities.

Also, the CMC works to increase minority student retention by providing assistance with academic preparation, academic advising, cultural activities, socio-cultural adjustment, financial resources, and faculty/staff recruitment. The CMC views retention as a University-wide effort involving all aspects of the educational process.

In summary, the intent of the CMC is to recruit minority students with the goal of graduating minority students.

The office hours are Monday-Thursday, 9 a.m.—9 p.m.; Friday 9 a.m.—6 p.m. For further information, contact Richard Massie or Zeb Strong at 273-2128.

Youth Opportunities Unlimited is an unique program that places potential high school dropouts in a college environment during the summer. Y.O.U. is a joint state and federal program that was started to find solutions to the high school dropout problem. The program targets 14- and 15-year-old students judged to be economically disadvantaged.

The Minority Mentor Project matches freshman and sophomore students with UT Arlington faculty and staff to facilitate successful graduation rates. Freshman or sophomores with less than 60 hours should contact the Office of Multicultural Services to participate.

HANDICAPPED STUDENT SERVICES

The objective of the Handicapped Student Services Office is to help physically impaired students. The Director of the office requires personal interviews with handicapped students prior to registration, if deemed necessary. The purpose of the Services Office is to provide needed services for handicapped students and to assist them with general campus orientation and registration. For further information contact the Handicapped Student Services Office, Lower Level, University Center, 273-3364.

STUDENT CONDUCT AND DISCIPLINE

The University of Texas at Arlington reserves the right to impose disciplinary penalties, including permanent expulsion, against a student for disciplinary reasons. Information about the rules of conduct and due process procedures is published in the *Rules and Regulations of the Board of Regents of The University of Texas System* and the *Handbook of Operating Procedures of The University of Texas at Arlington*, copies of which are in the Office of the Dean of the Graduate School.



BURSAR'S OFFICE

At the Bursar's Office, located on the first floor of Davis Hall, students may:

1. pay fees and bills due to the University
2. confer on all problems arising in connection with fees and bills;
3. obtain information concerning repayment of loans;
4. pay residence hall room rent;
5. obtain check cashing services;
6. pay fines for UT Arlington parking violations;
7. purchase movie and other local amusement tickets; and
8. pick up payroll or financial aid checks.

CHECK CASHING AND PAYMENT PROCEDURES

A current University I.D. is required of anyone making payment to the University by check or anyone desiring to cash a personal check. Students may cash personal checks for an amount not to exceed \$25.

RETURNED CHECKS

A charge of \$15 will be made for each returned check. A person who gives UT Arlington a bad check (one in which the bank is not at fault) will be subject to one or more of the following actions until the debt is cleared: (1) a bar against readmission of the student, (2) withholding of the student's grades and official transcript, (3) withholding of degree to which the student otherwise would be entitled.

Additionally, the University will not accept a check from anyone who has given a total of two bad checks unless the person submits a written statement from the bank stating "bank error or unusual circumstance" to be the cause of the bad checks.

STUDENT FINANCIAL AID

The following summaries are for informational purposes only. Current information on each program is available from the Financial Aid Office, located in Suite 252 Davis Hall, 273-3561.

ALUMNI LOAN FUND

The UT Arlington Alumni Association and other friends of the University have established loan funds for the benefit of students who need to borrow to meet current expenses. These loans are for amounts up to \$300 and are to be repaid during the semester in which the money is borrowed. To be eligible, graduate students must have completed a minimum of nine semester hours at UT Arlington with a grade point average of at least 3.0. First-time graduate students who have earned a baccalaureate degree from UT Arlington will be considered to have met minimum academic requirements for eligibility. All applicants must have demonstrable means of repayment.

ASSISTANCE BASED ON NEED

Students wishing to participate in any of the following financial aid programs should complete a Free Application for Federal Student Aid (FAFSA) and a UT Arlington Financial Aid Application as early as possible prior to their actual enrollment at the University. The funding process takes 10 to 12 weeks for completion. Financial aid in these categories is generally limited to U.S. citizens or those in this country on other than temporary visa status.

Federal Perkins Loan and Federal Stafford Loan

These are the primary sources of long-term loans available at UT Arlington. Both programs include deferred repayment provisions that permit students to repay the loan after termination of at least half-time studies at the University. For those students demonstrating financial need, interest will not accrue on the loans while the borrowers are enrolled on at least a half-time basis. Information regarding loan amounts and terms can be obtained from the Financial Aid Office.

SERVICES AND FINANCIAL AID

Federal Work-Study Program

A student who needs a job to help pay for college expenses may be eligible for employment through the Federal Work-Study Program. Eligibility is based on financial need as determined by the FAFSA. Most participants are employed in positions with various University departments, but limited off-campus jobs with certain approved agencies are also available.

FINANCIAL COUNSELING

The Financial Aid Office provides financial or budgetary counseling for any and all students regardless of whether or not they qualify for other types of financial assistance.

OUT-OF-STATE STUDENT ASSISTANCE

Several states offer aid to their students attending schools in other states. Amounts and requirements for this assistance vary greatly. Further information can be obtained from the Financial Aid Office.

VETERANS' ASSISTANCE

Contact the Registrar's Office for information concerning eligibility for and payment of VA benefits and other matters for veterans attending or planning to attend UT Arlington.

ASSISTANTSHIPS

Research and teaching assistantships are available in most departments. Such appointments may be held only by students unconditionally admitted to Graduate School. Prospective graduate students should see the appropriate department chairman for further information. To be continued on a research or teaching assistantship, a student must be in good standing and have performed assigned duties satisfactorily in the preceding semesters as determined by the respective department. Consult the catalog section on General Graduate School Regulations and Information for regulations regarding registration and responsibility of graduate assistants.

A student whose native language is not English must submit an acceptable score on the Test of Spoken English (TSE) before being appointed to an assistantship. An applicant who is a non-native speaker of English and who may wish to be considered for an assistantship should take the TSE before arriving in the United States and have the score sent to UT Arlington. Score reports which are submitted directly by the student or those marked "student copy" or "applicant's copy" are not considered official and will not be accepted by the University. The TSE is administered at TOEFL test centers around the world. Applicants should register for TSE-A (for teaching and research assistant applicants). See DOCUMENTATION AND APPLICANT EVALUATION CHARGES REQUIRED for further information.

The SPEAK examination is offered on the UT Arlington campus at various times during the year. A satisfactory score on this examination may be used for the Test of Spoken English-A (TSE-A) requirement. This examination may be taken in cases in which the student has come to UT Arlington without having taken the TSE-A and subsequently wishes to be considered for a graduate assistantship. Cost and time necessary for scoring the SPEAK examination are comparable to those for the TSE-A. The Office of Counseling and Career Development should be contacted for administration dates and other details.

STUDENT RIGHT-TO-KNOW ACT

Graduation rates — In 1991-1992 the graduation rate was 28.29% for students who entered UT Arlington in 1986 on a full-time basis, as first-time, degree-seeking freshmen. The projected 1992-1993 graduation rate for full-time, degree-seeking freshmen who entered here in 1987 is 28%.

Campus security — In compliance with the federal Student Right-To-Know and Campus Security Act (P.L. 101-542, as amended), UT Arlington publishes specified information on campus crime statistics and campus security policies. This information is disseminated through the Office of the Chief of the University Police.

ACADEMIC PROGRAMS AND COURSES OF INSTRUCTION

Departmental Programs

This catalog is a general information publication only. It is not intended to nor does it contain all regulations that relate to students. The provisions of this catalog do not constitute a contract, express or implied, between any applicant, student, or faculty member and The University of Texas at Arlington or The University of Texas System. The University reserves the right to withdraw courses at any time, change fees, rules, calendar, curriculum, degree programs, degree requirements, graduation procedures, and any other requirements affecting students. Changes will become effective whenever the proper authorities so determine and will apply to both prospective students and those already enrolled.

Students are held individually responsible for complying with all requirements of the rules and regulations of the University and the Board of Regents of The University of Texas System. Failure to read and comply with policies, regulations, and procedures will not exempt a student from whatever penalties he or she may incur.



Department of ACCOUNTING

Areas of Study

Accounting

Taxation

Business Administration (See Interdepartmental
and Intercampus Programs.)

Degrees

M.P.A., M.S.

M.S.

M.B.A., Ph.D.

Master's Degree Plans: Thesis and Non-Thesis

Chair: Debra M. Hopkins

409 Business 273-2044

Graduate Advisor: Mary Lee Hodge

433 Business 273-3028

Graduate Faculty:

Professors Courtney, Dunn, T. Hall, Hopkins, Ross, Solomon, Taylor

Associate Professors Beehler, B. Hall, Hassell, Mark, McConnell, Tsay, Walther

Assistant Professor Ho

Lecturer Hodge

OBJECTIVE

The objective of the Master of Professional Accounting, the Master of Science in Accounting, and the Master of Science in Taxation degree programs is to prepare students for careers as professional accountants in public, private, or government accounting. As a part of this objective, the programs are designed to provide the educational background to become Certified Public Accountants or to attain other appropriate professional certification*. The MPA program, appropriate for students without significant prior study in accounting, is also designed to provide a sound understanding in selected fields such as management, finance, behavioral sciences, management sciences, and economics. The MS in Accounting and MS in Taxation are more specialized degrees which build on the candidate's prior background in accounting and business related subjects. Thus, the programs seek to insure that the student attains a broad perspective, which is a requisite to success both as a professional accountant and as a top-level financial or business executive.

*Beginning in 1997, the Public Accountancy Act of 1991, as amended, will require completion of at least 150 semester hours of which 30 (excluding elementary accounting) must be in accounting for individuals to be licensed as Certified Public Accountants.

ACCREDITATION

The Master of Professional Accounting, the Master of Business Administration, and the Master of Science in Accounting are accredited by the American Assembly of Collegiate Schools of Business.

DEGREE REQUIREMENTS

Admission to an accounting graduate degree program is based upon the general admission requirements of the Graduate School. Both a satisfactory score on the Graduate Management Admission Test and other evidence (such as a suitable GPA in previous study) are required for admission to the program.

The programs, which can be completed by part-time students who attend classes during the evening hours, are designed to accommodate students with divergent educational backgrounds and career interests. Each student's program of work must be approved by the Accounting Graduate Advisor and it must include a minimum of 15 semester hours in advanced graduate accounting courses taken at The University of Texas at Arlington. It should be noted that courses which are not considered suitable to a student's program will not be approved. During the final semester, students who have written a thesis must defend the thesis in

ACCOUNTING

an oral examination. The following requirements for the Accounting Graduate Degrees are in addition to the general regulations and requirements given in the introductory sections of this catalog.

GRADE AND GRADUATION REQUIREMENTS

Students enrolled in accounting degree programs (MPA, MS-Accounting, MS-Tax) are subject to the grade requirements for academic probation and graduation as specified under the general regulations of the Graduate School (stated elsewhere in this catalog). In addition to regulations of the Graduate School, regulations of the Department of Accounting specify that a student's program of work will not be approved if the student has earned a grade of C in more courses, which are applied to the program of work, than allowed per the schedule below.

Number of Courses (UT Arlington coursework only)	Allowable Number of Grades of C
12 courses	2
13 and above	3

Courses in which the student has earned a grade of D or F may not be applied to the program of work.

INTEGRATED FIVE-YEAR PROGRAM (Professional Program in Accounting)

The Public Accountancy Act of 1991, as amended, requires, beginning in 1997, the completion of at least 150 semester hours, of which 30 must be in accounting (excluding elementary accounting), for individuals to be licensed as Certified Public Accountants. A professional program satisfying these requirements is offered by The University of Texas at Arlington. The program will allow a student to earn both the Bachelor of Business Administration and Master of Science in Accounting or Taxation upon completion of an integrated five-year program. The proposed integrated program can be completed in approximately one less semester than required to earn separate bachelor's and master's degrees in accounting.

Master of Professional Accounting Background Category I

Students who have had no prior academic work in business administration are included in this category. These students will take the courses in the Foundation Program (27 semester hours as shown below); in addition, they must complete the requirements of the Category I MPA Program which totals 39 semester hours of work.

Foundation Program

Semester I	Semester II
Accounting Analysis I (ACCT 5301)	Accounting Analysis II (ACCT 5302)
Economic Analysis I (ECON 5309)	Economic Analysis II (ECON 5311)
Statistics (BUSA 5301)	Marketing (MARK 5311)
Behavioral Science in Management or Social Science or equivalent	Finance (FINA 5311)
	Management (MANA 5312)

Category I MPA Program

Financial Accounting I (ACCT 5311)
Financial Accounting II (ACCT 5312)
Financial Accounting III (ACCT 5319)
Cost Accounting (ACCT 5317)
Accounting for Management Planning and Control (ACCT 5322)
Survey of Accounting Systems (ACCT 5329)
Study of Federal Income Tax Law Relative to Individuals (ACCT 5314)
Contemporary Issues in Accounting Theory (ACCT 5327)
Auditing Concepts and Practices (ACCT 5316)
Law I (BLAW 3311)
Business Policy (BUSA 5333)

In addition to the courses listed above (or their equivalents), the student will select one graduate level accounting course and one appropriate graduate level course in statistics, management science, or information systems.

Master of Professional Accounting Background Category II

Students who have some prior academic work in business administration but who do not have the equivalent of a major in accounting are included in this category. Students in Category II must meet the same foundation requirements as Category I students, and they must complete the coursework of the Category I MPA Program. However, courses equivalent to those taken in a student's previous academic work will be waived; such courses cannot be repeated for credit. For example, a student with an undergraduate major in business administration typically would not be required to complete any of the courses in the Foundation Program.

In addition to any needed foundation courses and regardless of the number of courses waived, a student in Category II who chooses to write a thesis is required to complete a minimum of 33 semester hours; a student who chooses not to write a thesis is required to complete a minimum of 39 semester hours (including 18 hours of accounting coursework).

Master of Science in Accounting

This program is designed for students who have an undergraduate degree in accounting or a degree in business administration with a major in accounting who wish to specialize in an area of accounting other than taxation. The student, with the assistance and consent of the Graduate Advisor, will develop a course of study designed to meet his or her educational needs in light of previous academic work and career objectives. Specialization tracks are available in accounting systems, auditing, financial accounting, and managerial accounting.

A minimum of 30 semester hours (including 18 semester hours of accounting coursework) is required if the student chooses to write a thesis. If the student chooses not to write a thesis, a minimum of 36 semester hours (including 24 semester hours of accounting coursework) is required. The student must have previously studied or include in his or her program courses covering the following areas of accounting: financial accounting and accounting theory, management accounting (including cost accounting), management information and computer systems, financial and operational auditing, and taxation. At least six semester hours of non-accounting graduate level courses offered by the College of Business Administration are required, including BUSA 5333 and an appropriate graduate course in statistics, management science, or information systems. BUSA 5333 is waived if the student has had a similar course before admission to the Master of Science in Accounting program.

Background Requirements

Students in the MS in Accounting program must have completed the following courses in addition to the Program Requirements (below) for the MS in Accounting degree:

1. Courses equivalent to the Foundation Program for the Master of Professional Accounting degree (see above); and
2. Courses equivalent to UT Arlington accounting courses ACCT 5311, 5312, 5314, 5316, 5317, and 5322. These courses typically will have been completed as a part of a candidate's undergraduate program in accounting.

Program Requirements

The required program for an MS in Accounting consists of the following:

Eighteen semester hours: Graduate level accounting courses beyond those stipulated in Background Requirements above. ACCT 5319, 5321, 5327, and 5329 must be included if equivalent courses have not been completed previously. The courses selected must include at least 12 semester hours of non-tax graduate level accounting courses.

Three semester hours: BUSA 5333 (Business Policy), or an elective non-accounting graduate level course offered by the College of Business Administration if the student completed a course similar to BUSA 5333 before admission to the MS in Accounting Program.

Three semester hours: Appropriate graduate level course in Statistics, Management Science, or Information Systems.

ACCOUNTING

Thesis Option (Total program of 30 semester hours)

Six semester hours: Thesis on accounting (non-tax) topic.

Non-Thesis Option (Total program of 36 semester hours)

Six semester hours: Graduate level accounting courses (other than taxation courses) offered by the College of Business Administration.

Six semester hours: Graduate level courses offered by the College of Business Administration.

Master of Science in Taxation

This program is designed for students who have an undergraduate degree in accounting or a degree in business administration with a major in accounting who wish to specialize in taxation. The student, with the assistance and consent of the Graduate Advisor, will develop a course of study designed to meet his or her educational needs in light of previous academic work and career objectives.

A minimum of 36 semester hours, including a minimum of 18 semester hours in taxation courses beyond ACCT 5314, is required. The student may choose to write a thesis that will count as six semester hours toward the 36-hour requirement. The student must have previously studied or include in his or her program courses covering the following areas of accounting: financial accounting and accounting theory, management accounting (including cost accounting), management information and computer systems, financial and operational auditing, and taxation. Also required is BUSA 5333. BUSA 5333 is waived if the student has had a similar course before admission to the Master of Science in Taxation program.

Background Requirements

Students in the MS in Taxation program must have completed the following courses in addition to the Program Requirements (below) for the MS in Taxation degree:

1. Courses equivalent to the Foundation Program for the Master of Professional Accounting degree (see above); and
2. Courses equivalent to UT Arlington accounting courses: ACCT 5311, 5312, 5314, 5316, 5317, and 5322.

These courses typically will have been completed as a part of a candidate's undergraduate program in accounting.

Program Requirements

The required program for an MS in Taxation consists of the following:

Eighteen semester hours: Graduate level taxation courses beyond ACCT 5314. Taxation courses required of all candidates are ACCT 5339, 5341, 5342, and 5347.

Three semester hours: BUSA 5333 (Business Policy) or an elective graduate level course offered by the College of Business Administration if the student completed a course similar to BUSA 5333 before admission to the MS in Taxation program.

Six semester hours: Elective graduate level course offered by the College of Business Administration.

Thesis Option (Total Program of 36 semester hours)

Nine semester hours: Thesis on taxation topic.

Non-Thesis Option (Total program of 36 semester hours)

Nine semester hours: Elective graduate level courses offered by the College of Business Administration.

The grade of R (research in progress) is a permanent grade. An incomplete (the grade of X) cannot be given in a course which is graded R. To receive credit for an R-graded course the student must continue to enroll in the course until a passing grade is received. Three-hour thesis and three- and six-hour dissertation courses are graded R/F only. The grade of P (required for graduation) can be received in six- or nine-hour thesis courses and nine-hour dissertation courses only. In the course listings below, R-graded courses are designated either "Graded P/F/R" or "Graded R." (See also the section entitled "R" GRADE in this catalog.)

ACCOUNTING (ACCT)

5301. ACCOUNTING ANALYSIS I (3-0). Introduction to concepts, purposes, problems, methodology, and terminology of financial accounting. \$15 computer fee.

5302. ACCOUNTING ANALYSIS II (3-0). Introduction to concepts, purposes, problems, methodology, and terminology of managerial accounting. Prerequisite: ACCT 5301 or equivalent. \$15 computer fee.

5310. INTRODUCTION TO BUSINESS TAXATION (3-0). Introduction to Internal Revenue Code, Treasury Regulations and other tax literature applicable to business entities. Includes tax planning for sole proprietorship, partnership and corporation. Cannot be taken for credit by accounting majors. Prerequisite: ACCT 5301 or equivalent. \$15 computer fee.

5311. FINANCIAL ACCOUNTING I (3-0). Examination of financial accounting process, problems encountered in preparation of financial statements, and concepts and principles used to resolve these problems. Prerequisite: ACCT 5301 or equivalent. \$15 computer fee.

5312. FINANCIAL ACCOUNTING II (3-0). Study of additional problems encountered in preparation of financial statements. Prerequisite: ACCT 5311 or equivalent.

5313. SOFTWARE TOOLS FOR ACCOUNTANTS (3-0). A study of software programs which are commonly useful to accountants in both private and public practice. Topics include spreadsheets, graphics, communications, word processing, and other computer software tools. Prerequisite: ACCT 5302 or equivalent. \$30 computer fee.

5314. STUDY OF FEDERAL INCOME TAX LAW RELATIVE TO INDIVIDUALS (3-0). Comprehensive analysis of the federal income tax consequences applicable to individuals. Emphasizes the analysis of concepts relating to passive and earned income, deductible expenses, and tax credits. May not be taken for credit by students who have received credit for any course in federal income taxation. Prerequisite: ACCT 5301 or equivalent. \$15 computer fee.

5316. AUDITING CONCEPTS AND PRACTICES (3-0). Concentrates on practice of professional accounting and auditing. Emphasizes decision making in a variety of unstructured situations where decisions demand a grasp of purpose, method, and judgment for their resolution. May not be taken for credit by students who have received credit for a course in auditing. Prerequisites: ACCT 5312 or equivalent and BUSA 5301 or equivalent. \$15 computer fee.

5317. COST ACCOUNTING (3-0). Uses and classification of costs incurred in manufacturing. Emphasis on concepts involved in assignment and reporting of costs under job order, process, standard and direct costing systems. Prerequisite: ACCT 5302 or equivalent. \$15 computer fee.

5318. STUDIES IN AUDITING (3-0). A critical analysis of advanced topics in both auditing theory and professional practice. Emphasis on: development of auditing theory, generally accepted auditing standards, professional responsibilities, auditing EDP, SEC practice and reporting, cases in audit decision making, and analyses of emerging issues and contemporary problems in auditing. Prerequisite: ACCT 5316 or equivalent.

5319. FINANCIAL ACCOUNTING III (3-0). Accounting for business combinations, preparation of consolidated financial statements, multi-national operations, partnerships, and estates and trusts. Prerequisite: ACCT 5312 or equivalent.

5320. GOVERNMENTAL AND NONPROFIT ACCOUNTING (3-0). Budgeting, accounting and financial reporting, managerial control, and auditing considerations of governmental and nonprofit entities (e.g. hospitals, universities, and voluntary health and welfare organizations). Prerequisite: ACCT 5301 or equivalent or permission of the instructor.

5321. RESEARCH IN ACCOUNTING ISSUES (3-0). Designed to improve student's ability to research complex areas in accounting and to sharpen understanding and application of accounting concepts and principles. Case studies and problems considered and analyzed. Prerequisite: ACCT 5312 or equivalent. \$15 computer fee.

5322. ACCOUNTING FOR MANAGEMENT PLANNING AND CONTROL (3-0). Concentrates on information needs of management for planning and control of operations. Topics include setting corporate objectives, behavioral problems, capital budgeting and profit-planning, the use of quantitative tools, divisional performance evaluation, and transfer pricing. May not be taken for credit by students who previously received credit for ACCT 4302 or equivalent. Prerequisite: ACCT 5317 or equivalent or consent of instructor. \$15 computer fee.

ACCOUNTING

5323. CORPORATE MODELING (3-0). Aggregative approach to modeling corporate activities with emphasis on financial modeling. Problem definition, design choices, and validation problems considered. Computer models developed. Prerequisite: ACCT 5322 or equivalent and consent of instructor. \$15 computer fee.

5324. ADVANCED STUDIES IN PLANNING AND CONTROL (3-0). In-depth study of selected topics in planning and control using cases and readings from current literature. Representative topics include behavioral and organizational considerations and use of quantitative techniques for effective planning and control, design of accounting systems for performance measurement. Emphasis of course and topics vary. Prerequisite: ACCT 5322 or equivalent.

5327. CONTEMPORARY ISSUES IN ACCOUNTING THEORY (3-0). Designed to familiarize students with significant problems currently facing the accounting profession, to examine in depth various solutions proposed by accounting scholars and others, and to strengthen student understanding of today's critical issues in accounting theory. Prerequisite: ACCT 5312 or equivalent.

5329. SURVEY OF ACCOUNTING SYSTEMS (3-0). A survey and design critique of typical commercial, horizontal, accounting software systems. Functional areas include general ledger, receivables, payables, payroll, and inventory. Evaluation criteria include data capture, processing features, internal control, audit trails, and reporting capabilities. Prerequisites: six hours of accounting. \$30 computer fee.

5330. INTERNATIONAL ACCOUNTING AND FINANCIAL REPORTING (3-0). Financial accounting and reporting principles and practices in various countries, the role of accounting in economic development, as well as the accounting considerations in international business operations—e.g. foreign currency translation, auditing, accounting systems, taxation, and sensitive payments. Prerequisite: ACCT 5302.

5335. DESIGN OF ACCOUNTING SYSTEMS (3-0). A detailed study of the data entry, storage (file design), internal control, and reporting requirements of accounting systems, followed by the development of a significant accounting sub-system using a database package. Prerequisites: ACCT 5316 and 5329 or equivalents. \$30 computer fee.

5336. SELECTED TOPICS IN ACCOUNTING SYSTEMS (3-0). The study of theoretical and practical aspects of selected issues in accounting systems; issues for study include contemporary topics such as design techniques, management and development of accounting systems, and factors affecting choice of an accounting system. Prerequisite: ACCT 5329 or equivalent. \$30 computer fee.

5339. TAX PLANNING AND RESEARCH (3-0). A study of the use of various techniques and procedures available in evaluating issues arising under federal income tax law. Emphasizes research into individual and business tax problems and planning alternatives. Prerequisite: ACCT 5314 or equivalent. \$30 computer fee.

5340. STUDY OF FEDERAL INCOME TAX FOR ENTITIES OTHER THAN INDIVIDUALS (3-0). Comprehensive analysis of the federal income tax consequences applicable to entities other than individuals. Analysis of the relevant tax principles of corporations, partnerships, trusts and estates will be undertaken. Cannot be taken for credit within the 36-hour program requirements for Master of Science in Taxation program. Prerequisite: ACCT 5314 or equivalent. \$15 computer fee.

5341. TAX PROBLEMS OF PARTNERSHIPS AND PARTNERS (3-0). Analysis of the federal income tax rules governing partners and partnerships. Prerequisite: ACCT 5339 or equivalent. \$15 computer fee.

5342. TAX PROBLEMS OF CORPORATIONS AND SHAREHOLDERS (3-0). Analysis of the federal income tax rules governing corporations and shareholders. Subjects include corporate formations, corporate capital structure, administrative requirements affecting corporations, the corporate alternative minimum tax, special tax provisions (such as the personal holding company and accumulated earnings taxes and the collapsible corporation rules), nonliquidating distributions, stock dividends, redemptions and partial liquidations, liquidating distributions, corporate reorganizations, and Subchapter S corporations. Prerequisite: ACCT 5339 or equivalent. \$15 computer fee.

5343. TAX PROBLEMS OF TRANSACTIONS IN REAL ESTATE (3-0). Problems and elections relating to the acquisition, holding, and disposition of real property. Subjects include means of acquisition and disposition, capital gains and losses, deferred payment sales, organization of syndicates, sale and lease-back, dissolutions, and general tax-saving methods. Prerequisite: ACCT 5339 or equivalent.

5344. TAX PROBLEMS OF THE EXTRACTIVE INDUSTRIES (3-0). Subjects include depletion, intangible drilling and development costs, exchanges of interests in oil and gas property, studies of current practices in planning petroleum transactions. Prerequisite: ACCT 5339 or equivalent.

- 5345. CONTEMPORARY ISSUES IN FEDERAL TAXATION (3-0).** Analysis of current federal taxation problems. Subjects include recent changes in federal tax legislation, minimization of tax liability through certain investments, analysis of tax liabilities. May be repeated for credit. Prerequisites: ACCT 5314 or equivalent and approval of Graduate Advisor. \$15 computer fee.
- 5346. SEMINAR IN FEDERAL TAXATION (3-0).** In-depth study of current topics in the operations of the federal taxation system. Material to be covered will vary based on the semester offered and the topics considered by the instructor to be of current interest. Topics may include tax procedure and administration; tax accounting methods, procedures and elections available to taxable entities; accounting periods; installment sales; inventory methods; and uniform capitalization rules. May be repeated for credit. Prerequisites: ACCT 5314 or equivalent and the approval of the Graduate Advisor.
- 5347. FEDERAL TAXATION OF GIFTS AND ESTATES (3-0).** A comprehensive survey of the principles and procedures involved in determining the federal estate tax and the supplementary federal gift tax including taxability and valuation of property and the determination of deductions and credits. Prerequisite: ACCT 5339 or equivalent. \$15 computer fee.
- 5348. FEDERAL TAXATION OF INTERNATIONAL TRANSACTIONS (3-0).** Introduction to United States taxation of multinational and foreign corporations. Subjects include sourcing of income and expenses, the U.S. foreign tax credit, controlled foreign corporations, U.S. taxation of foreign persons and export incentive provisions. Prerequisites: ACCT 5339 and 5342.
- 5352. AUDIT AND CONTROL OF EDP SYSTEMS (3-0).** A study of controls needed in EDP systems, related audit problems, and approaches to using the computer as an audit tool. Prerequisites: ACCT 5329 and 5316 or equivalents. \$30 computer fee.
- 5353. STATISTICAL TECHNIQUES USED IN ACCOUNTING (3-0).** A study of statistical techniques used in accounting. Topics include alternative sample selection methods, attribute methods, mean-per-unit estimation, ratio and difference estimation, monetary unit sampling, and regression analysis. Prerequisite: BUSA 5301 or an introductory course in statistics. \$30 computer fee.
- 5382. INDEPENDENT STUDIES IN ACCOUNTING.** Extensive analysis of an accounting topic. Graded R. Prerequisite: consent of faculty member and department chair.
- 5391, 5691. RESEARCH COLLOQUIUM.** Provides the vehicle for presentation of research by the candidate and an arena for critical evaluation by faculty and other candidates. May, with appropriate permission, be used as a partial substitute for the traditional type of thesis work. Graded P/F/R.
- 5392. SELECTED TOPICS IN ACCOUNTING.** In-depth study of selected topics in accounting. May be repeated when topics vary. Prerequisite: consent of instructor.
- 5398, 5698. THESIS.** 5398 graded R/F only; 5698 graded P/F/R. Prerequisite: permission of Graduate Advisor.
- 6101. ACCOUNTING RESEARCH COLLOQUIUM (1-0).** A forum in which visiting scholars and UT Arlington faculty members present and discuss results of their contemporary research. Doctoral students participate by meeting with visiting scholars, reading the research papers, providing written critiques, and discussing the papers. Doctoral students are required to enroll and attend the colloquia presentations each fall and spring semester until the students pass all their comprehensive examinations. May be repeated for credit. Graded P/F. Prerequisite: consent of PhD advisor.
- 6309. SEMINAR IN ACCOUNTING RESEARCH I (3-0).** Analysis of the theoretical and empirical literature in accounting. Prerequisite: consent of Graduate Advisor. \$30 computer fee.
- 6310. SEMINAR IN ACCOUNTING RESEARCH II (3-0).** Continuation of analysis of the theoretical and empirical literature in accounting. Prerequisites: ACCT 6309 and consent of the Graduate Advisor. \$30 computer fee.
- 6311. SEMINAR IN ACCOUNTING RESEARCH III (3-0).** Continuation of analysis of the theoretical and empirical literature in accounting. Prerequisites: ACCT 6310 and consent of the Graduate Advisor. \$30 computer fee.

Program in ADMINISTRATION

See Interdepartmental and Intercampus Programs.

Program in AEROSPACE ENGINEERING

Area of Study

Aerospace Engineering

Degrees

M.S., M.Engr., Ph.D.

Master's Degree Plans: Thesis (M.S.), Thesis-Substitute (M.S.), and Non-Thesis (M.Engr.)

Program Director: D.R. Wilson

211B Engineering

273-2603

Graduate Advisor: F.R. Payne

315G Engineering

273-2074

Graduate Faculty:

Professors Anderson, Gaines, Payne, Seath, Wilson
Associate Professors Joshi, Lu, Parpia, Stanovsky
Assistant Professor Tuckness
Professors Emeriti Dalley, Fairchild

OBJECTIVE

The overall objective of the graduate program in aerospace engineering is to develop in a student the ability to define a technical problem, establish an appropriate mathematical or experimental model based on a firm understanding of the physical nature of the problem, analyze the problem by theoretical, numerical, or experimental techniques, and evaluate the results. Although this ability is developed in the context of aerospace problems, it is applicable to the engineering of any physical system. The program is designed for a student with any of the following specific objectives:

1. A sound foundation in advanced mathematics, science, and engineering which will equip the student well for research and development work or for further advanced study toward a doctoral degree in engineering.
2. A program of advanced study which allows specialization in one of the following areas:
 - a. Atmospheric and space flight mechanics
 - b. Orbital mechanics
 - c. Atmospheric/orbital flight simulation
 - d. Stability, guidance, navigation, and control
 - e. Space vehicle/mission design
 - f. Theoretical and applied aerodynamics
 - g. Gasdynamics
 - h. Viscous fluid mechanics, turbulence
 - i. Computational and experimental fluid dynamics
 - j. Hypersonics
 - k. Aerospace propulsion
 - l. V/STOL and rotorcraft aerodynamics
 - m. Structural mechanics
 - n. Mechanical vibrations

- o. Composite structures
 - p. Aeroelasticity
 - q. Flight Vehicle Design
3. A balanced but non-specialized program of advanced study in aerodynamics, astronautics, flight dynamics, structural analysis, propulsion, and fluid mechanics, with emphasis on experimental techniques and modern mathematical analysis.

ADMISSION REQUIREMENTS

Applicants for the Master's Degree in aerospace engineering must meet the general requirements of the Graduate School as stated in the catalog section entitled "Admission Requirements and Procedures" to be considered for unconditional admission.

Applicants who do not meet all of the minimum criteria but nevertheless show promise of being able to complete the Master's program successfully will be considered for probationary admission. For applicants without prior formal training in engineering, the same minimum criteria will apply, and, in addition, their prior records will be reviewed for relevance to the intended program of study. In general, a specific program of remedial work will usually be required to remove any deficiencies that would prevent successful completion of the graduate program.

Students applying for the PhD program are expected to have qualifications exceeding the above-stated minimum requirements. In addition, their master's degree program will be closely reviewed for relevance to their intended program of studies for the PhD degree.

CONTINUATION

The Aerospace Engineering Graduate Program, in fulfillment of its responsibility to graduate highly qualified professional engineers, has established certain policies and procedures. In addition to the requirements of the Graduate School listed elsewhere, to continue in the program each aerospace engineering graduate student must:

1. Maintain at least a B (3.0) overall GPA in all coursework major and minor, and
2. Demonstrate suitability for professional engineering practice.

At such time as questions are raised by aerospace engineering graduate faculty regarding either of the above, the student will be notified and will be provided the opportunity to respond to the Committee on Graduate Studies in Aerospace Engineering. The Committee on Graduate Studies will review the student's performance and make a recommendation concerning the student's eligibility to continue in the program. Appeal of a decision on continuation may be made through normal procedures outlined in the section of this catalog entitled "Grievances Other than Grades."

DEGREE REQUIREMENTS

All entering students must be proficient in computer programming. No graduate credit will be granted for courses that are required in the undergraduate aerospace engineering curriculum. Normally, all master's and doctoral candidates in aerospace engineering shall enroll in the Graduate Seminar (AE 5101) a minimum of three times (see course description). Repeat enrollments shall require an oral presentation of thesis/dissertation results. All candidates are required to obtain an approved program of work in the second full semester or after 12 hours are completed.

Master of Engineering

The Master of Engineering degree is an advanced program of work offered on a non-thesis basis. This degree is described in the *Advanced Degrees and Requirements* portion of this catalog.

Master of Science in Aerospace Engineering

The Master of Science degree in aerospace engineering is an advanced program of study consisting of a minimum of 24 credit hours of advanced coursework, and six credit hours of an acceptable thesis. The thesis may be oriented toward either research or advanced engineering analysis and design. The Graduate Advisor should be consulted for specific degree requirements.

AEROSPACE ENGINEERING

Doctor of Philosophy

The PhD degree can be tailored to satisfy the individual student's aspirations in choice of the area of specialization, while at the same time providing a broad range of knowledge in the major technical areas comprising the field of aerospace engineering. The program will generally require two to three years of full-time study beyond the Master's degree and will include a scholarly dissertation that provides an original contribution to the literature in aerospace engineering.

The grade of R (research in progress) is a permanent grade. An incomplete (the grade of X) cannot be given in a course which is graded R. To receive credit for an R-graded course the student must continue to enroll in the course until a passing grade is received. Three-hour thesis and three and six-hour dissertation courses are graded R/F only. The grade of P (required for graduation) can be received in six- or nine-hour thesis courses and nine-hour dissertation courses only. In the course listings below, R-graded courses are designated either "Graded P/F/R" or "Graded R." (See also the section entitled "R" GRADE in this catalog.)

AEROSPACE ENGINEERING (AE)

5101. GRADUATE SEMINAR (1-0). May be repeated as often as required. Enrollment mandatory for first semester graduate students and for students enrolled in thesis, dissertation, or research courses. Purpose is to acquaint peers and faculty with research in progress at UT Arlington. During total enrollments in this course, student is expected to present at least two seminars: ideally, the first to be when the problem area has been well-defined and the second as a "dry-run" for the oral defense.

5301. ADVANCED TOPICS IN AERODYNAMICS (3-0). May be repeated for credit as topics change. Topics include: hypersonic aerodynamics, transonic aerodynamics, unsteady aerodynamics and optimum aerodynamic shapes. \$10 computer fee.

5302. ADVANCED FLIGHT MECHANICS (3-0). Basic dynamics of vehicles, flight path analysis and optimization. Prerequisite: permission of department. \$10 computer fee.

5303. AERODYNAMICS OF WINGS AND BODIES (3-0). Application of classical potential theory to the analysis of the aerodynamics of wings and bodies. Knowledge of complex variable theory assumed. \$10 computer fee.

5305. LAMINAR BOUNDARY LAYERS (3-0). Conservation laws of a viscous fluid developed from integrated viewpoints. Prandtl's boundary-layer concepts and applications. Lie group theory provides scaling laws for solutions including jet, wake, stagnation flows. Similarities include Stokes, Heimeanz, Falkner-Skan, von Karman, and Pohlhausen. Singular perturbations provide "Triple deck" modeling. Emphasis upon laminar flow. Prerequisite: a course in fluid mechanics. \$15 computer fee.

5306. TURBULENT BOUNDARY LAYERS (3-0). Flow stability and transition as precursors of turbulence introduced. The Reynolds' equations, eddy viscosity, "Law of the wall," and "Law of the wake" lead to calculational schemes exercised upon computer. Statistical measurements, correlations, spectra ("PSD"), skewness and kurtosis treated from a phenomenological, not a probabilistic view point. Emphasis upon developing insights for calculation, measurement and modeling. Prerequisite: AE 5305 or approval of instructor. \$15 computer fee.

5307. HELICOPTER DYNAMICS (3-0). Introduction to blade flapping motion. Comparisons of hub types and number of blades. Effects of in-plane and torsional deflections. Aeroelastic effects and couplings. Coupling between rotor and fuselage. Ground resonance. Fuselage vibrations.

5308. TURBULENCE TOPICS (3-0). Include statistical and phenomenological theories developing insights, modeling technology for simulations, experiments to validate theories and models and computing turbulence as a scientific art. May be repeated for credit as topics change. Prerequisite: Fluid or Continuum Mechanics.

5310. AEROSPACE VEHICLE DYNAMICS SIMULATION AND DESIGN (3-0). Aerospace trajectory simulation and design of aerospace vehicles; large scale simulation design; structure of large scale simulations; simulations used as analysis tools. Course will concentrate around guidance, navigation, and control simulation of a lunar and/or Mars landing vehicle. Prerequisite: AE 5302. \$10 computer fee.

5311. ADVANCED ASTRONAUTICS (3-0). Topics include orbital mechanics, Keplerian mechanics, orbit determination, perturbations, numerical techniques, and applied optimal estimation.

5315. FUNDAMENTALS OF COMPOSITES (3-0). Fundamental relationships between the mechanical behavior and the composition of multiphase media; failure criteria discussed. Also offered as EM 5333, ME 5348.

5322. AEROELASTICITY I (3-0). Math models for the steady aerodynamics and structural stiffness of aircraft wings are presented and combined into a static aeroelastic math model. Loss of wing lift due to static aeroelasticity as well as the structural instability called aeroelastic divergence are covered.

5323. AERODYNAMICS OF WINGS AND BODIES II (3-0). Nonlinear phenomena in aerodynamics, including flow separation, vortex formation, vortex asymmetries, and vortex interactions with wings and bodies. Prerequisite: AE 5303 or equivalent.

5324. DYNAMIC DATA ANALYSIS (3-0). Uncertainty and error analysis, transducers, signal conditioning, analog and digital data acquisition techniques and systems, statistical analysis of random data in time, and frequency domains.

5325. ANALYSIS OF COMPOSITE STRUCTURES (3-0). Anisotropic elasticity and laminate theory with thermal-hydrothermal considerations. Plates and panels of composite materials; static and dynamic analysis. Joining of composite materials structures. Fabrication and curing processes for advanced composites. Advanced topics. (Also offered as EM 5336.) Prerequisite: consent of instructor.

5326. ADVANCED PROPULSION (3-0). Developing thrust and efficiency equations, thermodynamic cycle analysis, cycle design methods of aerospace propulsion systems, component performance analysis methods, component matching and dynamic interactions, and vehicle/propulsion-system interactions. \$15 computer fee.

5327. COMPUTATIONAL AERODYNAMICS I (3-0). Solution of engineering problems by finite-difference methods, emphasis on aerodynamic problems characterized by single linear and non-linear equations, introduction to and application of major algorithms used in solving aerodynamics problems by computational methods. Prerequisite: consent of instructor. \$15 computer fee.

5328. COMPUTATIONAL AERODYNAMICS II (3-0). Review of the fundamental equations of aerodynamics, development of methods for solving Euler, boundary-layer, Navier-Stokes, and parabolized Navier-Stokes equations, application to practical aerodynamic analysis and design problems. Prerequisite: AE 5327 or consent of instructor. \$15 computer fee.

5329. GRID GENERATION METHODS IN AERODYNAMICS (3-0). Generation of grids for numerical solution of aerodynamic analysis and design problems, generation of grids by algebraic methods, solution to differential and integral equations, application to aerodynamic flow field analysis. Prerequisite: graduate standing or consent of instructor.

5330. FLOW STABILITY AND TRANSITION TO TURBULENCE (3-0). Laminar flow stability predicted by the linear methods of small perturbation theory and integral techniques for arbitrary strength and form of disturbance so that transition-onset and development can be calculated. Matched asymptotic expansion techniques developed for singular perturbation problems. Prerequisite: approval of instructor.

5331. INTEGRAL EQUATIONS IN ENGINEERING (3-0). Analysis of non-linear systems in engineering using integral equations. Integration of ordinary and partial differential equations with applications to fluid systems. Prerequisite: graduate or advanced senior standing. \$15 computer fee.

5332. HYPERSONIC FLOW I (3-0). General features of hypersonic flow fields. Inviscid hypersonic flow: thin shock layer theory, Newtonian flow, constant density solutions, small disturbance theory, method of characteristics. Prerequisite: consent of instructor.

5333. HYPERSONIC FLOW II (3-0). Review of inviscid flow at high Mach number. Introduction to high-temperature gasdynamics. Viscous hypersonic flow: results from boundary layer theory, boundary layer transition, viscous interactions. Prerequisite: consent of instructor.

5334. LINEAR SYSTEM ANALYSIS FOR AEROSPACE ENGINEERING (3-0). Linear multivariable systems theory applied to aerospace vehicle trajectories; state transition matrix, controllability, observability, and stability; least squares optimization and properties of the Riccati equation.

5335. ATMOSPHERIC AND SPACE FLIGHT CONTROL THEORY I (3-0). Classical control theory applied to atmospheric and spaceflight control; stability analysis by Bode and Root locus methods; Laplace transform analysis of aerospace vehicle longitudinal and lateral-directional stability and response; design considerations. Prerequisite: AE 5334 or permission of instructor.

5336. ATMOSPHERIC AND SPACE FLIGHT CONTROL THEORY II (3-0). Modern control theory applied to atmospheric and spaceflight control; state space methods; aerospace vehicle digital control

AEROSPACE ENGINEERING

systems; non-linear control theory; software development for atmospheric and spaceflight control. Prerequisite: AE 5335.

5337. GUIDANCE OF AEROSPACE VEHICLES (3-0). Equilibrium glide trajectories for atmospheric flight; energy guidance methods; two point boundary value methods used in terminal landing of aerospace vehicle; optimization techniques; aerospace guidance sensitivity analysis; spacecraft attitude determination; coordinate systems. Prerequisite: AE 5302 or 5311 or permission of instructor.

5338. AEROSPACE NAVIGATION ANALYSIS (3-0). Aircraft trajectory and spacecraft orbit determination; aerospace navigation system modeling; sequential and batch processors; linear and minimum variance estimates; discrete and continuous Kalman filters; filter divergence. Prerequisites: AE 5302 or 5311, and AE 6320 or permission of instructor. \$10 computer fee.

5339. SPACECRAFT SYSTEMS DESIGN AND ENGINEERING (3-0). Spacecraft design methods and system engineering; atmospheric and vacuum environments; flight mechanics and propulsion; attitude determination and control; configuration and structural design; thermal control; power subsystems; telecommunications; mass, power, and volume estimates.

5340. EXPERIMENTAL METHODS IN TURBULENCE I (2-3). May be repeated for credit. Techniques to be presented include hot-wire and hot-film anemometers, laser-Doppler and laser-interferometer, hot-thermister, high response pressure sensors, and fluid tracers. Student will participate actively in the selection, design, and execution of flow experiments. Prerequisite: approval of instructor. \$15 lab fee.

5342. GASDYNAMICS (3-0). Review of fundamental compressible flow theory, method of characteristics for perfect gases, the Rankine-Hugoniot conditions, linearized flow theory. Also offered as ME 5342. \$10 computer fee.

5343. HIGH-TEMPERATURE GASDYNAMICS I (3-0). Surveys kinetic theory, statistical mechanics, and chemical reaction rate theory. Application to the prediction of thermodynamic properties of gases and the analysis of problems in high-temperature gasdynamics. \$10 computer fee.

5344. HIGH-TEMPERATURE GASDYNAMICS II (3-0). Non-equilibrium kinetic theory, Boltzmann equation, development of Navier-Stokes and energy equations for non-equilibrium flow, thermal and chemical non-equilibrium flows. Prerequisite: consent of instructor. \$10 computer fee.

5345. RADIATIVE GASDYNAMICS (3-0). Energy transfer by radiation, radiative transfer equation, radiative equilibrium, emission, and absorption of radiation, flow with radiative non-equilibrium. \$10 computer fee.

5346. MOLECULAR GASDYNAMICS (3-0). Non-equilibrium kinetic theory, Boltzmann equation, collision dynamics, gas-surface interactions. Monte Carlo methods, chemical and thermal non-equilibrium, applications to flight at extreme altitude. \$10 computer fee.

5347. EXPERIMENTAL METHODS IN HYPERSONIC AERODYNAMICS (3-0). Requirements and operational characteristics of hypersonic test facilities. Experimental methods for pressure, temperature, velocity, force, and heat transfer measurements. Optical diagnostics. Data acquisition methods.

5348. HYPERSONIC PROPULSION (3-0). Design and performance analysis of propulsion systems for sustained flight at hypersonic speeds, airframe/propulsion system integration, supersonic combustion, finite-rate chemistry effects, radiative cooling. \$10 computer fee.

5350. HIGH TEMPERATURE COMPOSITES (3-0). Constitutive behavior of high temperature composites, manufacturing, current limitations and advances, thermal fatigue, long term stiffness and strength, damage tolerance and durability. \$10 computer fee.

5353. COMPRESSIBLE TURBULENT BOUNDARY LAYERS (3-0). Introduction to the effects of compressibility on turbulent boundary layers, emphasizing phenomenological aspects. Treatment of engineering problems, compressibility transformations, turbulence modeling, shock/boundary-layer interactions. Contemporary viewpoints and advanced topics. Prerequisite: AE 3303.

5355. DESIGN OF HYPERSONIC VEHICLE STRUCTURES (3-0). Structural design of hypersonic flight vehicles, thermal gradients, active cooling, case studies. \$10 computer fee.

5191, 5291, 5391. ADVANCED STUDIES IN AEROSPACE ENGINEERING. May be repeated for credit. May be graded P/F. Graded R.

5398, 5698, 5998. THESIS. 5398 graded R/F only; 5698 and 5998 graded P/F/R. Prerequisite: graduate standing in aerospace engineering. Co-requisite: AE 5101.

6313. AEROSPACE AVIONIC SYSTEM DESIGN (3-0). Design of guidance, navigation, and control system of spacecraft and aircraft. Selection and tradeoff between various avionic components such as the

IMU, sun sensor, horizon sensor, star tracker, GPS navigation sensor, terrain navigation sensor, flight computer and other avionic components. Mass, power, and volume estimates and tradeoffs between avionic system and other vehicle systems.

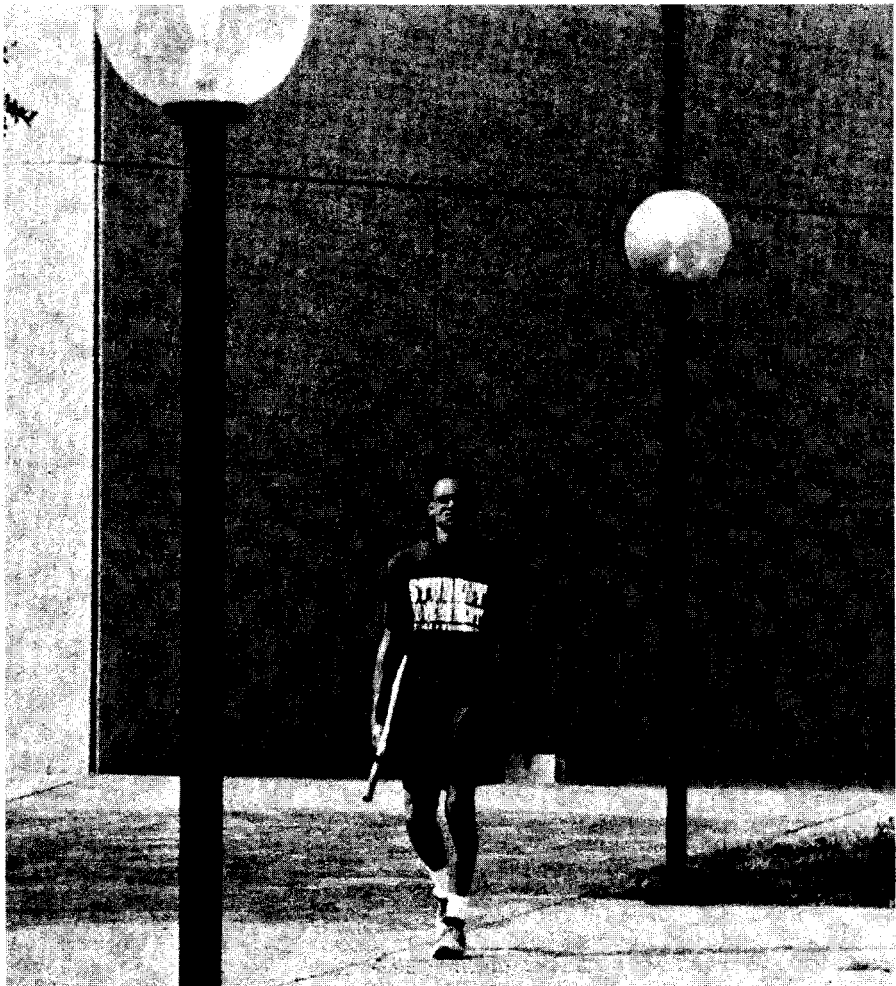
6314. SPACECRAFT MISSION DESIGN AND ANALYSIS (3-0). Spacecraft mission design and constraints; launch windows; rendezvous analysis; design of typical mission. \$10 computer fee.

6315. THEORETICAL ASTRONAUTICS (3-0). The equations of motion of the restricted problem of three bodies; Jacobian integral; motion around Lagrange points; applications to Earth-Moon systems; investigations into spacecraft station keeping at Lagrange points. Prerequisite: AE 5311.

6322. AEROELASTICITY II (3-0). Models for the unsteady aerodynamics as well as structural stiffness and mass of aircraft wings are presented and combined into a dynamic aeroelastic math model. Atmospheric turbulence response, ride quality, wing buffeting, and flutter (dynamic aeroelastic instability) are covered.

6197-6997. RESEARCH IN AEROSPACE ENGINEERING. May be repeated for credit. Graded P/F/R. Co-requisite: AE 5101.

6399, 6699, 6999. DISSERTATION. Prerequisite: admission to candidacy for the Doctor of Philosophy degree. 6399 and 6699 graded R/F only; 6999 graded P/F/R. Co-requisite: AE 5101.



ARCHITECTURE

Program in ARCHITECTURE

Area of Study
Architecture

Degree
M. Arch.

Master's Degree Plans: Thesis, Thesis Substitute
(Design Thesis), and Non-Thesis (Advanced Studio)

Dean, School of Architecture and

Director of Architecture: Edward M. Baum 203 ED Architecture 273-2801

Graduate Advisor: Todd Hamilton 203 EA Architecture 273-2801

Graduate Faculty:

Professors Antoniadis, Baum, Duncan, Ferrier, Henry, McDermott, Mehta,
Price

Associate Professors Gintole, Guy, Hamilton, Maruszczak, Pinno, C. Wright,
Yardley

Assistant Professor Youssefzadeh

Dean Emeritus G. Wright

OBJECTIVE

The purpose of the Master of Architecture degree program is to educate toward ultimate leadership positions within the profession of architecture.

The program emphasizes architectural design strongly informed by history, theory, and technology. It provides an intensive core of courses for those entering the field followed by a flexible series of options for advanced students.

ACCREDITATION

The Master of Architecture degree is a professional degree accredited by the National Architectural Accrediting Board.

DEGREE REQUIREMENTS

The applicant must meet the general requirements of the Graduate School. A personal interview is recommended, and letters of reference are required. Applicants to the professional degree programs Paths B and C must submit a portfolio of work for evaluation by the School.

Undergraduate students must have approval of the Graduate Advisor prior to enrollment in graduate courses. All graduate students in architecture are required to consult the Graduate Advisor for course and schedule approval each semester prior to registration.

Professional Degree Program: Path A

For applicants who hold a degree but do not meet the minimum requirements of a Bachelor of Science in Architecture.

A minimum of 104 credit hours in architectural design, theory, and practice is required of Path A candidates for the professional degree in architecture (M.Arch). Due to the rigor of the program (not unlike any other professional school—law or medicine), students entering this program are advised to discontinue outside employment.

Advancement in Professional Degree Program Path A is predicated upon successful and timely completion of required coursework as well as an annual review of the student's portfolio of design work by the Graduate Studies Committee of the Architecture Program.

In addition to completing an introductory curriculum beginning in the summer of the first semester of enrollment, students must also complete the Path B core curriculum of 39 credit hours. The core curriculum of this course of study is ARCH 5325, 5326, 5329, 5331, 5333, and 24 hours of advanced studio. Students approved by the Committee on Graduate Studies to substitute a design thesis for the last semester of the required studio sequence must also take ARCH 5363 prior to enrollment in ARCH 5693.

Electives must include at least one course from each of the following categories of courses offered by the school: (a) history and theory (b) technology and practice, and (c) allied disciplines (landscape architecture, urban design, housing, and interior design).

Suggested Course Sequence: Path A

First Year

Summer Semester

5591 Design Studio I
5301 Principles of Architecture
5342 Architectural Graphics I

Fall Semester

5592 Design Studio II
5323 Construction I
5343 Architectural Graphics II
5303 History of Architecture I

Spring Semester

5593 Design Studio III
5324 Architectural Structures I
5304 History of Architecture II
Elective 3 hours

Second Year

Summer Semester

5594 Design Studio IV
5329 Architectural Computer Graphics

Fall Semester

Advanced Studio 6 hours
5327 Architectural Structures II
5325 Environmental Controls I
Elective 3 hours

Spring Semester

Advanced Studio 6 hours
5328 Architectural Structures III
5326 Environmental Controls II
Elective 3 hours

Third Year

Fall Semester

Advanced Studio 6 hours
5331 Professional Practice
5363 Design Research
(for design thesis option)
5333 Construction II
Elective 3 hours
(Thesis or advanced studio options)

Spring Semester

Advanced Studio 6 hours
or
5693 Design Thesis
or
5698 Thesis
Electives 6 hours

Professional Degree Program: Path B

For applicants who hold a Bachelor of Science in Architecture degree or the equivalent from an accredited college or university.

A minimum of 54 credit hours is required for the thesis option or 57 for the design thesis and advanced studio options.

The core curriculum for this course of study is ARCH 5325, 5326, 5329, 5331, 5333, 18 hours of advanced studio, and 5693 or 5698 or advanced studio. Students in design thesis option must take ARCH 5363 prior to enrollment in ARCH 5693.

ARCHITECTURE

Electives must include at least one course from each of the following categories of courses offered by the School of Architecture: (a) history and theory (b) technology and practice and (c) allied disciplines (landscape architecture, urban design, housing, and interior design).

Suggested Course Sequence: Path B

First Year

Fall Semester

Advanced Studio 6 hours
5325 Environmental Controls I
5333 Construction II
Elective: 3 hours

Spring Semester

Advanced Studio 6 hours
5326 Environmental Controls II
5329 Architectural Computer Graphics
Elective: 3 hours

Second Year

Fall Semester

Advanced Studio 6 hours
5331 Professional Practice
5363 Design Research (for design thesis option)
Elective: 3 hours
6 hours (advanced studio option)

Spring Semester

5698 Thesis
or
5693 Design Thesis
or
Advanced Studio 6 hours
Electives: 6 hours

Post-Professional Degree Program: Path C

For applicants who hold a five-year professional degree in architecture (BArch) or a four-year degree in architecture and acceptable professional experience including registration.

Thirty credit hours are required of students in Path C with thesis while 33 hours will be required of students with design thesis or advanced studio options.

A minimum of 18 hours is required in architectural program courses including six hours of history/theory as well as thesis, design thesis, or advanced studio. Students are also required to take an advanced studio which may be waived by student request if design proficiency or equivalent experience has been demonstrated. The remainder of the work will be arranged with and approved by the Graduate Advisor to suit the interests of the student. Courses of study provide for an area of specialization or for advanced general studies.

Suggested Course Sequence: Path C

Fall Semester

History/Theory: 3 hours
Advanced Studio: 6 hours
5363 Design Research (for design thesis option)
Elective: 3 hours

Spring Semester

History/Theory: 3 hours
Advanced Studio 6 hours
or
5693 Design Thesis
or
5698 Thesis
Electives: 9 hours (for design thesis or Advanced studio options)
6 hours (for thesis option)

JOINT M.C.R.P. AND M.ARCH. DEGREE PROGRAM

Students in the joint program can earn both the Master of City and Regional Planning and the Master of Architecture degrees in a curriculum of 87 semester credit hours. Applicants must meet the admission requirements of both the MCRP and the M.Arch programs. City and Regional Planning students wishing to earn the MArch degree will be required to take Path A (see above) unless they have earned an undergraduate degree in architecture which will allow CIRP applicants to take Path B. Programs of study will follow both master's programs, with all of the 15 credit hours of electives in the MArch program to be taken in the MCRP program. In addition to the 36 credit hours of architectural core courses, the remainder of coursework will be in the City and Regional Planning program with a required thesis proposal and program of work to be jointly approved by the City and Regional Planning Division and the

Architecture Program. A thesis supervisor should be selected from CIRP or the School of Architecture, and committee members could be selected from both faculties.

Course selection and programs of study should be designed with the assistance of the Graduate Advisors in both areas. Only in special instances may students select the thesis substitute plan of the MCRP program. The successful candidate will be awarded both degrees rather than one joint degree.

The grade of R (research in progress) is a permanent grade. An incomplete (the grade of X) cannot be given in a course which is graded R. To receive credit for an R-graded course the student must continue to enroll in the course until a passing grade is received. Three-hour thesis and three- and six-hour dissertation courses are graded R/F only. The grade of P (required for graduation) can be received in six- or nine-hour thesis courses and nine-hour dissertation courses only. In the course listings below, R-graded courses are designated either "Graded P/F/R" or "Graded R." (See also the section entitled "R" GRADE in this catalog.)

ARCHITECTURE (ARCH)

- 5301. PRINCIPLES OF ARCHITECTURE (3-0).** A survey study of the interrelationships between society, culture and architecture. Concurrent enrollment in ARCH 5591 and 5342 required.
- 5302. LYRICISM IN ARCHITECTURE (3-0).** Concepts and models of architecture that express a philosophy concerning feelings, intuition, and creative spontaneity, emphasizing flowing rhythms and nature-inspired forms.
- 5303. HISTORY OF ARCHITECTURE I (3-0).** History of architecture from pre-history through the Middle Ages. Prerequisite: permission of instructor.
- 5304. HISTORY OF ARCHITECTURE II (3-0).** History of Architecture from the Renaissance to the present. Prerequisites: ARCH 5303 and permission of instructor.
- 5305. THE CITY OF ROME (3-0).** History, topography, and monuments of Rome and its environs from its legendary founding in 753 B.C. until the 20th Century, with special emphasis on imperial and papal Rome.
- 5306. URBAN DESIGN (3-0).** Urban design theory, method, and implementation using contemporary and historic examples.
- 5307. THEORY OF CITY PLANNING (3-0).** The physical aspects of city planning as it relates to the social, economic, and political aspects of planning as a discipline.
- 5308. HISTORY OF URBAN FORM (3-0).** History of urban form, considered as the product of political, economic and social forces. Prerequisite: permission of instructor.
- 5309. THE CITY OF LONDON (3-0).** History, topography, and monuments of Greater London from before the Roman colonization until the 20th Century, emphasizing London's growth into a world capital since the Great Fire of 1666.
- 5310. AMERICAN ARCHITECTURE TO 1917 (3-0).** Detailed consideration of the architecture of the United States from the 17th Century until World War I, with special attention to the great and little masters of the field. Prerequisites: ARCH 2303 and 2304.
- 5311. ARCHITECTURAL THEORY (3-0).** A review and analysis of the concepts, philosophy, ideology, and models that promulgated 20th Century architectural design. May be repeated for credit as topics change. Prerequisite: permission of instructor.
- 5312. POETICS OF ARCHITECTURE (3-0).** The poetic dimension in architecture, as presented through readings, analyses, and projects.
- 5313. HISTORIC RESTORATION AND ADAPTIVE RE-USE (3-0).** Investigation of methods and procedures used in restoration of buildings, including building diagnostics, re-fabrication of architectural details, cleaning and waterproofing, structural investigation and reinforcement; examination of office procedures and practice, production of measured drawings, photogrammetry, code investigation, working drawing techniques and problems of aesthetic integrity/design retrofit.
- 5314. HISTORIC PRESERVATION (3-0).** Concepts of historic preservation as expressed in legislation, institutions and actual projects. Lectures and case studies designed to familiarize the student with methods of architectural and bibliographic research, preservation legislation, historic certification procedures, economic strategies, and current problems in adaptive use of historic landmarks.

ARCHITECTURE

- 5315. TOPICS IN ARCHITECTURAL HISTORY (3-0).** Courses to explore and present selected topics in architecture and related fields of the Ancient Mediterranean, the Classical World, the Middle Ages, the 19th Century, and the Non-Western Traditions. May be repeated for credit as topics change. Prerequisite: permission of instructor.
- 5316. MODERN ARCHITECTURE I: 1890 TO 1945 (3-0).** Origins and development of Modern Architecture in Europe from 1890 to World War II, and its further evolution in Europe and America from 1918 to 1945. Prerequisites: ARCH 2303 and 2304.
- 5317. MODERN ARCHITECTURE II: 1945 TO PRESENT (3-0).** Architectural developments in Europe, Asia, and America since World War II. Prerequisites: ARCH 2303 and 2304.
- 5318. RENAISSANCE ARCHITECTURE (3-0).** Detailed consideration of Renaissance and Mannerist architecture in Europe of the 15th and 16th centuries. Prerequisite: ARCH 2304 or equivalent.
- 5319. HOUSING DESIGN (3-0).** Evolution of housing from the end of the 19th Century to the present with particular emphasis on contemporary design methods, techniques and solutions.
- 5320. BAROQUE ARCHITECTURE (3-0).** Detailed consideration of Baroque architecture in Europe from 1600 until about 1750. Prerequisite: ARCH 2304 or equivalent.
- 5321. ADVANCED COMPUTER APPLICATIONS (3-0).** The study and application of specialized computer programs in environmental design. Prerequisites: ARCH 4329 or 5329 or the equivalent, and permission of the instructor. \$15 computer fee.
- 5323. CONSTRUCTION I (3-0).** Construction materials and structural concepts as used in buildings. Prerequisite: permission of instructor.
- 5324. ARCHITECTURAL STRUCTURES I (3-0).** Statics, strength of materials and simple structural systems in buildings. Prerequisite: permission of instructor.
- 5325. ENVIRONMENTAL CONTROL SYSTEMS (3-0).** Illumination, acoustics, climate controls, mechanical and electrical systems, and their significance in the total design.
- 5326. ENVIRONMENTAL CONTROL SYSTEMS (3-0).** Continuation of ARCH 5325.
- 5327. ARCHITECTURAL STRUCTURES II (3-0).** Continuation of ARCH 5324 with emphasis on structural theory and systems in wood and steel. Prerequisite: ARCH 5324.
- 5328. ARCHITECTURAL STRUCTURES III (3-0).** Continuation of ARCH 5327 with emphasis on structural theory and systems in masonry and reinforced concrete. Prerequisite: ARCH 5327.
- 5329. ARCHITECTURAL COMPUTER GRAPHICS (3-0).** Computer aided design, drafting and graphic techniques as applied to architecture. Prerequisite: permission of the instructor. \$15 computer fee. \$10 lab fee.
- 5330. COMPARATIVE STRUCTURES (3-0).** Comparative analysis and design of structural systems and construction techniques, including architectural and economic determinants.
- 5331. PROFESSIONAL PRACTICE (3-0).** Survey of the administrative functions, and the ethical and legal responsibilities of the architect. \$5 computer fee.
- 5332. ENERGY USE AND CONSERVATION IN ARCHITECTURE (3-0).** Concepts of the efficient use and conservation of energy and their embodiment in the built environment. Prerequisite: permission of the instructor.
- 5333. CONSTRUCTION II (3-0).** Advanced construction assemblies and methods, including the principles of cost control. Prerequisites: ARCH 5323 and 5328.
- 5335. ADVANCED PROFESSIONAL PRACTICE II: MARKETING DESIGN SERVICES (3-0).** A study of the strategies and methods for marketing professional services. Presented as case studies of architecture, interior design, and landscape architecture firms.
- 5336. ADVANCED PROFESSIONAL PRACTICE III: PROJECT MANAGEMENT OF LARGE BUILDINGS (3-0).** A study of how large buildings are realized through architectural offices, from preliminary design through construction.
- 5337. SOILS AND FOUNDATIONS (3-0).** Soil classifications, field and laboratory identification, physical properties and load-bearing characteristics, retaining walls and foundations.
- 5338. MASONRY STRUCTURES AND CONSTRUCTION (3-0).** Materials, construction, and structural aspects of loadbearing masonry. Masonry in non-loadbearing and veneer applications.
- 5342. ARCHITECTURAL GRAPHICS I (2-4).** Architectural drawing, perception, projections, and three dimensional representation. Concurrent enrollment in ARCH 5591 is required.

- 5343. ARCHITECTURAL GRAPHICS II (2-4).** A continuation of ARCH 5342 with emphasis on more advanced techniques: composition, tone, shades and shadows, and color. \$2 lab fee.
- 5344. CONCEPTUAL DRAWING (3-0).** Seminar to explore aspects of conceptual drawing for the architect and the relationship of design ideas in the drawing process.
- 5348. PRINCIPLES OF ARCHITECTURAL PHOTOGRAPHY (2-4).** The use of photography as an investigative and presentation medium in architecture. Emphasis on composition in black and white technique. \$16 lab fee.
- 5349. ADVANCED ARCHITECTURAL PHOTOGRAPHY (2-4).** Advanced techniques in photography, including use of the view camera and lighting techniques, and their use in photographing architecture and architectural models. \$16 lab fee.
- 5350. VESSELS (3-0).** The design of objects for the post-Industrial Age, including vehicles, furniture, jewelry, household objects, and clothing.
- 5351. WILDERNESS: A CONDITION OF MIND (3-0).** Changing conceptions of wilderness in Western thought, from ancestral prejudices to recent, revolutionary appreciation. Literary and visual documentation.
- 5352. PAINTERS AS ARCHITECTS (3-0).** A study of artists' rendering of architectural forms and urban spaces in the pictorial arts. Examples of fictive architecture from several cultures are explored chronologically.
- 5363. DESIGN RESEARCH (3-0).** Seminar directed toward the understanding of research methods and the programming of an independent design project, leading to the thesis substitute. Graded R.
- 5591. DESIGN STUDIO I (3-9).** An intensive studio course in architectonic theory and operations. Emphasis on analytic, conceptual, and manipulation procedures. \$13 lab fee.
- 5592. DESIGN STUDIO II (3-9).** Continuation of ARCH 5591. Studio course emphasizing the interrelationship of formal/spatial ideas, use, and the building fabric. Prerequisite: ARCH 5591. \$13 lab fee.
- 5593. DESIGN STUDIO III (3-9).** Continuation of ARCH 5592. Studio course emphasizing the interrelationship of formal/spatial ideas, use, and the building fabric with special attention to the urban context. Prerequisite: ARCH 5592. \$13 lab fee.
- 5594. DESIGN STUDIO IV (3-9).** Continuation of ARCH 5593. Emphasis on complex building designs in urban environments. Off campus study may be substituted. \$13 lab fee.
- 5670. ADVANCED DESIGN STUDIO: URBAN DESIGN (3-9).** Studio course emphasizing the analysis and design of building aggregations within the urban context. May be repeated for credit. \$13 lab fee.
- 5671. ADVANCED DESIGN STUDIO: ARCHITECTURAL PROJECTS (3-9).** Studio course in the generation and subsequent development of architectural ideas in buildings. May be repeated for credit. \$13 lab fee.
- 5672. ADVANCED DESIGN STUDIO: SPECIAL PROJECTS (3-9).** Studio course in the generation and subsequent development of architectural ideas in selected building types. May be repeated for credit. \$13 lab fee.
- 5693. DESIGN THESIS.** Individual study project conducted by a supervising committee, with program and statement of intent to be filed with the Graduate Advisor during the previous semester. Graded R. Prerequisite: ARCH 5363.
- 5381, 5681. PRACTICUM (0-16).** Internship program including work done through an approved architect's office, designed to give practical experience leading to a broader knowledge of the profession. Placement in offices must be approved, and in some cases may also be arranged by the school. Students may enroll in 5381 for half-time employment or 5681 for full-time employment. Students enrolled in Practicum may also participate in the Intern Development Program of the American Institute of Architects. No more than six total credit hours in Practicum are allowed for degree. Graded P/F/R.
- 5191, 5291, 5391. CONFERENCE COURSE.** Special subjects and issues as arranged with individual students and faculty members. May be repeated for credit. Graded P/F/R.
- 5195-5695. TOPICS IN ARCHITECTURE.** Studio, lecture or seminar courses to explore and present special topics in architecture and environmental design. May be repeated for credit as topics change.
- 5698. THESIS.** Independent research and presentation of findings under direction of a supervising committee. May be repeated, but only six hours may be counted toward degree. Graded P/F/R.

Department of ART

Area of Study

Humanities (See Interdepartmental
and Intercampus Programs.)

Degrees

M.A., Ph.D.

Chair: Kenda North

335 Fine Arts 273-2891

Graduate Faculty:

Associate Professors Spurlock, Wright

OBJECTIVE

The graduate course offerings in art are provided to support other graduate degree programs, for example, an art history concentration in Humanities, and to meet the express needs of students. No program leading to a graduate degree in art exists at this time.

The grade of R (research in progress) is a permanent grade. An incomplete (the grade of X) cannot be given in a course which is graded R. To receive credit for an R-graded course the student must continue to enroll in the course until a passing grade is received. Three-hour thesis and three- and six-hour dissertation courses are graded R/F only. The grade of P (required for graduation) can be received in six- or nine-hour thesis courses and nine-hour dissertation courses only. In the course listings below, R-graded courses are designated either "Graded P/F/R" or "Graded R." (See also the section entitled "R" GRADE in this catalog.)

ART (ART)

5320. HISTORY OF ART CRITICISM (3-0). Survey of the sources of art history and its literature from classical antiquity to the modern period.

5391. INDEPENDENT STUDY (3-0). Independent research projects in art. Must be stated in writing and approved by supervising faculty and Graduate Advisor prior to registration. May be repeated for credit. Graded P/F/R.

6330. SEMINAR IN SPECIAL TOPICS IN ART HISTORY AND CRITICISM. May be repeated for credit as the topic changes.

6391. READINGS IN ART HISTORY (3-0). Methodological approaches to the history of art from the 18th Century to the present day. May be repeated for credit.

Department of BIOLOGY

<i>Areas of Study</i>	<i>Degree</i>
Biology	M.S.
Quantitative Biology	Ph.D.
Mathematical Sciences (See Interdepartmental and Intercampus Programs.)	Ph.D.

Master's Degree Plans: Thesis and Non-Thesis

<i>Acting Chair:</i> Neal Smatresk	337 Life Science	273-2871
<i>Graduate Advisor:</i> John Bacon	B17A Life Science	273-2400
<i>Graduate Faculty:</i>		

Professors Arnott, Bacon, Bragg, Brodie, Campbell, Hellier, McCrady, McDonald, McMahon, Robinson, Smatresk, Stewart, Whitmore
Associate Professors Chrzanowski, Formanowicz, Neill, Sterner
Assistant Professors Phillips, Smits
Professor Emeritus Pyburn

OBJECTIVE

The program leading to the degree of Master of Science in biology is designated to provide graduate education which will prepare students to pursue vocations in industry, government, and teaching, and to pursue further graduate education leading to the doctorate. The doctoral program is designed to train students to apply sophisticated quantitative techniques to solving basic and applied problems in biology. Students in this program will attain substantially greater quantitative skills than in traditional doctoral programs in the biological sciences, providing them with a competitive advantage in business, industry, government, and academia.

ADMISSION

Master of Science

In addition to the general regulations and admission requirements stated elsewhere in this catalog, the student must present to the department a satisfactory score on the Graduate Record Examination. International students whose native language is not English must present a minimum TOEFL score of 575.

Animal Behavior Option: Study in the area of animal behavior is offered jointly by biology and psychology graduate programs.

Doctor of Philosophy

In addition to the general regulations and admission requirements stated elsewhere in this catalog, the student must present to the department a combined score of 1200 on the quantitative and analytical sections of the Graduate Record Exam.

DEGREE REQUIREMENTS

Master of Science

Supporting work outside the student's major area may be taken in botany, chemistry, geology, mathematics, microbiology, physics, and zoology. Approved courses in civil engineering, philosophy, psychology, and sociology may also be taken in support of the student's program. Subject to written

BIOLOGY

approval by the Graduate Advisor and within the limitations stated in the General Graduate School Regulations, a student may take up to nine hours of coursework from among courses listed under Biology at the 3000 or 4000 levels.

The non-thesis plan is designed to meet the needs of practicing teachers or those intending to enter the teaching profession. Students enrolled in the non-thesis option are required to take 24 hours of formal coursework in biology plus two hours of 5101, and 5391. Students enrolled in the thesis-plan program are required to take 18 hours of formal coursework, two hours of 5101, 5698, and sufficient additional hours to complete degree requirements.

Doctor of Philosophy

The degree of Doctor of Philosophy in Quantitative Biology requires distinguished attainment both in scholarship and in research. In addition to meeting the minimum requirements of a planned course of study, the ultimate basis for conferring the degree must be the demonstrated ability to do independent and creative work and the exhibition of a profound grasp of the subject matter within the field.

Mathematics: Students will be expected to have (or complete during their first year of residence) a strong quantitative background including formal courses in differential and integral calculus, differential equations (or equivalent skills), and computer programming.

Foreign Language: Students will be required to demonstrate proficiency in one foreign language or in computer skills above that required for entry into the program.

Course Requirements: A total of 60 hours of coursework will normally be taken including 18 hours of required courses, 12 hours of electives, and 30 hours of seminar and research courses. All students in the program are required to take BIOL 5314 (Biometry), BIOL 5361 (Advanced Biometry), and BIOL 5362 (Experimental Design and Analysis). Students must take nine hours from among the following courses in quantitative biology: BIOL 5306 (Bioenergetics), BIOL 5316 (Advanced Evolutionary Biology), BIOL 5363 (Quantitative Ultrastructure), BIOL 5366 (Theoretical Ecology), BIOL 5363 (Quantitative Approaches to Physiology), BIOL 5367 (Theoretical Systematics), or BIOL 5364 (Population Genetics). Twelve hours of electives may be selected by the student under supervision of his/her dissertation committee from among courses listed below in the department's course offerings that are designated by an asterisk (*) at the end of the course description. Finally, 30 hours of seminars and research, including 18 hours of dissertation (BIOL 6399, 6699, or 6999), are required from among the following courses: BIOL 5101, 5200, 5291, 5391, 5193-5693, 5398, 5698, or 5998, or BIOL 6191, 6291, 6391, 6491, 6591, or 6691 (can be repeated for credit).

The grade of R (research in progress) is a permanent grade. An incomplete (the grade of X) cannot be given in a course which is graded R. To receive credit for an R-graded course the student must continue to enroll in the course until a passing grade is received. Three-hour thesis and three- and six-hour dissertation courses are graded R/F only. The grade of P (required for graduation) can be received in six- or nine-hour thesis courses and nine-hour dissertation courses only. In the course listings below, R-graded courses are designated either "Graded P/F/R" or "Graded R." (See also the section entitled "R" GRADE in this catalog.)

BIOLOGY (BIOL)

5101. SPECIAL TOPICS IN BIOLOGY (1-0). Seminar on significant biological research. May be repeated for credit. Prerequisite: consent of faculty.*

5302. MICROBIAL GENETICS (3-0). Consideration of the nature, expression, and regulation of the genetic processes in micro-organisms. Prerequisites: BIOL 2451 and 3315 or consent of instructor.*

5306. BIOENERGETICS (3-0). The use of quantitative analysis of energy resource partitioning to study the evolution of adaptational strategy at the cellular, individual and population levels, including quantitative analysis of physiological processes and life history adaptations in terms of energetic efficiency. Prerequisite: consent of instructor.

5309. HISTORY OF BIOLOGY (3-0). Trends of thought in the biological sciences with emphasis on notable contributors. Philosophical systems dealing with biological concepts in western civilization are stressed. Prerequisite: consent of instructor.

- 5310. SELECTED TOPICS IN BIOLOGY (3-0).** Topics may vary depending on the needs and interests of the students. May be repeated for credit. Prerequisite: consent of the student's thesis committee and the current course instructor.*
- 5311. EVOLUTION (3-0).** Study of the origin of living systems and the mechanism of their evolution. Prerequisite: BIOL 3315 or equivalent.*
- 5314. BIOMETRY (3-0).** An examination of statistical methods and procedures in relation to the design of biological experiments and the analysis of their results. Prerequisite: consent of instructor.
- 5315. COMMUNITY ECOLOGY (3-0).** An investigation of the effects of interspecific interactions on the distribution and abundance of organisms. Prerequisite: consent of the instructor.*
- 5320. BIOGEOGRAPHY (3-0).** The role of natural and artificial transport, population pressure and limiting agencies are examined in the light of the patterns of distribution of living organisms. Prerequisite: consent of instructor.*
- 5335. ANIMAL BEHAVIOR (3-0).** Phylogenetic approach to some basic problems in behavior, with special emphasis on unlearned behavior. Same as PSYC 5335.*
- 5339. PHYSIOLOGICAL ECOLOGY (3-0).** Survey of the physiological adaptations of animals to their environments. Emphasizes physiological variation and acclimation and the evolution of physiological processes. Prerequisite: consent of instructor.*
- 5342. ICHTHYOLOGY (2-3).** Classification, anatomy, physiology and natural history of fishes. Prerequisite: consent of instructor. \$10 lab fee.*
- 5343. HERPETOLOGY (2-3).** Systematics, speciation and adaptive mechanisms of reptiles and amphibians. Prerequisite: consent of instructor. \$10 lab fee.*
- 5345. ORNITHOLOGY (2-3).** Anatomy, physiology, identification, population dynamics and ethology of birds. Laboratory includes field identification, preparation of specimens, and field study techniques. A weekend field trip is required. Prerequisite: consent of instructor. \$20 lab fee.*
- 5353. SCANNING ELECTRON MICROSCOPY (1-4).** Principles and operation of the Scanning Electron Microscope (SEM). Training in the use of the JEOL JSM SEM. Specimen preparation for SEM included in the lectures and laboratory. Open to non-biologists. Prerequisite: consent of instructor. \$25 lab fee. \$30 microscope fee.*
- 5355. AQUATIC BIOLOGY (2-3).** Ecological relationships in aquatic ecosystems with emphasis on those of freshwater; laboratory concerned with the pond, stream, and reservoir habitats of the Southwest. Prerequisite: BIOL 4347 or consent of instructor. \$30 lab fee. \$15 microscope fee.*
- 5361. ADVANCED BIOMETRY (3-0).** Introduction to various computerized statistical application packages. Topics include multiple regression analysis, path analysis, partial correlation, residual analysis, and various techniques useful for data analysis. Prerequisite: BIOL 5314 or consent of instructor.
- 5362. EXPERIMENTAL DESIGN (3-0).** Various analysis of variance models will be explored including hierarchic models, multiway factorial models, Latin square designs, split plots designs, and incomplete block designs. Nonparametric methodologies and analysis of covariance techniques will also be presented. Prerequisite: BIOL 5314 or consent of the instructor.
- 5363. QUANTITATIVE APPROACHES TO PHYSIOLOGY (2-3).** Advanced methodologies for the analysis of physiological systems. Quantitative aspects of transport, respiration, electrophysiology, and cardiovascular physiology. Laboratory will emphasize practical measurement methodologies and principles of physiological measurement and instrumentation. Prerequisite: consent of instructor. \$30 lab fee.
- 5364. POPULATION GENETICS (3-0).** The genetics of evolution with emphasis on measuring, predicting, and modeling genetic change in populations.
- 5365. QUANTITATIVE ULTRASTRUCTURE (2-3).** Surveys quantitative methods used in biological ultrastructural analysis. Stresses techniques of stereology (morphometry) electron microscopic autoradiography and energy dispersive X-ray analysis as they are applied to biological systems. Prerequisite: consent of the instructor. \$25 lab fee. \$30 microscope fee.
- 5366. THEORETICAL ECOLOGY (3-0).** Theoretical constructs of modern ecology will be discussed. These will include stability patterns in natural systems, equilibrium versus non-equilibrium models of nature, plant-herbivore systems, competition, and niche theory. Prerequisite: consent of the instructor.
- 5367. THEORETICAL SYSTEMATICS (3-0).** Various approaches to the classification of organisms, including cladistics, evolutionary systematics, and numerical taxonomy. Current methodologies will be provided. Prerequisite: BIOL 5324 and consent of the instructor.

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5390. EXPERIMENTAL METHODS IN BIOLOGY (2-3). Theory and practice of commonly used techniques in biological research. Content may be routinely changed to provide a wider scope of methods than can be offered in one semester. \$10 lab fee.

5291, 5391. INDIVIDUAL PROBLEMS IN BIOLOGY. Individual research projects supervised by a staff member. Prerequisite: consent of staff.

5442. VERTEBRATE PHYSIOLOGY (3-3). Environmental approach to the study of physiological regulation, including consideration of energy metabolism, responses to temperature, water and solute metabolisms, oxygen transport, and acid-base regulation. Topics discussed in relation to current literature. Each student will select a small research project to be completed under supervision of instructor. Prerequisite: consent of instructor. \$30 lab fee. \$10 microscope fee.*

5449. PARASITOLOGY (3-3). Lecture deals with ecology of parasites, morphologic and physiologic adaptations to parasitic way of life, host adaptations to parasitism, and effects of parasites on hosts. Laboratory deals with clinical and veterinary parasitology, animal dissections, diagnosis of parasitic infections, and identification of parasites. Prerequisite: 16 hours of laboratory biology. \$30 lab fee. \$15 microscope fee.*

5193-5693. RESEARCH IN BIOLOGY. Conference course in which the student undertakes intensive investigation of topics under the supervision of a staff member. Prerequisite: consent of instructor. Graded P/F/R.

5398, 5698, 5998. THESIS. 5398 graded R/F only; 5698 and 5998 graded P/F/R. Prerequisite: consent of faculty.

6191-6691. ADVANCED RESEARCH. Faculty supervised individual research. May be repeated for credit.

6399-6999. DISSERTATION. 6399 and 6699 graded R/F only; 6999 graded P/F/R. Prerequisite: admission to candidacy for the degree Doctor of Philosophy in Quantitative Biology.



Program in BIOMEDICAL ENGINEERING

See Interdepartmental and Intercampus Programs.

Program in BUSINESS ADMINISTRATION

See Interdepartmental and Intercampus Programs.

Department of CHEMISTRY AND BIOCHEMISTRY

Areas of Study

Chemistry
Applied Chemistry
Mathematical Sciences (See Interdepartmental
and Intercampus Programs.)

Degrees

M.S.
Ph.D.
Ph.D.

Master's Degree Plans: Thesis, Thesis Substitute, and Non-Thesis

Chair: H. Keith McDowell 219 Science Hall 273-3171

Graduate Advisor: James B. White 300F Science Hall 273-3817

Graduate Faculty:

Professors Baker, Bellion, Elsenbaumer, Francis, Girardot, Marynick,
McDowell, Pomerantz, Rajeshwar, Schelly, Ternay, Timmons
Associate Professor White
Assistant Professors Dias, Smith

OBJECTIVE: MASTER OF SCIENCE

The objectives of the Chemistry and Biochemistry Department's program leading to the Master of Science degree include (a) developing the individual's ability to do independent research, (b) preparing students for more advanced study in chemistry and (c) providing advanced training to professional chemists and those employed in technical and business areas in which chemistry at this level is necessary for efficient performance. Research areas include analytical chemistry, biochemistry, bioinorganic chemistry, colloid and surface chemistry, electrochemistry, inorganic chemistry, medicinal chemistry, organic chemistry, physical chemistry, polymer chemistry, and theoretical chemistry.

MASTER'S DEGREE REQUIREMENTS

A candidate for graduate study must satisfy the general admission requirements of the Graduate School, and his or her academic record must show preparation for advanced work in chemistry.

CHEMISTRY AND BIOCHEMISTRY

Master's Degree With Thesis

A minimum of 18 hours in chemistry from courses listed in the Graduate Catalog will be required. Twelve of these hours should be from Chemistry 5301, 5309, 5311, 5315, and 5321. Electives may be senior or graduate division courses in a science or engineering subject selected by the candidate with the approval of the Graduate Advisor.

Master's Degree With Thesis Substitute

Admission to the program requires approval of the Graduate Studies Committee. Minimal registration in a project course (CHEM 5391 or 5691 or CHEM 5392 or 5692) is also required. At the time the degree is awarded the candidate is expected to have completed at least five years of suitable professional experience in an industrial, government, or other chemistry laboratory.

All potential applicants MUST contact the Graduate Advisor prior to registration.

Master's Degree Non-Thesis

This option requires a minimum of 36 hours of coursework of which at least 24 hours must be in chemistry. All courses must be approved by the Graduate Advisor.

OBJECTIVE: PhD IN MATHEMATICAL SCIENCES/CHEMISTRY OPTION

The program leading to the Doctor of Philosophy degree in mathematical sciences/chemistry option is designed primarily to prepare chemists for research and teaching careers which involve the theoretical and mathematical aspects of chemistry. For further details, see Interdepartmental and Intercampus Programs.

OBJECTIVE: PhD IN APPLIED CHEMISTRY

The program leading to the Doctor of Philosophy degree in Applied Chemistry is designed primarily to prepare doctoral-level chemists for industrial research careers. The student must (1) acquire the practical knowledge of the type of research conducted in industry and of the constraints (both practical and philosophical) under which such research is conducted; and, (2) demonstrate the ability to carry out independent research. The areas of research include analytical chemistry, biochemistry, bioinorganic chemistry, colloid and surface chemistry, electrochemistry, inorganic chemistry, medicinal chemistry, organic chemistry, physical chemistry, polymer chemistry, and theoretical chemistry.

PH.D. DEGREE REQUIREMENTS

To be admitted to the Ph.D. program, an applicant must satisfy the general admission requirements of the Graduate School and his or her academic record must show preparation for advanced work in chemistry.

Each candidate must complete the following program requirements:

1. Core courses for students emphasizing organic, inorganic, or polymer chemistry.

FOUR from:

CHEM 5303 Quantum Chemistry or CHEM 5301 Physical Chemistry I

CHEM 5309 Organic Chemistry I

CHEM 5311 Analytical Chemistry

CHEM 5315 Inorganic Chemistry

CHEM 5321 Metabolism and Regulation

Plus:

CHEM 6201 Unit Operations

CHEM 6202 Principles of Industrial Chemistry

CHEM 6203 Regulatory Aspects of the Chemical Industry

And:

IE 5327 Information Systems for Engineering Management Decisions, OR

ECON 5309 Economic Analysis I

(Also see Note 5 below)

2. Core courses for students emphasizing physical or analytical chemistry.

CHEM 5301 Physical Chemistry I

CHEM 5302 Physical Chemistry II

Plus THREE from:

CHEM 5309 Organic Chemistry I
 CHEM 5311 Analytical Chemistry
 CHEM 5315 Inorganic Chemistry
 CHEM 5321 Metabolism and Regulation

Plus:

CHEM 6201 Unit Operations
 CHEM 6202 Principles of Industrial Chemistry
 CHEM 6203 Regulatory Aspects of the Chemical Industry

And:

IE 5327 Information Systems for Engineering Management Decisions, OR
 ECON 5309 Economic Analysis I

3. Students emphasizing biochemistry who have not had one full year of General Biochemistry must also take the following courses BEFORE taking CHEM 5321, 5325, and 5327:

CHEM 5319 General Biochemistry I
 CHEM 5320 General Biochemistry II
 Core courses for students emphasizing biochemistry.

CHEM 5311 Analytical Chemistry
 CHEM 5321 Metabolism and Regulation
 CHEM 5325 Enzymology
 CHEM 5327 Biochemical Genetics

Plus ONE from:

CHEM 5303 Quantum Chemistry OR 5301 Physical Chemistry I
 CHEM 5309 Organic Chemistry I
 CHEM 5315 Inorganic Chemistry

Plus:

CHEM 6201 Unit Operations
 CHEM 6202 Principles of Industrial Chemistry
 CHEM 6203 Regulatory Aspects of the Chemical Industry

And:

IE 5327 Information Systems for Engineering Management Decisions, OR
 ECON 5309 Economic Analysis I

4. ALL students are required to take the Chemistry Internship: CHEM 6304 and 6904.
 5. A student emphasizing organic chemistry will also have the following as REQUIRED courses:
 CHEM 5308 Determination of Molecular Structure by Physical Methods
 CHEM 5310 Organic Chemistry II
 CHEM 5312 Advanced Organic Synthesis

6. Additional research and elective courses chosen according to the student's dissertation topic and area of specialization under the guidance of the supervising committee.

A course grade may be used to satisfy degree requirements for no more than seven years after the course has been completed.

After admission to the doctoral program the student must successfully complete the appropriate examination(s) required by the faculty of the student's discipline. The candidate must demonstrate proficiency in an approved computer language.

A supplementary set of guidelines, published by the Department of Chemistry and Biochemistry, should be consulted.

The grade of R (research in progress) is a permanent grade. An incomplete (the grade of X) cannot be given in a course which is graded R. To receive credit for an R-graded course the student must continue to enroll in the course until a passing grade is received. Three-hour thesis and three- and six-hour dissertation courses are graded R/F only. The grade of P (required for graduation) can be received in six- or nine-hour thesis courses and nine-hour dissertation courses only. In the courses listings below, R-graded courses are designated either "Graded P/F/R" or "Graded R." (See also the section entitled "R" GRADE in this catalog.)

CHEMISTRY (CHEM)

5101. SEMINAR IN CHEMISTRY (1-0). Two semesters of registration required of all graduate students. May not be counted for credit toward the degree requirements. Every student is expected to present one seminar to the Chemistry Department during the two-semester period. Includes learning how to prepare, present, and defend an oral presentation. Seminar topics are selected with the assistance of the instructor and may include both pure and applied chemistry. Graded P/F only.

5300. SELECTED TOPICS IN ADVANCED CHEMISTRY (3-0). The area may vary (typically analytical, applied, biological, colloid, environmental, inorganic, organic, physical, polymer, materials, theoretical, etc.) and will be announced in advance. More than one area may be covered simultaneously, in parallel courses offered under different section numbers. May be repeated for credit when area or topics vary. Prerequisite: permission of instructor.

5301. PHYSICAL CHEMISTRY I (3-0). An introduction to the basic principles of quantum mechanics including Schrödinger and Heisenberg formulations, basic postulates, operator algebra, exact solutions of model problems, approximation methods, group theory, and spin systems. Application of quantum mechanics for spectroscopy including time dependent perturbation theory, selection rules, and a survey of electronic, ESR, NMR, rotational, and vibrational spectroscopies. Emphasis will be placed on relevance to molecular structure, chemical dynamics, and materials science.

5302. PHYSICAL CHEMISTRY II (3-0). Thermodynamics, equilibrium, and introduction to non-equilibrium systems. Kinetics of simple and complex reactions. Theories of rate processes and molecular reaction dynamics. Statistical thermodynamics and its relevance to kinetics and spectroscopy.

5303. QUANTUM CHEMISTRY (3-0). A course emphasizing molecular quantum mechanics. Topics include the basic postulates of quantum mechanics, many electron wave functions, the variation method, and molecular orbital theory at various levels of approximation (Hückel, Extended Hückel, semi-empirical, *ab initio*, etc.). Related methods, such as force-field approaches and molecular dynamics, will be discussed.

5308. DETERMINATION OF MOLECULAR STRUCTURE BY PHYSICAL METHODS (3-0). The use of modern instrumental techniques to determine structure: infrared, ultraviolet, and magnetic resonance spectroscopy, mass spectrometry, optical rotatory dispersion. Emphasis on interpretation of spectra. Prerequisite: CHEM 2322 or equivalent.

5309. ORGANIC CHEMISTRY I (3-0). Bonding, structure, stereochemistry; kinetics, substituent effects, isotope effects, solvent effects, and linear free-energy relationships in determining reaction mechanisms; acids and bases, orbital symmetry, and pericyclic reactions. Prerequisites: CHEM 2322 and 3322 or equivalent.

5310. ORGANIC CHEMISTRY II (3-0). A survey of organic reaction mechanisms; nucleophilic and electrophilic substitution, rearrangement, addition, elimination, free-radical, and photochemical; the effects of structure and experimental conditions. Prerequisite: CHEM 5309 or permission.

5311. ANALYTICAL CHEMISTRY (3-0). Survey of sampling theory, practice, and data processing; optical methods of analysis; electroanalytical methodology; miscellaneous analyses including flow systems, x-ray and thermal methods, and surface-sensitive techniques; chromatographic methods. Prerequisite: CHEM 4461 or equivalent.

5312. ADVANCED ORGANIC SYNTHESIS (3-0). Synthetically important reactions, strategy in organic synthesis using retrosynthetic analysis and mechanistic understanding of reactions, synthons, asymmetric synthesis. Prerequisite: CHEM 5310 or permission of instructor.

5315. INORGANIC CHEMISTRY (3-0). Survey of main group and transition element compounds including: factors influencing Lewis acid-base interactions, bonding, spectral and magnetic properties, reaction mechanisms, organometallic chemistry and the metallic bond. Prerequisite: CHEM 3322.

5319. GENERAL BIOCHEMISTRY I (3-0). Amino acids, carbohydrates, nucleic acids, enzymes. Obtaining of energy and cellular material from glucose including glycolysis, the TCA cycle, electron transport and oxidative phosphorylation and the pentose phosphate pathway. Prerequisite: CHEM 2322 or equivalent. A knowledge of physical chemistry is helpful.

5320. GENERAL BIOCHEMISTRY II (3-0). Modes of breakdown and synthesis of fats, oxidative degradation of amino acids and proteins and biosynthesis of carbohydrate, nucleic acids, and protein. Chemical significance of the genetic code. Prerequisite: one semester of approved biochemistry (CHEM 5319 or equivalent).

CHEMISTRY AND BIOCHEMISTRY

5321. METABOLISM AND REGULATION (3-0). Biosynthesis of amino acids, purines, pyrimidines, and complex lipids, including terpenes and steroids, with emphasis on regulation of these pathways. Aspects of more complex metabolic regulation by hormones, second messengers and receptor-mediated endocytosis with emphasis on chemical and structural modifications of proteins involved. Prerequisite: CHEM 5320.

5325. ENZYMOLOGY (3-0). A study of enzymes including structures, reaction mechanisms, regulation, and kinetics. Prerequisite: CHEM 5320.

5327. BIOCHEMICAL GENETICS (3-0). Aspects of the biochemistry of gene expression in prokaryotic and eukaryotic organisms, its regulation and control, together with genetic manipulations, and the methodology of recombinant DNA technology. Prerequisite: CHEM 5320.

5330. STATISTICAL THERMODYNAMICS (3-0). Investigation of macroscopic systems and properties from a microscopic or molecular point of view, using statistical arguments. Includes: ensembles; phase spaces; Boltzmann, Fermi-Dirac and Bose-Einstein distributions; thermodynamic functions; kinetic theory of gases; Debye-Huckel theory; correlation functions. Prerequisite: CHEM 3322.

5332. CHEMICAL KINETICS (3-0). Kinetics and mechanisms of reactions in the gas phase, solutions, and at interfaces, theory of rate processes, structure-reactivity correlations and photochemical kinetics. Contemporary experimental methods to study reaction dynamics on a molecular level. Prerequisite: CHEM 3322.

5333. THERMODYNAMICS OF MATERIALS (3-0). Applications of thermodynamics to the study of materials, thermodynamic properties of liquid and solid solutions and their relationship to surface and crystalline defects. Also offered as MSE 5320. Prerequisite: permission of instructor.

5340. ENVIRONMENTAL CHEMISTRY (3-0). Descriptive chemistry of air, water, and soil systems including pollutants; chemical and physical processes in the environment and their modeling; analytical, disposal, and recycling techniques. Prerequisite: permission of instructor.

5350. ADVANCED POLYMER CHEMISTRY (3-0). Polymer synthesis and reactions including condensation, free-radical, ionic, and coordination polymerizations; principles of polymerization including thermodynamics and kinetic considerations; physical characterizations including determinations of absolute molecular weights, relative molecular weights, morphology, glass transitions, and polymer crystallinity; relationships between macromolecular structure, properties, and uses of polymeric materials. Also offered as MSE 5346. Prerequisites: CHEM 2321 and 2322 or permission of instructor.

5461. ANALYTICAL INSTRUMENTATION (2-8). Theory of instrumentation and chemical signal source. Practical experiments utilizing atomic and molecular absorption and emission spectroscopy, chromatographic analysis, and electrochemical techniques. Prerequisite: CHEM 3322 or equivalent. \$5 computer fee. \$20 lab fee.

5191-5691. READINGS IN CHEMISTRY. Conference course which may be repeated for credit, with credit granted according to work performed. Graded P/F/R only. Prerequisite: permission of instructor.

5192-5692. RESEARCH IN CHEMISTRY. Conference course with laboratory with credit granted according to work performed. May be repeated for credit. Prerequisite: permission of instructor. Graded P/F/R.

5398, 5698, 5998. THESIS. 5398 graded R/F only; 5698 and 5998 graded P/F/R. Prerequisite: permission of instructor.

6201. UNIT OPERATIONS (2-0). Survey of measurement and control techniques, and the fundamentals of physical and chemical industrial processes. Prerequisite: CHEM 3322 or equivalent or permission of instructor.

6202. PRINCIPLES OF INDUSTRIAL CHEMISTRY (2-0). Survey of industrial inorganic and organic chemical processes. Prerequisite: permission of instructor.

6203. REGULATORY ASPECTS OF THE CHEMICAL INDUSTRY (2-0). Survey of chemical toxicology, regulatory aspects involved in the chemical industry, industrial safety, patents and patent law.

6304, 6904. CHEMISTRY INTERNSHIP (12-0). Each student is required to spend three months in a nonacademic chemical laboratory; credit may be given for a student's previous industrial research experience. Graded P/F/R only. Prerequisite: permission of Graduate Advisor.

6399, 6699, 6999. DISSERTATION. 6399 and 6699 graded R/F only; 6999 graded P/F/R. Prerequisite: admission to candidacy for the degree of Doctor of Science in Applied Chemistry.

DISSERTATION— See also Mathematical Sciences.

Program in CITY AND REGIONAL PLANNING

See Interdepartmental and Intercampus Programs.

Department of CIVIL AND ENVIRONMENTAL ENGINEERING

<i>Area of Study</i>	<i>Degrees</i>	
Civil Engineering	M.S., M.Engr., Ph.D.	
<i>Master's Degree Plans:</i> Thesis (M.S.) and Non-Thesis (M.Engr.)		
<i>Chair:</i> Clinton E. Parker	425 Nedderman	794-5055
<i>Graduate Advisor:</i> Clinton E. Parker	417 Nedderman	273-2201
<i>Graduate Faculty:</i>		

Professors Huang, Matthys, Parker, Petry, Qasim, Yuan
Professor and President Emeritus Nedderman
Associate Professors Ardekani, Argento, Crosby, Spindler, Williams
Assistant Professors Collins, Kruzic
Professors Emeriti Haynes, Everard

OBJECTIVE

The objective of the graduate program in civil and environmental engineering is to prepare students for continued professional and scholarly development consistent with their technical interests. Students, with the assistance of a faculty advisor in their area of interest, plan their programs of study in one of the technical areas in civil engineering. Typical program and research areas are:

1. Environmental (water and air quality control, and solid and hazardous materials control);
2. Geotechnical (soil mechanics and foundations);
3. Structures and Applied Mechanics;
4. Transportation (traffic, highways, airports and transit); and
5. Water Resources (hydrology and hydraulics).

Research and continuing education opportunities in the environmental and construction areas are offered through two centers within the department. Information relative to the Center for Environmental Research and Training and the Construction Research Center can be found in the front portion of this catalog (see catalog index).

The department provides the student an opportunity to study advanced and special topics that are on the forefront of technology. These courses carry CE 5300 or CE 6300 numbers and are identified on a student's academic record by both number and course title. Examples of topics offered in the typical program areas are:

- Environmental** — Advanced Dispersion Modeling, Analysis of Pollutant Characteristics, Hazardous Waste Remediation;
- Geotechnical** — Expansive Clays, Soil Chemical Stability;
- Structures and Applied Mechanics** — Plate Structures, Earthquake Engineering, Non-linear Finite Element Methods, Analysis of Structural Plastic Systems;

CIVIL AND ENVIRONMENTAL ENGINEERING

Transportation — Transportation Systems and Network Modeling, Urban Operations Research, Vehicular Energy Consumption and Emissions;
Water Resources — Groundwater Modeling, Kinematic Wave Theory, Urban Hydrology.

ADMISSION

Applicants admitted to the graduate program who hold a baccalaureate degree in civil engineering must meet the general requirements of the Graduate School as stated under the section entitled "Admission Requirements and Procedures" and those established by the Civil and Environmental Engineering Graduate Faculty.

Admission to the PhD program requires a master's degree or its equivalent and a GPA of 3.5 or greater in all advanced graduate work. The applicant shall also demonstrate through previous academic preparation the potential to carry out independent research in civil engineering. During the first year in the doctoral program the student's potential for pursuing the doctoral degree will be assessed by a diagnostic evaluation.

Applicants not meeting all criteria may be admitted on a provisional or probationary basis only under exceptional circumstances. Applicants with degrees in other disciplines may qualify for graduate study in civil engineering after a review of their area of technical interest and after completion of an approved program of leveling courses.

GRADE REQUIREMENTS AND CONTINUATION

The Civil and Environmental Engineering Graduate Program has established rules, regulations, policies, and procedures for continuation in the graduate program and fulfilling graduation requirements. These can be found in the Civil Engineering Graduate Handbook available in the Civil Engineering Office. In addition to the requirements of the Graduate School listed elsewhere, to continue in the program each civil engineering graduate student must:

1. Maintain an overall GPA of 3.0 or higher for the Master's program and 3.5 or higher for the PhD program in all coursework undertaken and all coursework on his/her approved program of study.
2. Accumulate no more than three deficiency points as defined below.

A student will be declared ineligible for further graduate study in civil engineering and will be dismissed from the civil engineering graduate program if he/she accumulates grade deficiency points greater than three. Any grade of C is one deficiency point, any grade of D is two deficiency points, and any grade of F is three deficiency points. Deficiency points may not be removed from the student's record by repeating a course or by completing additional coursework.

No organized course in which a grade of P is received can be used to satisfy course requirements for a graduate degree in civil engineering.

DEGREE REQUIREMENTS

The responsibility rests with each student for knowing the rules, regulations, and filing deadlines of the Graduate School and the Civil Engineering Committee on Graduate Studies (see Civil Engineering Graduate Handbook available in Civil Engineering Office). Requirements of the Graduate School and the Civil Engineering Committee on Graduate Studies must be met. The degrees offered and minimum course requirements are identified in the following paragraphs.

The Master of Science degree is a research-oriented program in which completion of a thesis is mandatory. The program consists of a minimum of at least 24 credit hours of coursework and an acceptable thesis (six credit hours). The Master of Engineering degree is an engineering practice-oriented program requiring a minimum of 36 credit hours. A maximum of six hours may be a special project. A final program examination is required of all master's degree candidates. Thesis degree candidates will be required to present an oral defense of the thesis. Non-thesis degree candidates will fulfill the program examination requirement upon the successful completion of CE 5193, Master's Comprehensive Examination. Candidates must enroll in CE 5193 in the semester they intend to graduate.

The PhD degree is a research degree and, as such, requires the candidate to successfully carry out original, independent research in an area acceptable to the civil engineering faculty. Normally, a minimum of one year of advanced coursework beyond the master's degree is required.

The grade of R (research in progress) is a permanent grade. An incomplete (the grade of X) cannot be given in a course which is graded R. To receive credit for an R-graded course

CIVIL AND ENVIRONMENTAL ENGINEERING

the student must continue to enroll in the course until a passing grade is received. Three-hour thesis and three- and six-hour dissertation courses are graded R/F only. The grade of P (required for graduation) can be received in six- or nine-hour thesis courses and nine-hour dissertation courses only. In the course listings below, R-graded courses are designated either "Graded P/R/R" or "Graded R." (See also the section entitled "R" GRADE in this catalog.)

CIVIL ENGINEERING (CE)

5193. MASTER'S COMPREHENSIVE EXAMINATION (1-0). Directed study, consultation, and comprehensive examination over coursework leading to the Master of Engineering degree in civil engineering. Required of all Master of Engineering students in the semester they plan to graduate. Grade P/F/R.

5300. TOPICS IN CIVIL ENGINEERING (3-0). Topics of current interest in the field of civil engineering. The subject title is listed in the class schedule and in the student's record. May be repeated for credit when topic changes.

5301. ENERGY METHODS IN APPLIED MECHANICS (3-0). Minimum potential energy, principle of complementary energy, Castigliano's Theorem, and variational principles. Also Hamilton's principles and Lagrange's equations. Credit not granted for both CE 5301 and EM 5324. Prerequisite: permission of instructor.

5302. THEORY OF STRUCTURES I (3-0). Analysis of statically indeterminate elastic structures. Maxwell's law of reciprocal displacements, Castigliano's theorems, real work, virtual work, method of consistent deformations, column analogy, elastic center, influence lines, three-moment theorem, approximate analysis of structural frames. Prerequisite: CE 3341. \$10 computer fee.

5303. MATRIX METHODS FOR STRUCTURES (3-0). Stiffness and flexibility methods of structural analysis by using matrix algebra. Credit not granted for both CE 4308 and CE 5303. Prerequisite: CE 3341. \$10 computer fee.

5304. STRUCTURAL DESIGN IN LIGHT GAGE STEEL (3-0). Design course for cold formed steel structures. Includes post buckling, plate behavior of stiffened and unstiffened elements, columns, braced and unbraced beams, connectors, and shear diaphragms. Building Codes and related recommended practice documents. Prerequisite: CE 4348.

5305. STRUCTURAL PLASTICS DESIGN (3-0). A design synthesis course for fiber reinforced plastics in civil engineering structures. Topics include types of plastics and composites, structural behavior, analysis and design of flat sandwich structures, axially loaded members, beam-columns, and building connections. Building codes and related recommended practice documents. Prerequisite: CE 3311. \$10 computer fee.

5307. STRUCTURAL TIMBER DESIGN (3-0). Covers grade and design properties of structural lumber; design criteria using timber; design of bending and compression members; connectors design; design of glued laminated timber, box beams, stressed-skin panels, shear walls, and trusses. Prerequisite: CE 3341.

5308. MASONRY STRUCTURES (3-0). Includes masonry unit types and grades, mortar types, reinforcing and connectors, and beam, column, arch, bearing wall design. Structural behavior and standard construction practices. Plain and reinforced masonry, building codes and recommended practice documents. Prerequisite: CE 3341. \$10 computer fee.

5309. PRESTRESSED CONCRETE (3-0). Discussions concerning materials and methods used in prestressing; design of sections for flexure, shear and anchorage; camber, deflections and cable layouts, simple spans, continuous beams, prestressed piles, and prestressed tanks. Prerequisite: CE 4347. \$10 computer fee.

5310. NUMERICAL METHODS IN STRUCTURAL DESIGN (3-0). Suitable numerical and approximate methods used in structures. Includes problems of static response, stability and free vibration. Prerequisites: CSE 2306 or equivalent and CE 3341. \$10 computer fee.

5311. STEEL DESIGN I (3-0). A design synthesis course for metal structures. Topics include beam columns, building connections, plastic design, rigid frame, and multistory building design. Building codes and related documents. Prerequisite: CE 4348.

5312. CONCRETE DESIGN I (3-0). Includes structural components such as beams, columns, slabs, footings and walls using the ultimate strength method; building code requirements for reinforced concrete;

flat slabs, and other two-way systems; and yield line theory, torsion, and shear-friction. Prerequisite: CE 4347. \$10 computer fee.

5313. CONCRETE DESIGN II (3-0). Structural systems such as continuous beams, arches, continuous frames, box girders, viereckel trusses, shear walls with columns, caissons and mat foundations. Computer methods of analysis and design utilized to study building and bridge structure. Beam methods for long shells discussed. Prerequisite: CE 4347. \$10 computer fee.

5314. STEEL DESIGN II (3-0). Covers torsional design of beams, beams with web holes, composite design of beams, lateral-torsional buckling of beams, plate buckling, column design and behavior, frame stability, bracing requirements for compression members. Prerequisite: CE 4348.

5315. ADVANCED MECHANICS OF MATERIALS (3-0). Analysis of stresses and strains at a point, stress-strain relationships, stresses due to various loading conditions, theories of failure, energy methods, shear center, unsymmetrical bending, curved beams, torsion and buckling problems. Credit not granted for both CE 5315 and CE 4324. Prerequisite: CE 3311. \$5 computer fee.

5316. WATER SUPPLY AND TREATMENT PLANT DESIGN (3-0). Theory and design of community water supply systems. Design of treatment facilities, equipment selection and distribution network, and cost estimates. Credit not granted for both CE 4356 and CE 5316. Prerequisites: CE 3131 and 3334.

5317. WASTEWATER TREATMENT PLANT DESIGN (3-0). Effluent quality standards, and theory and design of wastewater treatment plants. Design and layout of wastewater treatment systems using manufacturers' catalogs, and cost estimates. Credit not granted for both CE 4357 and CE 5317. Prerequisites: CE 3131 and 3334.

5318. PHYSICAL-CHEMICAL PROCESSES I (3-0). Principles of unit process modeling using reactor and kinetic theory, and theory and design of mixing, flocculation, sedimentation, filtration, gas transfer, adsorption, ion exchange, and membrane processes. Prerequisites: CE 3131 and 3334 or consent of instructor. \$15 computer fee.

5319. PHYSICAL-CHEMICAL PROCESSES II (3-0). Principles of water chemistry applied to the theory and design of unit processes including coagulation, precipitation, corrosion, oxidation-reduction, and disinfection. Prerequisite: CE 5318 or concurrent registration therein. \$15 computer fee.

5320. SOLID WASTE MANAGEMENT (3-0). Technical aspects of current practices and new developments in the management of solid waste facilities. Theory and design of solid waste collection, transfer, disposal and recovery, and reuse systems. Prerequisite: consent of instructor.

5325. BIOLOGICAL PROCESSES (3-0). Biological processes used in water quality control. Includes principles from microbiology and biochemistry applied to suspended and attached growth systems. Prerequisite: CE 5318 or concurrent registration therein.

5326. ENVIRONMENTAL TOXICOLOGY FOR ENGINEERS (3-0). Toxicology for engineers and scientists. Dose-response, absorption, distribution, and elimination; general aspects of toxicological responses pertinent to engineered solutions. Prerequisite: consent of instructor.

5327. ENVIRONMENTAL RISK ASSESSMENT (3-0). Hazard determination, endpoints in risk assessment, risk assessment epidemiology, regulatory evaluation of risks, and risk-benefit analysis and applications to engineered solutions. Case studies are used. Prerequisite: CE 5326 or consent of instructor.

5328. AIR POLLUTION CONTROL — PARTICULATES (3-0). Air pollution law, federal and state regulations. Particle dynamics. Types, sources and effects of air pollutants. Design of particulate collection, transport and removal systems. Introduction to air pollutant dispersion modeling. Prerequisite: consent of instructor.

5330. CHARACTERISTICS OF TRAFFIC (3-0). The fundamental elements of traffic — the driver, the vehicle, and the roadway — are considered and then extended into studies of streams of traffic flow. Techniques of conducting traffic engineering studies, including methods of measuring speed, volume, and density, are covered along with methods for the determination of capacity on freeways and rural highways (uninterrupted flow facilities). Parking and accident studies are also included. Prerequisite: CE 3302.

5331. TRAFFIC ENGINEERING OPERATIONS (3-0). Methods of traffic regulation and control optimization. Traffic laws, motorist communication by means of traffic control devices, and the design and operation of both fixed time and actuated traffic signals at intersections. Analysis and design techniques for intersections using capacity and level of service concepts. Prerequisite: CE 3302. Credit will not be granted for both CE 4313 and 5331. \$5 computer fee.

CIVIL AND ENVIRONMENTAL ENGINEERING

- 5332. HIGHWAY DESIGN (3-0).** Geometric considerations necessary for the design of city streets, highways, and freeways such as the cross sections, vertical and horizontal alignment, sight distances and stopping distances. Includes the design of maneuver areas, channelization, ramps, intersections, and interchanges. Prerequisite: CE 3302. Credit will not be granted for both CE 4312 and 5332.
- 5333. TRAFFIC CONTROL SYSTEMS (3-0).** Control algorithms and optimization of splits, offsets, and cycle lengths for arterial progression and traffic signals in networks; computer simulation techniques; problem solving with computer simulation and optimization packages; freeway control using ramp meters and dynamic motorist communications. Prerequisites: CE 5331. \$10 computer fee.
- 5335. AIRPORT ENGINEERING (3-0).** Airport master planning, for forecasting air travel demand, airside capacity, passenger terminal design, air traffic control, land access planning and design, landside operations, air cargo facility design. Prerequisite: CE 3302.
- 5336. PAVEMENT DESIGN (3-0).** Principles and theoretical concepts of rigid and flexible pavements for highways and airfields; effects of traffic loads, natural forces, and material quality; current design practices (including bituminous mixture design and pavement foundation design); and pavement management systems. Prerequisites: CE 3302, 3261, and 3443.
- 5337. URBAN TRANSPORTATION PLANNING (3-0).** Theory and application of comprehensive urban transportation planning technology. Basic studies of population, urban economics, land use, simulation models, forecasting trip generation and distribution, traffic assignment, modal split, system design and evaluation, mass transit characteristics. Prerequisite: CE 3302 or consent of instructor.
- 5344. CONSTRUCTION METHODS: FIELD OPERATIONS (3-0).** Introduction to the methods, equipment, and management techniques used in the construction industry. Topics include equipment operating characteristics, job site safety, and field management. Prerequisites: consent of instructor and IE 3312 or equivalent.
- 5346. OPEN CHANNEL FLOW (3-0).** Steady flow in open channels. Basic principles, velocity formulas, backwater curves, flow through transitions, obstructions, and bends. Credit not granted for both CE 4358 and 5346. Prerequisite: CE 3305 or permission of instructor. \$5 computer fee.
- 5347. SURFACE WATER HYDROLOGY (3-0).** Study of hydrologic cycle, elements of hydrometeorology, infiltration and soil moisture, runoff, rainfall-runoff relationships and effects of these factors with regard to utilization and conservation of water resources. Prerequisite: CE 4331 or permission of instructor. \$5 computer fee.
- 5348. GROUND-WATER HYDROLOGY (3-0).** Occurrence and movement of ground water from a geologic viewpoint as preparation for application of general hydrologic equations to such problems as safe yield, hydraulics of wells, well design, and artificial recharge. Prerequisite: CE 4331 or permission of instructor. \$5 computer fee.
- 5351. DAM APPURTENANCES AND THEIR DESIGN (3-0).** Hydraulic principles used in the design of appurtenances associated with retarding structures such as dams and diversion works. Prerequisite: CE 5346.
- 5361. ADVANCED SOIL TESTING (2-4).** Considers soil testing techniques utilized during research, determination of stabilization mix designs, and development of complete soil parameters. Testing includes specialized consolidation, direct and triaxial shear, soil stabilization and selected chemical and mineralogical techniques. Prerequisites: CE 5365 and 5366. \$15 lab fee.
- 5362. STRUCTURE-SOIL INTERACTION (3-0).** Considers methods of analysis of structure-soil interaction behavior including numerical techniques. Physical problems reviewed include beams, slabs, flexible retaining walls, and laterally loaded piles interacting with elastic and inelastic soils. Prerequisite: CE 4321 or 5364. \$15 computer fee.
- 5363. EARTH STRUCTURES (3-0).** Study of the states of stress and analysis techniques associated with cuts, fills, and retaining structures. Includes slope stability, embankment reinforcement, conventional and reinforced earth retaining walls, excavation bracing, and sheet pile wharf structures. Prerequisite: consent of instructor. \$15 computer fee.
- 5364. FOUNDATION ANALYSIS AND DESIGN (3-0).** The design, construction, and performance of footings, rafts, and piles founded on or in sands, clays, silts, stratified soils, and weak rock. Includes the influence of various geologic terrain on selecting foundation type and constructability, insitu investigations to determine material design parameters, bearing capacity, and settlement of foundations. Prerequisite: consent of instructor.

CIVIL AND ENVIRONMENTAL ENGINEERING

- 5365. THEORETICAL SOIL MECHANICS I (3-0).** Theory of consolidation, magnitude, time rate, pore pressure dissipation with variable construction rate and layered soils. Secondary compression, preconsolidation, and preloading. Shear strength of soil. Critical state soil mechanics, dilation and strain-softening in drained shear, pore pressure response in undrained shear, including static liquefaction. Prerequisite: consent of instructor.
- 5366. THEORETICAL SOIL MECHANICS II (3-0).** Physicochemical properties and behavior of soils, emphasizing expansive clay soils; theories of plastic equilibrium; behavioral patterns to engineering problems. Prerequisite: consent of instructor.
- 5367. APPLIED SOIL MECHANICS (3-0).** Engineering reports as concern subsurface investigations discussed as well as the design of subsurface investigations. Case histories discussed showing the reasoning for the types of foundations recommended. Students will be placed in the position of the consulting engineer and engineering reports will be written for several projects. Prerequisite: CE 5364 or consent of instructor.
- 5368. SEEPAGE ANALYSIS (3-0).** Permeability and flow through porous media. Evaluation of both steady and non-steady state aquifer tests, design of dewatering systems, flow nets and seepage beneath concrete dams, pavements, and cut slopes. Seepage through and beneath earth dams, remedial treatment such as relief wells and horizontal drains, and seepage cutoff with slurry trenches and membranes. Prerequisite: consent of instructor. \$10 computer fee.
- 5369. EARTH AND ROCKFILL DAMS (3-0).** Studies and requirements used to select potential sites and dam type, comparing earth, rockfill, arch, and RCC concrete gravity dams. Design, construction, instrumentation, and performance of dams, including dam failures. Evaluation of hydrofracturing, embankment cracking, design of filters, rapid reservoir drawdown, and earthquake response. Prerequisite: consent of instructor. \$15 computer fee.
- 5191, 5391. ADVANCED STUDIES IN CIVIL ENGINEERING.** Individual studies of advanced topics under the supervision of a professor or professors. Graded P/F/R.
- 5395, 5695. MASTER'S PROJECT.** Non-thesis master's degree candidates with approval to include a project in their program. Grades P/F/R. Prerequisite: consent of instructor and Graduate Advisor. \$15 computer fee.
- 5398, 5698, 5998. THESIS.** Research and preparation pertaining to the master's thesis. 5398 graded R/F only; 5698 and 5998 graded P/F/R.
- 6300. ADVANCED TOPICS IN CIVIL ENGINEERING (3-0).** Topics of current interest in the field of civil engineering. The subject title is listed in the class schedule and in the student's record. May be repeated for credit when topic changes. Prerequisite: consent of instructor. \$10 computer fee.
- 6306. PUBLIC TRANSIT PLANNING AND OPERATION (3-0).** Theory and application of technologies used for transit demand analysis, routing, scheduling, evaluation, crew assignment, maintenance strategies, and management. Land-use impact on public transit policy and operation is also introduced. Prerequisite: consent of instructor. \$10 computer fee.
- 6308. PLANNING MODELS FOR TRANSPORTATION (3-0).** Analytical analysis of urban travel demand-trip generation, distribution, model split, and assignment, employing mathematical, statistical, and computer techniques; principles of model development including sketch planning and state-of-the-art techniques. Prerequisite: CE 5337. \$10 computer fee.
- 6309. TRAFFIC FLOW THEORY (3-0).** Speed, density relationships of vehicular traffic flow; statistical aspects of traffic events and queuing processes; deterministic models and simulation models of traffic flow behavior; applications of flow theory to traffic problem solutions. Prerequisite: CE 5330 or 5331.
- 6313. CONSTITUTIVE THEORY AND SOIL MODELING (3-0).** Analytical and numerical techniques for geotechnical problems. Includes limit equilibrium, method of characteristics and finite element methods (FEM). Major emphasis is on the non-linear elasticity and plasticity based formulations to relate stress and strain for use in FEM. Prerequisite: consent of instructor. \$15 computer fee.
- 6314. STORMWATER MODELING (3-0).** Interpretation of hydrologic data using methods of systems analysis; hydrologic components analyzed as linear and nonlinear systems integrated into mathematical models of watershed response including kinematic wave theory; optimizing model parameters with illustrative examples. Prerequisites: CE 5346 and 5347. \$10 computer fee.
- 6323. HAZARDOUS WASTE MANAGEMENT (3-0).** Sources, chemistry, monitoring, and classifications of hazardous wastes. Discussion of environmental hazards, legal aspects, transportation, detoxification, storage, and disposal and incineration. Prerequisite: consent of instructor.

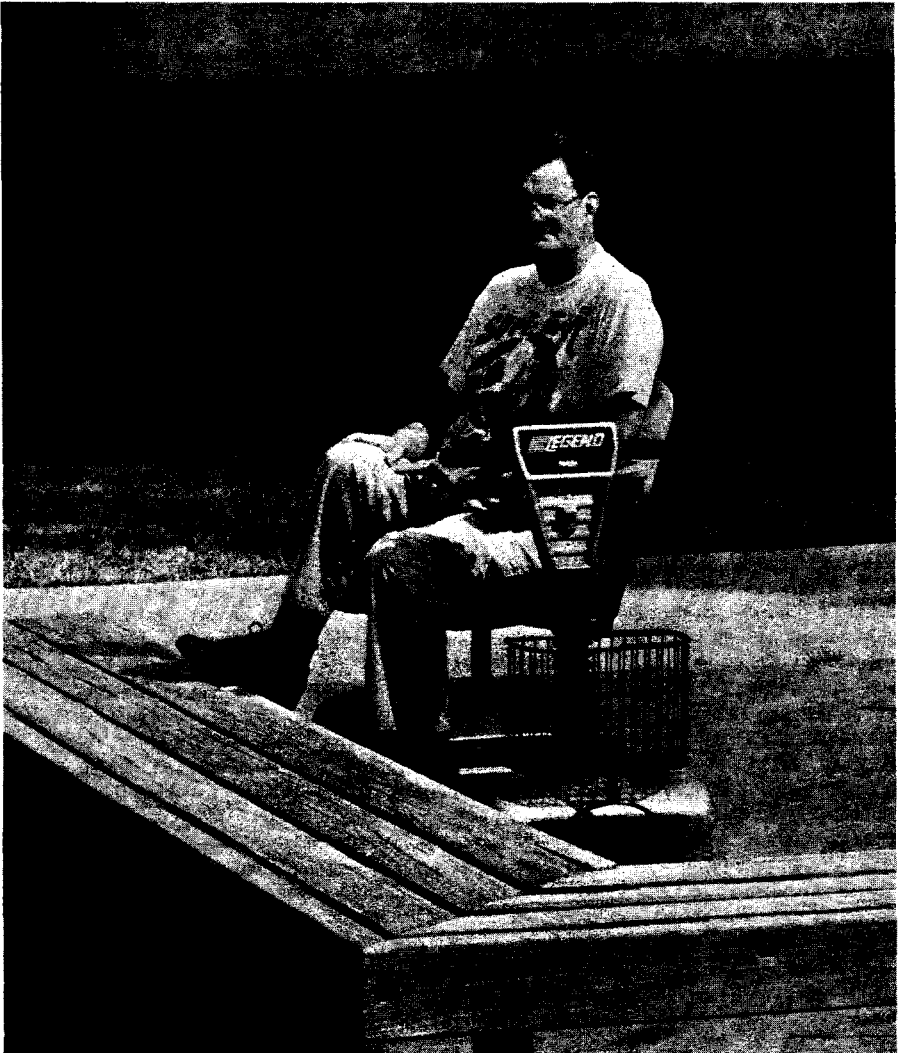
CIVIL AND ENVIRONMENTAL ENGINEERING

6324. DISPERSION MODELING (3-0). Review of air pollution meteorology; pollutant dispersion calculations; utilizing Gaussian dispersion models; point, line, and area source dispersion calculations; multipoint source dispersion models utilizing computerized models; modeling results application to federal and state regulations. Prerequisite: CE 5328 or consent of instructor. \$10 computer fee.

6325. AIR POLLUTION CONTROL — GASES (3-0). Ideal gas laws, properties of gases and vapors. Calculation of gaseous emission rates, determination of required efficiency and selection of appropriate gas pollutant control devices. Design considerations for incinerators, scrubbers, adsorption and absorption systems. Prerequisite: CE 5328 or consent of instructor.

6326. INDUSTRIAL AND HAZARDOUS WASTE (3-0). Specialized physical, chemical, and biological treatment schemes required to treat specific industrial wastes. Pretreatment regulations, individual industries, and combined municipal and industrial waste treatment. Prerequisites: CE 5319 and 5325.

6327. ADVANCED WATER QUALITY CONTROL PROCESSES (1-6). Standard laboratory techniques for unit operations and processes in water and waste treatment. Advanced environmental engineer-



CIVIL AND ENVIRONMENTAL ENGINEERING

ing theories and practices, research topics, and methods. Prerequisites: CE 5319 and 5325. \$5 computer fee. \$10 lab fee.

6328. MODELING OF NATURAL WATER SYSTEMS (3-0). Ecological response of lakes, reservoirs, streams, estuaries, and wetlands from point and nonpoint discharges. Mathematical models for water quality prediction and planning examined and developed. Prerequisite: CE 5319. \$15 computer fee.

6351. THEORY OF STRUCTURES II (3-0). Continuation of Theory of Structures I. Study of the theory of arches, rings, rigid frames, three dimensional frames and trusses, cable supported structures, long span continuous structures and statically indeterminate continuous trusses, classical methods, and energy methods. Prerequisite: CE 5302 or consent of instructor. \$10 computer fee.

6352. FINITE ELEMENT METHOD FOR STRUCTURES (3-0). Structural stiffness, finite elements of a continuum, plane stress and strain, axi-symmetric stress analysis, element shape functions, and various applications. Prerequisite: CE 5303. \$10 computer fee.

6353. BEHAVIOR OF STRUCTURES UNDER DYNAMIC LOADS (3-0). Idealization of structures for dynamic analysis, natural and forced vibrations of single and multiple degrees of freedom systems, response of structures subjected to blast, wind, and earthquakes. Prerequisite: CE 5302. \$15 computer fee.

6354. THEORY OF THIN ELASTIC SHELLS (3-0). Elements of differential geometry, basic equations for shells of arbitrary shape. Specific equations for cylindrical shells, shells of revolution, etc. Credit not granted for both CE 6354 and EM 5320. Prerequisite: consent of instructor.

6355. TENSORS IN STRUCTURAL MECHANICS (3-0). Metric tensor, strain and stress tensors, constitutive equations, covariant derivative, divergence and curl, continuum mechanics, geometry of curved surfaces, plates and shells. Prerequisite: CE 6354 or EM 5320, or consent of instructor.

6356. RANDOM VIBRATION OF STRUCTURES (3-0). Stationary random process, autocorrelation and spectral density, ergodic process, frequency and time domain solutions, random excitation and response, design consideration. Prerequisite: CE 6353 or equivalent knowledge.

6391,6691,6991. ADVANCED PROJECTS IN CIVIL ENGINEERING. Projects using and developing emerging technology. Prerequisite: consent of instructor and graduate advisor. Graded P/F/R. \$15 computer fee.

6197-6997. RESEARCH IN CIVIL ENGINEERING. May be repeated for credit. Graded P/F/R.

6399,6699,6999. DISSERTATION. Preparation of a doctoral dissertation in civil engineering. Prerequisite: admission to candidacy for the Doctor of Philosophy degree. 6399 and 6699 graded R/F only; 6999 graded P/F/R.

A limited number (not to exceed a total of nine semester hours) of the following courses may be applicable toward a graduate degree if approved in advance by the Graduate Advisor.

- 4304. STRUCTURAL STEEL DESIGN
- 4308. ADVANCED STRUCTURAL ANALYSIS
- 4312. STREET AND HIGHWAY DESIGN
- 4313. TRAFFIC ENGINEERING
- 4321. FOUNDATION ENGINEERING
- 4322. SOIL STABILIZATION
- 4324. MECHANICS OF MATERIALS II
- 4350. AIR POLLUTION CONTROL
- 4356. DESIGN OF MUNICIPAL WATER SUPPLY SYSTEMS
- 4357. DESIGN OF MUNICIPAL WASTEWATER TREATMENT SYSTEMS
- 4358. OPEN CONDUIT SYSTEMS

COMMUNICATION

Department of COMMUNICATION

Areas of Study

Humanities (See Interdepartmental
and Inter-campus Programs.)
Urban Affairs

Degrees

M.A., Ph.D.
M.A.

Chair: Earl Andresen

118 Fine Arts 273-2163

Graduate Faculty:

Professor Andresen
Associate Professors McCallum, Wood

OBJECTIVE

The graduate course offerings in communication are provided in support of other graduate programs and to meet the express needs of students. No program leading to a graduate degree in communication exists at this time.

SPEECH (SPCH)

5310. PERSUASION (3-0). A comparison of traditional with contemporary behavioral science theories of persuasive discourse and their supporting research.

5320. AMERICAN PUBLIC ADDRESS (3-0). Examination of significant public discourse throughout American history considering its intellectual merit and cultural influence on American life and character.

5330. FREEDOM OF EXPRESSION (3-0). Reading and analysis of legal, philosophical, and rhetorical works concerned with the First Amendment, especially as applied to communication in the 20th Century.

JOURNALISM (JOUR)

5341. MEDIA ANALYSIS OF URBAN INDICATORS (3-0). Analysis of media information systems for reporting social, economic, demographic, political trends in urban environment; precision reporting through use of statistical indicators, survey methodology.

Department of COMPUTER SCIENCE AND ENGINEERING

Areas of Study

Computer Science
Computer Science and Engineering
Mathematical Sciences (See Interdepartmental
and Intercampus Programs.)

Degrees
M.S., M.C.S., Ph.D.
M.S., M.Engr., Ph.D.
Ph.D.

Master's Degree Plans: Thesis (M.S.) and Non-thesis (M.C.S., M.Engr.)

Chair: Bill D. Carroll 300 Nedderman Hall 273-3785
Graduate Advisor: Lynn Peterson 344 Nedderman Hall 273-3785

Graduate Faculty:

Professors Carroll, Hsia, Kavi, Mettala, Walker
Associate Professors Elmasri, Harbison, Kamangar, Kung, Peterson, Shirazi,
Weems, Youn
Assistant Professors Banios, Byrne, Cook, Helal, Holder, Hufnagel, Raj

OBJECTIVE

The purpose of the graduate programs in Computer Science and Computer Science and Engineering is to prepare the student for continued professional and scholarly development. The Master of Science (M.S.) programs are designed to extend the student's knowledge and to provide additional strengthening in a particular concentration. The Master of Computer Science (M.C.S.) and Master of Engineering (M.Engr.) programs are designed to provide the student with the opportunity for professional development in the computer field. The Doctor of Philosophy (PhD) programs are designed to prepare the student to conduct research and development in an area of concentration.

Typical areas of concentration include

1. **computer architecture:** parallel processing, dataflow systems, scheduling and load balancing for parallel and distributed systems, tools for parallel programming, performance and reliability measurement, fault-tolerant multiprocessor interconnection networks, testable and reliable VLSI-based multiprocessor systems, silicon compilers, design automation systems;
2. **intelligent systems:** knowledge-based systems, knowledge representation, neural networks, knowledge acquisition, machine learning, planning, scientific visualization, pattern recognition, natural language processing;
3. **software engineering:** domain analysis, requirements engineering, incremental delivery, conceptual modeling, rapid prototyping, formal specifications, design environments, software testing, verification and validation;
4. **database:** temporal databases, object-oriented databases, database models and languages, distributed database systems, indexing and hashing techniques, conceptual modeling, data security, logic and databases, query optimization, relational design theory.

ADMISSION

Applicants for graduate study who have a baccalaureate degree in Computer Science or Computer Science and Engineering must meet the general requirements of the Graduate School as stated under the section entitled "Admission Requirements and Procedures".

COMPUTER SCIENCE AND ENGINEERING

Applicants who have limited background in Computer Science or Computer Science and Engineering but who meet all other requirements may be admitted. Such students normally must take additional courses beyond the minimums listed below. For further information, applicants may contact the Graduate Advisor.

CONTINUATION

The Computer Science and Engineering Graduate Program, in fulfillment of its responsibility to graduate highly qualified professional engineers, has established certain policies and procedures. In addition to the requirements of the Graduate School listed elsewhere in the catalog, a supplementary set of guidelines, published by the Department of Computer Science and Engineering, should be consulted for details.

DEGREE REQUIREMENTS

Master of Science in Computer Science

The Master of Science in Computer Science degree program is designed to develop the scholarship and research skills of the student. Thirty credit hours which include six thesis credits are required.

Master of Science in Computer Science and Engineering

The Master of Science in Computer Science and Engineering, which is intended for students with a baccalaureate degree in engineering, requires 30 credit hours of which six are thesis credits.

Master of Computer Science

The Master of Computer Science (MCS) provides professional development in computer science. The MCS requires 36 credits and includes a project or approved substitute.

Master of Engineering

The Master of Engineering in Computer Science and Engineering provides professional development in computer science and engineering to the student with a baccalaureate degree in engineering. The degree requires 36 credits and includes a project or approved substitute.

PhD (Computer Science)

The PhD in Computer Science continues the development of research and scholarship capabilities of the student. Coursework selection in each student's program is designed to support the dissertation area selected by the student.

A minimum of two semesters of full-time study is required during the dissertation phase. There is no foreign language requirement.

PhD (Computer Science and Engineering)

The PhD in Computer Science and Engineering is available to students with a prior degree in engineering. It contains essentially the same requirements as the PhD (Computer Science) degree except that it permits interdisciplinary research between Computer Science and one or more of the various engineering disciplines.

PhD (Mathematical Sciences)

See program listing for Mathematical Sciences under "Interdepartmental and Intercampus Programs."

The grade of R (research in progress) is a permanent grade. An incomplete (the grade of X) cannot be given in a course which is graded R. To receive credit for an R-graded course the student must continue to enroll in the course until a passing grade is received. Three-hour thesis and three- and six-hour dissertation courses are graded R/F only. The grade of P (required for graduation) can be received in six- or nine-hour thesis courses and nine-hour dissertation courses only. In the course listings below, R-graded courses are designated either "Graded P/F/R" or "Graded R." (See also the section entitled "R" GRADE in this catalog.)

COMPUTER SCIENCE ENGINEERING (CSE)

5300. INTRODUCTION TO PROGRAMMING (3-0). Introduction to computer programming. Structured design and programming techniques will be emphasized. \$25 computer fee.

5301. ASSEMBLY AND C LANGUAGES (3-0). Accelerated course for students entering the graduate computer science program. Includes a study of IBM and VAX machine language instruction sets, assembly language programming, and the C high level language. Prerequisite: CSE 5300 or other appropriate introductory programming course, or consent of instructor. \$25 computer fee.

5302. PROGRAMMING LANGUAGE CONCEPTS (3-0). Study and evaluation of concepts in programming language for modern computer systems. Programming projects are selected from string-based, symbolic, algorithmic, and object-oriented languages. Prerequisite: CSE 5310 or consent of instructor. \$25 computer fee.

5303. ARTIFICIAL INTELLIGENCE I (3-0). Introduction to the methods and concepts of artificial intelligence, including knowledge representation, search, theorem proving, planning, natural language processing, and study of the LISP language. Prerequisite: CSE 5310 or consent of instructor. \$25 computer fee.

5305. DESIGN AND CONSTRUCTION OF COMPILERS (3-0). Review of programming language structures, translation, and storage allocation. Introduction to context-free grammars and their description. Design and construction of compilers including lexical analysis, parsing and code generation techniques. Error analysis and simple code optimizations will be introduced. Prerequisites: CSE 5312, 5302, and 3302. \$25 computer fee.

5306. DESIGN OF OPERATING SYSTEMS (3-0). Hardware and software issues, algorithms and techniques used in constructing operating systems for modern computers. Includes memory, I/O, file, and processor management and scheduling. Topics of concurrency, synchronization, deadlock, paging, and virtual memory are covered. Prerequisite: CSE 5310 or consent of instructor. \$30 computer fee.

5307. COMPUTER NETWORKS (3-0). Study of communications architectures, protocols, and interfaces; communications networking techniques such as circuit switching, message switching, packet switching, broadcast network, and internetworking; OSI reference model and TCP/IP: Local networks, Arpanet, and ISDN. Prerequisite: CSE 5306 (or concurrent enrollment) or consent of instructor. \$30 computer fee.

5310. DATA STRUCTURES (3-0). Data structures and relationships among the forms of data structures and available processing algorithms are emphasized. Linked lists, stacks and queues, trees and graphs, and associated recursive and non-recursive traversal and sorting and searching algorithms are discussed. Topics include: AVL Trees, B-Trees, and hashing. Engineering trade-off evaluation of data structures and algorithms to solve specific problems are also covered. Prerequisite: CSE 5300 or consent of instructor. \$25 computer fee.

5311. DESIGN AND ANALYSIS OF ALGORITHMS (3-0). Techniques for analyzing upper bounds for algorithms and lower bounds for problems. Problem areas include: sorting, data structures, graphs, dynamic programming, combinatorial algorithms, organization of numerical computations, introduction to parallel models. Prerequisites: CSE 5310, MATH 5355 or equivalent, or consent of instructor. \$25 computer fee.

5312. FORMAL METHODS: SOFTWARE SYSTEMS (3-0). Abstractions used to build correct, reliable, and efficient systems. Formal techniques for specifying abstractions and for defining hierarchies of abstractions; operational and definitional specification languages; state transition and applicative models of computation, regular expressions and context-free languages; formal logic and proof techniques as they relate to computer science. Prerequisite: MATH 3314 or consent of instructor. \$25 computer fee.

5313. FORMAL METHODS: COMPUTER SYSTEMS (3-0). Mathematical formalisms needed for advanced studies in the area of computer systems. Reviews probability and transform theory. Covers pertinent abstractions and algorithms from coding theory, graph theory, Petri-nets and stochastic processes. Prerequisites: IE 3301 and CSE 1442 (or MATH 3314), or consent of instructor. \$25 computer fee.

5314. COMPUTER SYSTEM PERFORMANCE EVALUATION (3-0). Queueing network models and simulation for studying computer system capacity planning, hardware selection and upgrade, and performance evaluation and tuning. Prerequisites: CSE 5306 and 5313, or consent of instructor. \$25 computer fee.

COMPUTER SCIENCE AND ENGINEERING

5315. ADVANCED COMPUTATIONAL METHODS FOR ENGINEERS AND SCIENTISTS I (3-0). Selected topics from the theory and practice of using automatic digital computers for approximating arithmetic operations, approximating functions, solving systems of linear and non-linear equations, computing eigen-values and solving ordinary and partial differential equations. Prerequisites: CSE 2303, 2304, 2306 or knowledge of a programming language, or consent of instructor. \$25 computer fee.

5316. MODELING AND SIMULATION (3-0). Study of techniques used for system modeling and simulation of discrete stochastic systems. Topics include modeling methods, model validation procedures, steady state solution techniques, variance reduction methods, distributed simulation, etc. Prerequisites: CSE 5301 and IE 5317, or consent of instructor. \$25 computer fee.

5324. SOFTWARE ENGINEERING I: ANALYSIS, DESIGN, AND CREATION (3-0). Definitions, basic concepts, motivation, and goals of software engineering to methods to write requirements and specifications; methods to decompose and design systems; approaches to verification and validation; issues of software reuse and software reliability; team project. Prerequisites: CSE 5312 (or concurrent enrollment) and CSE 5310, or consent of instructor. \$25 computer fee.

5325. SOFTWARE ENGINEERING II: PROJECT MANAGEMENT, MAINTENANCE, AND METRICS (3-0). Models for system design and project organization including: cost estimation, scheduling, distribution of effort, and risk analysis; verification and validation; software metrics; maintenance issues; software reuse and reliability; team project. Prerequisites: CSE 5324 and 5306 or consent of instructor. \$25 computer fee.

5328. SOFTWARE DEVELOPMENT STUDIO I (1-2). Apply the knowledge and skills gained in other software engineering courses as they synthesize a solution to a significant, realistic, and ultimately practical problem, and carry out a team project including proposal writing, problem analysis, software requirements specification, software project planning, and preliminary software design. Prerequisite: CSE 5325 (or concurrent enrollment), or consent of instructor. \$25 computer fee.

5329. SOFTWARE DEVELOPMENT STUDIO II (1-2). Continuation of CSE 5328 to carry out the team project to include detailed software design, implementation, software quality assurance, software testing, integration, and demonstration. Prerequisite: CSE 5328. \$25 computer fee.

5330. DATABASE SYSTEMS I (3-0). Database system architecture; file structures for databases, including indexing, hashing, and B+-trees; the relational model and algebra; the SQL database language; network database systems; Entity-Relationship data modeling; advanced data modeling concepts; functional dependencies and basic normalization. Prerequisite: CSE 5310 or consent of instructor. \$25 computer fee.

5331. DATABASE SYSTEMS II (3-0). Relational database design theory; relational calculus; database system implementation techniques, including concurrency control, recovery, atomic commitment, and query optimization; security of databases; introduction to object-oriented, deductive, and distributed databases. Prerequisites: CSE 5311, 5330, and 5312, or consent of instructor. \$25 computer fee.

5342. MICROCOMPUTER SYSTEMS II (2-3). Advanced studies in the design and implementation of microprocessor/microcomputer based systems. Emphasis will be on the application of state-of-the-art devices and components to real-time, interactive, and/or embedded systems. Prerequisite: CSE 5441 or consent of instructor. \$30 laboratory fee.

5345. VLSI SYSTEMS DESIGN (3-0). Analysis and design of MOS digital circuits as used in VLSI. Circuit simulation, logic simulation and timing analysis of MOS digital circuits. Use of HDL's such as VHDL as a simulation tool. Techniques for subsystem design using mask geometry manipulation systems, gate array based designs, design of testable circuits, and complexity of area time tradeoffs. Prerequisites: CSE 5440 and 4315, or consent of instructor. \$30 computer fee.

5350. COMPUTER ARCHITECTURE, MEMORY SYSTEMS, AND PIPELINE PROCESSING (3-0). A study of advanced uniprocessor and basic multiprocessor systems. Topics include microprogramming, memory management systems, pipelined processors, array and vector processors, and introduction to architecture of multiprocessor systems. Prerequisites: CSE 5306 and 5440, or consent of instructor. \$25 computer fee.

5351. PARALLEL PROCESSING (3-0). Covers the theory and practice of parallel processing. Theoretical topics include: abstract models and algorithms for shared memory computation (PRAM); algorithms for various topologies such as meshes and hypercubes; efficiency and speedup analysis. Problem areas include data structures, numerical methods, graphs, combinatorics. Practical topics include synchronization, routing, scheduling, parallelizing serial computations, programming languages. Includes program-

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ming exercises using one or more concurrent programming languages, on one or more parallel computers. Prerequisite: CSE 5306 or consent of instructor. \$30 computer fee.

5360. ARTIFICIAL INTELLIGENCE II (3-0). Continuation of artificial intelligence methods and techniques, including expert systems, machine learning, distributed AI, truth maintenance, uncertainty reasoning, and study of the PROLOG language. Prerequisite: CSE 5303 or consent of instructor. \$25 computer fee.

5361. NATURAL LANGUAGE PROCESSING (3-0). Computer techniques for processing natural language; view of current state of natural language processing as a subfield of AI. Prerequisites: CSE 5303 and 5312 or consent of instructor. \$25 computer fee.

5362. EXPERT SYSTEMS (3-0). Consideration of techniques used in the construction of expert systems; examination of existing systems. Prerequisite: CSE 5360 or equivalent or consent of instructor. \$25 computer fee.

5365. COMPUTER GRAPHICS (3-0). Input/output devices and programming techniques suitable for the visual representation of data and images. Prerequisites: MATH 1325 and CSE 5311 (or concurrent enrollment), or consent of instructor. \$30 computer fee.

5366. SIGNAL PROCESSING (3-0). Basic theoretical methods for processing digital signals are presented. Topics include: Sampling theorem, correlation and convolution, difference equations, Fourier transform, Z transform, and design of digital filters. Prerequisite: consent of instructor. \$25 computer fee.

5368. NEURAL NETWORKS (3-0). Theoretical principles of neurocomputing. Learning algorithms, information capacity, and mapping properties of feedforward and recurrent networks. Different neural network models will be implemented and their practical applications discussed. Prerequisites: MATH 3318 and CSE 5300, or consent of instructor. \$25 computer fee.

5191, 5291, 5391. INDIVIDUAL STUDY IN COMPUTER SCIENCE. Topics dealing with special problems in Computer Science on an individual instruction basis. May be repeated for credit. Prerequisite: consent of instructor. May be graded P/F. Graded R. \$25 computer fee.

5392. TOPICS IN COMPUTER SCIENCE (3-0). May be repeated for credit when the topics vary. Prerequisite: graduate standing and consent of instructor. \$25 computer fee.

5395. MASTER'S PROJECT. Non-thesis master's degree candidates are required to take prior to graduation. Prerequisite: consent of instructor and Graduate Advisor. Graded P/F/R. \$25 computer fee.

5197, 5297, 5397. GRADUATE SEMINAR. Presentation by graduate students, faculty members, and visiting researchers. Preparation of research papers. Prerequisite: graduate standing. Graded P/F only. \$10 computer fee.

5398 or 5698. THESIS. Prerequisite: graduate standing in computer science and consent of instructor. 5398 graded R/F only; 5698 graded P/F/R. \$30 computer fee.

5440. DIGITAL LOGIC AND COMPUTER ORGANIZATION (3-3). A design intensive course focusing on digital logic and conventional (von Neumann) computer organization; digital logic design, design of instruction sets, microprogrammed and hardwired control units, design of ALU, memory organizations, and design of input/output processors. Prerequisite: CSE 5301 or consent of instructor. \$30 lab fee.

5441. MICROCOMPUTER SYSTEMS I (3-3). Design and application of microcomputer systems. Emphasis will be on system and component architectures, programming, interfacing, A/D and D/A conversion, and basic applications. Prerequisite: CSE 5440 or consent of instructor. \$30 lab fee.

6306. ADVANCED OPERATING SYSTEMS (3-0). Formal models, analysis, and issues of modern distributed and centralized computer operating systems. Topics of determinacy, synchronization, deadlock, virtual memory are covered at an advanced level. Topic areas of security and language mechanisms for concurrency are also covered. Prerequisite: CSE 5306 or consent of instructor. \$25 computer fee.

6312. ADVANCED FORMAL METHODS (3-0). Advanced mathematical models and their application to new areas in software and systems, including specification models and verification methods; formalization of system and development concepts and its analysis capability to facilitate the development and automation of quality software. Prerequisite: CSE 5312 or consent of instructor. \$25 computer fee.

6324. ADVANCED TOPICS IN SOFTWARE ENGINEERING (3-0). May be repeated for credit when topics change. Prerequisite: CSE 5325 (or concurrent enrollment), or consent of instructor. \$25 computer fee.

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6325. REAL-TIME SYSTEMS DESIGN (3-0). Specification, design, and analysis of real-time systems including real-time logics and decidability of real-time conditions; real-time scheduling approaches, and schedulability analysis, system requirement specifications and languages; procedural and object-oriented methods; specialized analysis techniques for distributed and for control applications. Class project using object-oriented analysis, design and object-oriented languages. Prerequisites: CSE 5325 and 5312, or consent of instructor. \$25 computer fee.

6330. DISTRIBUTED DATABASES (3-0). Distributed database systems in the homogeneous, heterogeneous, and multi-database environments; distributed database architecture and design, including transaction models, distributed query optimization, recovery, reliability, and concurrency control; data fragmentation, replication, and allocation. Prerequisites: CSE 5331 and 5306, or consent of instructor. \$25 computer fee.

6331. ADVANCED TOPICS IN DATABASE SYSTEMS (3-0). May be repeated for credit when topics change. Prerequisites: CSE 5331 and consent of instructor. \$25 computer fee.

6345. DESIGN AUTOMATION OF DIGITAL SYSTEMS (3-0). Design automation systems for synthesis from RTL. Techniques for developing compilers and rule checkers. Design methods using gate arrays and systolic arrays. Placement, routing and design for testability. Emphasis will be on designing a digital system from a high level description, such as SDL/HDL. Prerequisite: CSE 5345 or consent of instructor. \$25 computer fee.

6346. COMPUTER-AIDED DESIGN SYSTEMS (3-0). Requirements, methodologies, and the design of CAD and CAE systems, including both hardware and software design. Interactive computer graphics techniques and the use of graphics-oriented VLSI chip sets will be investigated and implemented. Prerequisites: CSE 5365 and 5341, or consent of instructor. \$30 computer fee.

6350. ADVANCED TOPICS IN COMPUTER ARCHITECTURE (3-0). May be repeated for credit when topics change. Prerequisites: CSE 5350 and consent of instructor. \$25 computer fee.

6351. TOPICS IN PARALLEL AND DISTRIBUTED COMPUTING (3-0). May be repeated for credit when topics change. Prerequisites: CSE 5350, 5351, or consent of instructor. \$25 computer fee.

6352. FAULT-TOLERANT COMPUTING (3-0). Design and analysis of fault-tolerant computing systems with emphasis on hardware and software redundancy techniques. Fault detection, fault isolation, recovery, reliability and availability estimation. Other topics include distributed self-testing and diagnostics, and algorithm-based techniques. Prerequisites: CSE 5313 and 5350, or consent of instructor. \$25 computer fee.

6362. ADVANCED TOPICS IN ARTIFICIAL INTELLIGENCE (3-0). May be repeated for credit when the topic changes. Prerequisites: CSE 5303 and 5360, and consent of instructor. \$25 computer fee.

6363. MACHINE LEARNING (3-0). A detailed investigation of current machine learning theory and methodologies. Covers the background and basics of machine learning, including representation, inductive bias and performance evaluation. Analyzes and compares different machine learning methodologies, including statistical, connectionist, symbolic and optimization, and presents theoretical results for comparing methods and determining what is learnable. Current issues in machine learning research and alternative learning methods will also be examined. Prerequisite: CSE 5360 or consent of instructor. \$25 computer fee.

6366. DIGITAL IMAGE PROCESSING (3-0). Digitization and coding of images, characterization and representation of digital images in spatial and frequency domain, picture restoration and enhancement, filtering of two-dimensional signals, image reconstruction. Prerequisite: CSE 5366 or equivalent, or consent of instructor. \$25 computer fee.

6367. COMPUTER VISION (3-0). Advanced techniques for interpretation, analysis, and classification of digital images. Topics include methods for segmentation, feature extraction, recognition, stereo vision, 3-D modeling, and analysis of time-varying imagery. Also taught as EE 6358. Prerequisite: CSE 6366 or EE 5356 or EE 5357, or consent of instructor. \$25 computer fee.

6192, 6292, 6392. SPECIAL TOPICS IN ADVANCED COMPUTER SCIENCE. May be repeated for credit when the topics vary. Prerequisites: graduate standing and consent of the instructor. \$25 computer fee.

6197-6997. RESEARCH IN COMPUTER SCIENCE. Individually supervised research projects. Graded P/F/R. Prerequisites: graduate standing in computer science, consent of instructor, and approval of Graduate Advisor. \$25 computer fee.

6399, 6699, 6999. DISSERTATION. Preparation of dissertation in computer science or computer science and engineering. See also the section on interdepartmental and intercampus programs for students in the PhD program in mathematical sciences. 6399 and 6699 graded R/F only; 6999 graded P/F/R. Prerequisite: consent of instructor. \$30 computer fee.

Program in CRIMINAL JUSTICE

See Interdepartmental and Intercampus Programs.

Department of ECONOMICS

Areas of Study

Economics

Business Administration (see Interdepartmental and Intercampus Programs.)

Degrees

M.A.

M.B.A., Ph.D.

Master's Degree Plans: Thesis and Non-Thesis

Acting Chair: Lawrence F. Ziegler

309-C Business 273-3061

Graduate Advisor: P.M. Hayashi

319 Business 273-3257

Graduate Faculty:

Professors Amacher, Carney, Furubotn, Hayashi, Holland, Martin, Meiners,
Mullendore, Ziegler

Associate Professors Himarios, McCall

Assistant Professors Crowder, Fleissig, Smythe

OBJECTIVE

The general purpose of the Master of Arts in economics program is to provide students an opportunity to obtain a better understanding of the economic aspects of modern society and a greater depth of training in the discipline of economic science than is possible in a baccalaureate degree program. Specific objectives of the program are to prepare students for careers in government, business, research, and teaching and for further graduate study.

Economics is one of the areas a student may choose to study in the Doctor of Philosophy in Business Administration program. Additional information concerning the doctoral program is presented in the catalog under the heading Administration.

DEGREE REQUIREMENTS

Applicants meeting the general admission requirements of the Graduate School, including a satisfactory score on either the Graduate Record Examination or the Graduate Management Admission Test, may be admitted unconditionally to the program. Other applicants may be admitted if approved by the Graduate Advisor in economics and the Graduate Dean. Applicants admitted but not having 12 semester hours of advanced courses in economics or not meeting prerequisite requirements for core courses are admitted subject to conditions assessed by the Graduate Advisor in economics.

Master's Degree with Thesis: A minimum of 30 semester hours is required. The core requirement is ECON 5310, 5312, 5336, and the thesis (for which a six hour credit is received). Six hours of electives in

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economics must be chosen. The remaining nine hours of electives may be a combination of courses in economics or in a minor field. A maximum of nine hours of advanced undergraduate courses may be taken for graduate credit, with the approval of the Graduate Advisor. Not more than six hours of such courses may be in either the major or the minor field.

Master's Degree, Non-thesis: The non-thesis degree option is designed for students who will enter the job market upon completion of the MA degree in economics. This degree plan requires a minimum of 36 semester hours, including a core of ECON 5310, 5312, 5336 and 5329. The total may include up to 12 semester hours in supporting subjects with the approval of the Graduate Advisor. A maximum of nine semester hours of advanced undergraduate work may be taken for graduate credit, with the approval of the Graduate Advisor. Successful completion of ECON 5329 satisfies the Graduate School requirement of a final master's examination.

The grade of R (research in progress) is a permanent grade. An incomplete (the grade of X) cannot be given in a course which is graded R. To receive credit for an R-graded course the student must continue to enroll in the course until a passing grade is received. Three-hour thesis and three- and six-hour dissertation courses are graded R/F only. The grade of P (required for graduation) can be received in six- or nine-hour thesis courses and nine-hour dissertation courses only. In the course listings below, R-graded courses are designated either "Graded P/F/R" or "Graded R." (See also the section entitled "R" GRADE in this catalog.)

ECONOMICS (ECON)

5301. MATHEMATICS FOR ECONOMISTS (3-0). Designed to upgrade mathematical skills for graduate work in economics and business. May not be counted as a graduate course in economics or an MBA foundation course or elective. Prerequisite: college algebra or equivalent.

5305. ENVIRONMENTAL LAW & POLICY (3-0). Evolution of environmental law and policy; reviews primary environmental laws; Clean Air Act, Clean Water Act, Superfund, RCRA, and Endangered Species Act and their impact on the economy and environment.

5306. ENVIRONMENTAL ECONOMICS (3-0). This course examines economic theory and practice as it applies to environmental regulation, policy, and management. Prerequisite: ECON 5309 or equivalent.

5309. ECONOMIC ANALYSIS I (3-0). Accelerated course in fundamental economic analysis for students enrolled in graduate programs other than the Master of Arts in economics. Basic analytical concepts of price theory and application to managerial decisions developed. Includes the theory of consumer behavior, theory of the firm, and market structure. Non-credit for MA in Economics.

5310. MICROECONOMIC THEORY (3-0). Theories of consumer choice and of the firm; marginal productivity and functional distribution; general equilibrium of production, consumption, and exchange.

5311. ECONOMIC ANALYSIS II (3-0). Develops understanding of macroeconomic environment within which each person must earn a living. Integration of business, government, monetary, international factors within context of inflation, productivity, growth. Non-credit for MA in Economics.

5312. MACROECONOMIC THEORY (3-0). Study of the aggregate approach to the economy and the tools of analysis used for the solving of national economic problems.

5313. MANAGERIAL ECONOMICS (3-0). Application of economic analysis in formulating business decisions, drawing upon the theoretical foundations of the concepts of demand, cost, production, profits, and competition, with special emphasis on case studies. Prerequisite: ECON 5309 or equivalent. \$10 computer fee.

5314. INDUSTRIAL ORGANIZATION (3-0). Economic theories of firm and industry behavior, include the organization of the firm, oligopoly behavior, strategic entry deterrence, mergers and acquisitions, and technological competition. Prerequisite: ECON 5309.

5315. INSTITUTIONAL ANALYSIS & COMPARATIVE ECONOMIC SYSTEMS (3-0). Economic systems using New Institutional Economics. Attention to performance and efficiency of alternative systems; explains failure of socialist institutions; identifies obstacles confronting former communist countries; and projects the possible economic forms for emerging nations. Prerequisite: ECON 5309 or equivalent.

- 5316. MATHEMATICAL ECONOMICS I (3-0).** Mathematical methods useful in economic analysis; topics include constrained and unconstrained optimization problems, comparative statics and application to economic models. Prerequisites: ECON 5301, 5309, and 5311 or the equivalent.
- 5317. MATHEMATICAL ECONOMICS II (3-0).** Mathematical methods for economic dynamics and other advanced topics, including difference and differential equations, introduction to control theory, and their application to dynamic modelling. Prerequisite: ECON 5316 or equivalent.
- 5319. ECONOMIC ANALYSIS OF INTERNATIONAL BUSINESS (3-0).** Application of economic theory to the conduct of international business. Topics include emergence and operation of international business and the multinational corporation; analysis of the economic, financial, and political environment in which international business is conducted; political economy of the regulation of international business.
- 5320. ECONOMICS OF ORGANIZATION AND MANAGEMENT STRATEGY (3-0).** Economic perspective for business decisions concerning organization and management strategy, transaction costs, organization theory, joint ventures, strategic alliances, game theory, entry deterrence, and R&D rivalry. Prerequisite: ECON 5309 or equivalent.
- 5321. INTERNATIONAL ECONOMICS (3-0).** In-depth examination of the factors responsible for international specialization and exchange. Commercial policy questions also stressed. Prerequisites: ECON 5309 and 5311 or equivalent.
- 5327. INTERNATIONAL FINANCE AND OPEN ECONOMY MACROECONOMICS (3-0).** Study of international money and capital markets. Determination of output, balance-of-payments and exchange rates under different monetary and exchange rate regimes. Exchange rate intervention by central banks and exchange rate systems in developing countries are also discussed. Prerequisite: ECON 5311 or equivalent.
- 5328. INSTITUTIONAL ORGANIZATION AND BEHAVIOR (3-0).** Systematic study of the effects of institutional arrangements on economic behavior, property-rights/transactions-cost analysis applied to selected problems; consideration of the role of contractual obligations in business, principal-agent theory, alternative concepts of economic efficiency. Prerequisite: ECON 5309 or equivalent.
- 5329. RESEARCH METHODS IN APPLIED ECONOMICS (3-0).** Research problems and methods most commonly encountered by economists in industry and government; specific research projects required in applied areas such as corporate planning, utility rate analysis, manpower planning, micro and macro forecasting, etc.; emphasis on practical research methods and on the presentation of results in coherent written reports. Prerequisites: ECON 5310, 5312, and 5336. \$15 computer fee.
- 5330. ADVANCED LABOR ECONOMICS (3-0).** Economic analysis of the supply of labor, the allocation of labor among alternative uses, investment in human capital, the extent and incidence of unemployment, and the determination of wages. Prerequisite: ECON 5309 or equivalent.
- 5332. TRANSPORT ECONOMICS (3-0).** Characteristics, underlying economic principles, effective management of various transport modes. Function of transportation systems, logistics systems. Effective administration within regulated environment. Spatial element introduced to analysis. Contemporary developments, dynamic issues. Prerequisite: ECON 5309 or equivalent.
- 5333. ECONOMICS OF HEALTH (3-0).** Employment of economic theory to analyze the health sector and consider problems such as rising prices and maldistribution of resources. Topics include: methods of policy evaluation, impact of prospective payment and managed care, productivity, determinants of health. Prerequisite: ECON 5309 or equivalent.
- 5335. GOVERNMENT REGULATION OF BUSINESS (3-0).** Theory and practice of government regulation, including the rationale for government intervention, antitrust law and competition policy, regulation of natural monopolies, and effects of the deregulation movement. Prerequisite: ECON 5309.
- 5336. SEMINAR IN ADVANCED ECONOMETRICS I (3-0).** Generalized linear regression, time-series analysis, non-linear models, forecasting, system estimation with restrictions. Applications to economics and finance. Prerequisite: ECON 5336 or equivalent. \$15 computer fee.
- 5337. BUSINESS & ECONOMIC FORECASTING (3-0).** Econometric model-building and forecasting with applications to business and economics. Single equation models, multiple equation models, and time-series models are covered with emphasis on practical problems in analysis and forecasting. Prerequisite: BUSA 5301 or equivalent. \$15 computer fee.
- 5338. MODERN APPLIED TIME SERIES (3-0).** Univariate and multivariate time series; analysis of economic and financial data; out-of-sample forecasting using computer software. Autoregressive-moving

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average models, vector autoregression, unit roots, cointegration, ARCH and GARCH. Prerequisite: BUSA 5301 or equivalent.

5339. ECONOMICS AND UNCERTAINTY (3-0). Pure theory of risk and uncertainty, attitudes toward risk, measures of risk aversion and stochastic dominance as basis for studying random price, demand and production models of the firm; consumer saving and consumption. Prerequisite: ECON 5310.

5350. ECONOMIC FOUNDATIONS FOR THE SOCIAL SCIENCES I (3-0). Accelerated course in microeconomic analysis designed for those who are seeking master's degrees in other social sciences. Emphasizes the application of microeconomic theory to the study of current social problems, i.e., pollution, poverty, energy systems, etc. Non-credit for MA in Economics or MBA. Prerequisite: consent of the instructor.

5351. ECONOMIC FOUNDATIONS FOR THE SOCIAL SCIENCES II (3-0). Accelerated course in macroeconomic analysis designed for those seeking master's degrees in other social sciences. Emphasizes the application of macroeconomic theory to the solution of aggregate problems of the economic system, i.e., unemployment, inflation, growth, etc. Noncredit for M.A. in Economics or MBA. Prerequisite: consent of the instructor.

5382. INDEPENDENT STUDIES IN ECONOMICS. Extensive analysis of an economic topic. Prerequisite: consent of instructor and department chair.

5391. SPECIAL TOPICS IN ECONOMICS (3-0). In-depth study of selected topics in economics. May be repeated when topics vary. Prerequisite: consent of instructor.

5398, 5698, or 5998. THESIS. 5398 graded R/F only; 5698 and 5998 graded P/F/R. Prerequisite: permission of Graduate Advisor in economics.

6310. APPLIED MICROECONOMIC THEORY (3-0). Applications of advanced economic theory that explain and predict the behavior of individual households, business firms, and markets, and use of which substantially improves managerial decision-making in business and government; applications such as cost-benefit analysis, transfer pricing, and utility regulation. Prerequisites: ECON 5310 and 5316 or consent of instructor.

6312. APPLIED MACROECONOMIC THEORY (3-0). Applications of advanced economic theory that explain and predict the aggregate behavior of households, business firms, government, and markets, the use of which improves managerial decision-making in business and government; specific applications such as monetary and fiscal policy stimulation, forecasting, and estimation of the employment-inflation trade-off. Prerequisites: ECON 5312 and 5316 or consent of instructor.

6336. ADVANCED ECONOMETRICS (3-0). Advanced topics in econometrics, such as systems estimation with restrictions, time-series analysis, Bayesian econometrics, non-linear estimation and other special problems in econometrics. Prerequisite: ECON 5336 or equivalent. \$15 computer fee.

6337. SEMINAR IN ADVANCED ECONOMETRICS II (3-0). Detailed analysis of econometric techniques; statistical tests on computers. Time series topics — unit roots, cointegration, ARCH, GARCH. Testing for linear and non-linear restrictions. Includes Bayesian econometrics, nonparametrics, dynamics.

6392. RESEARCH IN ECONOMICS. Independent research under supervision of a faculty member. Prerequisite: consent of instructor.

Department of ELECTRICAL ENGINEERING

Area of Study

Electrical Engineering

Degrees

M.S., M.Engr., Ph.D.

Master's Degree Plans: Thesis and Non-Thesis

Chair: O. Robert Mitchell

518 Nedderman Hall

273-2672

Graduate Advisor: Sherman C. Reed

504 Nedderman Hall

273-2671

Graduate Faculty:

Professors Carter, Cash, Chen, Fitzer, Fung, Kondraske, Lewis, Magnusson, Manry, McElroy, Mitchell, Nunnally, Prabhu, Rao, Shoultz, Smith, Sobol, Yeung

Associate Professors Alavi, Bredow, Chwialkowski, Davis, Devarajan, Dillon, Klemmer, Lee, Lowy, Shieh

Assistant Professors Gordon, Maldonado, Tjuatja

Senior Lecturers Askew, Reed

Adjunct Professors Kozman, Wang

Adjunct Associate Professors Bu-Abbud, Mestha

OBJECTIVE

The course offerings provide the student with an opportunity to broaden as well as to intensify his or her knowledge in a number of areas of electrical engineering. The student, with the aid of a faculty advisor, may plan a program in any one of a number of fields of specialization within electrical engineering or from the offerings of related departments in science and engineering.

Graduate study and research are offered in the areas of:

1. Systems, Controls, Microprocessors; Nonlinear Modern Control, Robotics, Biomedical Signal Processing and Instrumentation.
2. Remote Sensing, Electromagnetic Fields, Propagation, Scattering, and Microwave Systems.
3. Optics, Electro-optics and Lasers.
4. Microelectronics and Semiconductors: Microwave, Millimeter-wave and Optoelectronic Devices and Integrated Circuits.
5. Digital Signal Processing, Digital Image Processing, Vision Systems, Neural Networks, and Flight Simulation.
6. Information Transmission and Communication Systems.
7. Energy Systems: Efficient Operation and Planning; Generation and Transmission, Conversion and Distribution.
8. Applied Physical Electronics: Pulse Electronics, High Power Optical Electronics, Laser Applications and Diagnostics.
9. Manufacturing Engineering: Robotics, Automation, Control, Data Management, Economics, and Instrumentation as applied to Manufacturing.

The program is designed to satisfy the needs of students pursuing master's and doctoral degrees and to provide for the student seeking to increase knowledge in areas of electrical engineering related to engineering practice.

DEGREE REQUIREMENTS

Students wishing to major in electrical engineering at the graduate level should have the Bachelor of Science degree in electrical engineering from an approved school. Applicants with degrees in other closely

ELECTRICAL ENGINEERING

related disciplines may qualify for graduate study in electrical engineering after completion of a faculty-approved program of leveling courses.

Degree requirements for master's degrees are described in the general catalog section on degree offerings/requirements. M.S. degree candidates' degree plans in electrical engineering may include up to nine credit hours of supporting courses in areas other than electrical engineering. M.Engr. candidates may include up to 12 credit hours outside of the department.

The PhD degree is a research degree. Degree requirements for the Doctoral degree are described in the general catalog section on degree offerings/requirements. Specific information may be obtained by contacting the Graduate Advisor.

Candidates for the MS, MEngr, and PhD degrees whose native language is not English must have a minimum Test of Spoken English (TSE) score of 225. Certification for graduation may be obtained via remedial work if the minimum is not met. Students whose native language is not English who have not taken the TSE must attempt the TSE prior to the end of their second semester.

CONTINUATION

The Electrical Engineering Graduate Program, in fulfillment of its responsibility to graduate highly qualified professional engineers, has established certain policies and procedures. In addition to the requirements of the Graduate School listed elsewhere, to continue in the program each electrical engineering graduate student must maintain at least a B (3.0) GPA in all electrical engineering coursework and at least a B (3.0) GPA in all coursework.

The grade of R (research in progress) is a permanent grade. An incomplete (the grade of X) cannot be given in a course which is graded R. To receive credit for an R-graded course the student must continue to enroll in the course until a passing grade is received. Three-hour thesis and three- and six-hour dissertation courses are graded R/F only. The grade of P (required for graduation) can be received in six- or nine-hour thesis courses and nine-hour dissertation courses only. In the course listings below, R-graded courses are designated either "Graded P/F/R" or "Graded R." (See also the section entitled "R" GRADE in this catalog.)

ELECTRICAL ENGINEERING (EE)

CORE COURSES IN ELECTRICAL ENGINEERING

5301. ADVANCED ENGINEERING ANALYSIS (3-0). Selected analytical methods dealing with topics such as complex analysis, vector spaces, Hilbert spaces, matrices, transform methods, and partial differential equations.

5302. RANDOM SIGNALS AND NOISE (3-0). Probability, random variables, and stochastic processes in physical systems. Topics include probability space, discrete and continuous random variables, density and conditional density functions, functions of random variables, mean-square estimation, random signals, system response, optimum system design, and Markov processes.

5303. APPLIED PHYSICAL ELECTRONICS (3-0). Introduction to physical electronics and space power applications. Charged particle dynamics, superconductivity, lasers and masers, power tubes, electromagnetic thrusters, conduction in the space environment, particle accelerators, and electromagnetic launchers will be studied. Prerequisite: EE 3319 or consent of instructor.

5304. NETWORK SYNTHESIS (3-0). Introduction to network synthesis of circuits using lumped linear, passive circuit elements. Topics include realizability theory, synthesis of driving point impedances and two port circuits, and Hilbert Transforms. \$10 computer fee.

5305. ADVANCED ELECTRONICS (3-0). Advanced study of solid-state devices and integrated circuits: Design, modeling, analysis and simulation techniques. Integrated circuit devices, biasing, gain stages and active loads, digital and analog design, operational amplifiers, wideband amplifiers, modulators, timers and oscillators, phase-locked loops, filters and converters. \$10 computer fee.

5306. ELECTROMAGNETIC THEORY (3-0). Advanced study of electromagnetic theory, its content, methods, and applications. Topics include theorems in electromagnetic theory, cylindrical and spherical wave functions, perturbational and variational techniques, scattering, and diffraction. Prerequisite: EE 3319 or consent of instructor. \$10 computer fee.

5307. LINEAR SYSTEMS ENGINEERING (3-0). Modern linear systems theory. Topics include state-space description of dynamic systems, similarity transformation, state feedback, state observers, and matrix fraction description of multivariable systems.

5308. POWER SYSTEM ANALYSIS (3-0). Presents the fundamental concepts of power system modeling and reviews the present status of power system modeling and simulation. Power system characteristics, and the application of simulation techniques to power system planning and operation. Prerequisite: EE 4301 or consent of instructor. \$10 computer fee.

5309. TOPICS IN ELECTRICAL ENGINEERING (3-0). Material may vary from semester to semester. Topics are selected from current areas of electrical engineering interest. May be repeated when topic changes.

MICROPROCESSORS AND DIGITAL SYSTEMS

5310. ADVANCED LOGIC CIRCUITS (3-0). Switching theory and logical design, with emphasis on sequential machines and digital system implementation using integrated circuits. \$10 computer fee. \$15 lab fee.

5311. DIGITAL COMPUTER DESIGN (3-0). Organization and design of digital computer systems and subsystems, using MSI and bit-slice devices. Prerequisite: EE 5310.

5313. MICROPROCESSOR SYSTEMS (3-0). Hardware and software development techniques for industry standard 16-bit and 32-bit microprocessors, and numerical co-processors. Topics include programmable I/O devices, disk controllers, and graphics engines. Prerequisite: EE 3310 or consent of instructor. \$10 computer fee.

5314. ADVANCED MICROPROCESSORS (3-0). Study of advanced microprocessors including 32-bit CISC and 64-bit RISC processors from Intel, Motorola, AMD and IBM. The design concepts, performance, and architectural limitations of RISC and CISC families of microprocessors will be compared based on detailed analysis of the selected devices. Prerequisite: EE 5313 or consent of instructor.

5315. SPECIAL PURPOSE MICROPROCESSORS (3-0). Device architectures and various aspects of hardware and software design presented for dominant families of digital signal processors (DSPs), transputers, and microcontrollers. Special attention given to problems related to real-time acquisition and processing of analog data (audio, video, RF, etc.), including state-of-the-art data conversion hardware. Prerequisite: EE 5313 or consent of instructor. \$10 computer fee.

5319. TOPICS IN DIGITAL SYSTEMS (3-0). Formal instruction in selected topics in digital systems and microcomputers. May be repeated when topic changes.

SYSTEMS AND CONTROLS

5320. DIGITAL CONTROL SYSTEMS (3-0). Analysis of discrete dynamic systems described by difference equations. Z-transform theory. Applications of signal flow graph theory. Prerequisite: EE 4314 or equivalent. \$10 computer fee.

5321. OPTIMAL CONTROL THEORY (3-0). Techniques in design of optimal control systems, including performance measures, dynamic programming, calculus of variations and Pontryagin's minimum principles. Prerequisite: EE 5307 or consent of instructor.

5322. OPTIMAL ESTIMATION THEORY (3-0). Optimal filtering for discrete-time and continuous-time dynamical systems with noise. Relation to Wiener filtering. Kalman filter design and implementation issues. Prerequisites: EE 5302 and 5307, EE 5320 or consent of instructor.

5325. ROBOTICS (3-0). Principles of kinematics, dynamics, and control of industrial robots. Inverse kinematics, velocities, and forces. Path planning and trajectory generation. Position, force, and hybrid control of robots. Also taught as ME 5337. Prerequisite: EE 4314 or consent of instructor. \$10 computer fee.

5328. PRINCIPLES OF INSTRUMENTATION AND MEASUREMENTS (3-0). Design of instrumentation systems. Both digital and analog techniques are covered. Topics include signal conditioning, data acquisition, microprocessor based control, and transduction principles.

5329. TOPICS IN SYSTEMS (3-0). Formal instruction in selected topics in systems engineering, such as advanced controls, systems performance, graphics subsystems design, robotics, and computer vision. May be repeated when topic changes.

6321. ADAPTIVE CONTROL SYSTEMS (3-0). Adaptive control of systems including self tuning regulators, model reference adaptive control, and gradient methods. Methods include Lyapunov and

ELECTRICAL ENGINEERING

hyperstability applied to continuous and discrete time systems. Computer simulation is included. Prerequisite: EE 5307 and EE 5321 or consent of instructor. \$10 computer fee.

6322. NONLINEAR CONTROL (3-0). Advanced concepts of nonlinear system stability. In-depth study of Lyapunov stability techniques with LaSalle's extension, feedback linearization, sliding mode theory, and describing functions. Applications of nonlinear techniques to control systems design. Prerequisite: EE 5307.

6325. ROBOTIC CONTROL (3-0). Analysis and computer simulation of robots, properties of the nonlinear robot dynamics. Control system design using Lyapunov techniques, robust design, sliding mode. Prerequisites: EE 4314, 5307, and 5325. \$10 computer fee.

ELECTROMAGNETIC FIELDS, MICROWAVE SYSTEMS, OPTICS

5331. MICROWAVE SYSTEMS ENGINEERING (3-0). Topics include the radar range equation, pulse, chirp, Doppler and FM-CW radars; scattering cross-sections; synthetic aperture radar; and polarimetric radar concepts. Prerequisite: EE 3319 or consent of instructor.

5332. ANTENNA SYSTEM ANALYSIS (3-0). Fundamental study of antennas and antenna design techniques. Topics include numerical analysis of wire antennas; aperture antennas; geometrical theory of diffraction; horns and reflector antennas; and antenna synthesis and measurements. Prerequisite: EE 4327 or consent of instructor. \$15 computer fee.

5333. WAVE PROPAGATION AND SCATTERING (3-0). The basic principles and techniques of electromagnetic wave propagation and scattering. Wave propagation problems include waves in inhomogeneous and layered media, periodic structures, and dispersive and anisotropic media. Scattering problems include scattering by simple objects such as spheres and ellipsoids. Inverse scattering problems include tomography, holography, and physical optics. Prerequisite: EE 5306 or consent of instructor. \$10 computer fee.

5335. CRYSTAL OPTICS (3-0). Light propagation in various birefringent (anisotropic) optical media with particular emphasis on electro-optic, photorefractive, and acousto-optic temporal and spatial modulation. The design, analysis, and applications of birefringent and electro-optic devices for communications and signal processing. Prerequisite: EE 3319 or consent of instructor.

5336. INTEGRATED OPTICS (3-0). Theory and techniques of integrated optics including optical waveguiding, coupling, modulation, semiconductor lasers, grating diffraction, detection, and integrated systems. Prerequisite: EE 3319 or consent of instructor. \$15 computer fee.

5337. FOURIER OPTICS AND HOLOGRAPHY (3-0). Theory of Fourier optics and holography including scalar diffraction theory, Fresnel and Fraunhofer diffraction, Fourier transforming properties of lenses, optical imaging systems, spatial filtering, and the theory and applications of holography. Prerequisite: EE 3319 or consent of instructor. \$15 computer fee.

5338. OPTICAL ELECTRONICS (3-0). The theory and techniques of optical electronics, including propagation of light rays and Gaussian beams, optical resonators, laser theory and applications, harmonic generation and parametric oscillation, electro-optic effect, and phase conjugation. Prerequisite: EE 3319 or consent of instructor.

5339. TOPICS IN ELECTROMAGNETICS (3-0). Formal instruction in electromagnetics. May be repeated when topic changes.

HIGH FREQUENCY MICROELECTRONIC DEVICES AND CIRCUITS

5340. SEMICONDUCTOR DEVICE THEORY I (3-0). Quantum mechanics applicable to semiconductor theory. Fundamentals of crystalline solids. Energy band theory, density of states, and effective mass theory. Intrinsic and extrinsic semiconductors, equilibrium statistics for electrons and holes. Transport, generation, and recombination of excess carriers. Device equations and physics. Theory, fabrication, and performance of p-n and Schottky diodes. Prerequisite: consent of instructor. \$10 computer fee.

5341. SEMICONDUCTOR DEVICE THEORY II (3-0). Continuation of 5340. In-depth review of semiconductor fundamentals. Two and three terminal devices including multijunction and interface devices. Heterostructure physics, fabrication and devices. Dielectric and optical properties. Scattering processes and high electron mobility transistors. High frequency and high speed devices. Optoelectronic devices including lasers, modulators, and detectors. Prerequisite: EE 5340 or consent of instructor. \$10 computer fee.

5342. QUANTUM WELL LASERS (3-0). Introduction to semiconductor heterostructures and quantum wells. Quantum theory of optical processes and laser operation. Threshold, spectral, and dynamical

behavior. Modern laser structures and technologies, including strained-layer and surface emitting lasers. Prerequisite: EE 5340 or consent of instructor. \$15 computer fee.

5343. INTEGRATED CIRCUIT FABRICATION TECHNOLOGY (2-3). Fundamentals of integrated circuit fabrication processes: crystal growth, thermal oxidation, dopant diffusion/implantation, thin film deposition/etching, and lithography. Introduction of process simulators such as SUPREM. Hands-on experience in the fabrication and characterization of resistors, MOS capacitors, junction diodes, and MOSFET devices. Prerequisite: EE 4320, 4329, or 5340. \$30 lab fee. \$10 computer fee.

5344. GaAs INTEGRATED CIRCUIT TECHNOLOGY (3-0). Design and fabrication of gallium arsenide (GaAs) monolithic microwave integrated circuits (MMICs) for use in analog microwave applications. Review of RF/microwave circuit concepts as applied to MMIC design. GaAs device operation, fabrication and process techniques for MESFETs, HEMTs, HBTs and others. MMIC design based on commercial foundry processes. Prerequisite: EE 4339 or 4326, or consent of instructor.

5345. ELECTRONICS MANUFACTURING (3-0). Advanced study of electronic and semiconductor integrated circuit manufacturing. Process design, control, modeling, simulation, measurements, testing, and diagnostics. Yield analysis, modeling, and management. Product design for manufacturability, testing, quality, and reliability. Prerequisite: EE 5343 or consent of instructor. \$30 computer fee.

5346. MICROWAVE DEVICES (3-0). Device physics and applications of microwave semiconductor devices and vacuum tubes. Topics include varactors, PIN diodes, avalanche devices, Gunn effect devices, transistors, traveling wave tubes, klystrons, and other active and passive devices. Prerequisite: EE 4329 or 5340 or consent of instructor. \$10 computer fee.

5347. MICROWAVE CIRCUITS (3-0). Theory of microwave circuit design; techniques include use of Kuroda identities, Richard's transformation, and ABCD parameters; topics include design of couplers, transformers, filters, and resonators in coaxial lines, strip lines, and microstrip. Prerequisite: EE 4445 or 4339 or consent of instructor. \$10 computer fee.

5348. RADIO-FREQUENCY CIRCUIT DESIGN (3-0). Design of lumped-element radio-frequency circuits operating at frequencies to 1 GHz. Impedance-matching, s-parameter design of amplifiers and oscillators, RF mixers. Other topics include noise theory (thermal and phase noise) and phase-locked loops. Prerequisite: EE 3304 or consent of instructor. \$15 computer fee.

5349. TOPICS IN INTEGRATED CIRCUIT TECHNOLOGY (3-0). Formal instruction in selected topics in integrated circuit technology. May be repeated when topic changes.

6342. ADVANCED QUANTUM DEVICES (3-0). Advanced concepts in quantum theory of semiconductors. Epitaxial growth and characterization of heterostructures, quantum wells, and superlattices including strained layers; electronic and optical properties of these structures; electronic and optoelectronic devices based on quantum wells and superlattices. Prerequisite: EE 5340 or consent of instructor.

6347. ELECTROMAGNETICS OF MICROWAVE STRUCTURES (3-0). Topics covered include analysis of discontinuities in rectangular waveguide, millimeter-waveguide systems such as fin line and dielectric waveguide, and full-wave analysis of waveguide structures such as microstrip. Prerequisite: EE 5306 or consent of instructor. \$10 computer fee.

SIGNAL PROCESSING

5351. DIGITAL SIGNAL PROCESSING (3-0). Discrete time linear systems: transform analysis of linear time invariant systems, structures for discrete time systems, finite wordlength effects. Design of infinite and finite impulse response filters. Prerequisite: EE 4318 or consent of instructor. \$10 computer fee.

5352. STATISTICAL SIGNAL PROCESSING (3-0). Estimation of autocorrelations and cross-correlations; estimation of power spectral densities using the DFT; AR modeling and Wiener filter design; Toeplitz recursion; maximum likelihood estimation and minimum mean square. Prerequisites: EE 5302 and 4318 or 5351. \$15 computer fee.

5355. DISCRETE TRANSFORMS AND THEIR APPLICATIONS (3-0). Principles and properties of discrete transforms such as discrete Fourier, discrete cosine, Walsh-Hadamard, slant, Haar, discrete sine, discrete Hartley, and rapid transforms, and their applications in signal and image processing. Comparison of these transforms and fast algorithms for their implementation. Prerequisite: graduate standing or consent of instructor.

ELECTRICAL ENGINEERING

5356. DIGITAL IMAGE PROCESSING (3-0). Digital image processing as applied to image sampling and quantization, image perception, image enhancement, image restoration, and filtering and image coding. Prerequisite: consent of instructor. \$10 computer fee.

5357. NONLINEAR IMAGE PROCESSING (3-0). Analysis of order statistic and morphological filters. Deformation-invariant feature sets. Shape recognition using nonlinear classifiers. Prerequisites: EE 4318 and 5302 or 5352. \$15 computer fee.

5359. TOPICS IN SIGNAL PROCESSING (3-0). Formal instruction in selected topics in signal processing. May be repeated when topic changes.

6351. NEURAL NETWORKS (3-0). Theory of the feedforward networks, clustering networks, and neural associative memories. Matrix-vector models. Training algorithms including back-propagation. Applications in pattern classification and mapping. Prerequisite: EE 5357 or consent of instructor. \$15 computer fee.

6358. COMPUTER VISION (3-0). Advanced techniques for interpretation, analysis, and classification of digital images. Topics include methods for: segmentation, feature extraction, recognition, stereo vision, 3-D modeling, and analysis of time varying imagery. Also taught as CSE 6322. Prerequisite: EE 5356 or 5357 or CSE 6321. \$15 computer fee.

COMMUNICATIONS

5360. DATA COMMUNICATION ENGINEERING (3-0). Data communication network planning, design, and analysis. Topics include the OSI layered model, interface standards, signals and protocols, modem and LAN standards. \$10 computer fee.

5362. DIGITAL COMMUNICATIONS (3-0). Baseband and carrier digital transmission systems. Comparisons of modulation techniques based on the error rate performance and channel capacity. Spectral analysis of digital modulation techniques. Applications of error detecting and correction coding, pulse code modulation, and time division multiplexing. Applications in lightwave, microwave, satellite, and computer communications. Prerequisites: EE 4330 and 5302. \$10 computer fee.



5363. MODERN TELEPHONY (3-0). Introduction to queueing theory; circuit switching and call processing in modern telephone systems. Integrated Services Digital Networks (ISDN) architecture and signaling standards are examined in detail. Prerequisite: EE 4330. \$10 computer fee.

5364. INFORMATION THEORY AND CODING (3-0). Transmission of information over noisy channels, Shannon's coding theorems, techniques of coding and decoding for reliable transmission over noisy channels, error-detecting, and error-correcting codes. Prerequisite: EE 5302.

5365. FIBER OPTIC TRANSMISSION SYSTEMS (3-0). Propagation in optical fibers, characteristics and manufacture of fibers, semiconductor lightwave sources and detectors, optical transmitters and receivers, lightwave transmission systems for wide area and local area networks. Prerequisites: EE 4430 and 3319. \$10 computer fee.

5366. COMMUNICATION SATELLITE SYSTEMS (3-0). Introduction of space communications, satellite orbits and their effect on communication system design. Design of communication satellites and their principal subsystems, communication link analysis, modulation, multiplexing, multiple access, encoding and forward error correction in satellite links. Atmospheric propagation effects, earth station design, and review of selected current and proposed systems. Prerequisites: EE 4330 or CSE 4344 and CSE 4313.

5368. DIGITAL RADIO TRANSMISSION SYSTEMS (3-0). Efficient spectrum utilization. Radio propagation and interference fundamentals including selective fading and countermeasures. Radio systems and route design, applications in point-to-point, cellular, and personal microcellular communications. Prerequisite: EE 5362.

5369. TOPICS IN COMMUNICATIONS (3-0). Formal instruction in selected topics in communications. May be repeated when topic changes.

6361. NETWORK MODELING AND SIMULATION (3-0). Queueing network models, discrete event simulation, dynamic network models, application of network simulation software, analysis of network performance. Prerequisites: EE 5302 and 5360. \$10 computer fee.

6362. ADVANCED DIGITAL COMMUNICATIONS (3-0). Linear decision feedback equalization, adaptive equalization, echo cancellation, digital signaling on fading multipath channels, coded waveforms for fading channels, spread spectrum systems. Prerequisite: EE 5362 and 5364.

6364. ADVANCED DATA NETWORKS (3-0). Detailed analysis of data networks using advanced queueing theory. Other topics include multi-access networks, packet and circuit switched networks, routing algorithms and flow control. Prerequisites: EE 5302 and 5360.

6365. ADVANCED FIBER OPTICS SYSTEMS (3-0). Laser modulation, design of high speed optical transmitters and receivers. Coherent detection systems, fiber and semiconductor optical amplifiers. Photonic switching, future technologies. Prerequisite: EE 5365. \$10 computer fee.

6368. SIMULATION OF COMMUNICATION SYSTEMS (3-0). Simulation methods of analysis of communications systems using customized commercial software and development of new software using C programming language. Analysis involving atmospheric point-to-point radio and cellular channels and fiber optic systems and modeling of their elements. Prerequisites: EE 5362 and 5368/5365, C and UNIX. \$15 computer fee.

ENERGY SYSTEMS

5371. POWER LOAD FLOW (3-0). Solution of large sparse matrix equations and application of load flow study to power system planning and operation. Prerequisite: EE 4301 or consent of instructor. \$15 computer fee.

5372. POWER SYSTEM DYNAMICS (3-0). Advanced theory of synchronous machines, steady-state stability, transient stability, and dynamic stability of a power system. Prerequisite: EE 4301 or consent of instructor.

5373. POWER SYSTEM OPERATIONS (3-0). Economic and security methods in power system operation. Prerequisite: EE 4301 or consent of instructor. \$10 computer fee.

5374. SHORT CIRCUIT ANALYSIS AND PROTECTION OF AN ELECTRICAL POWER SYSTEM (3-0). Power system short circuit calculations with symmetrical component models and bus impedance matrix representation. Application of system protection to faulted power system components. Prerequisite: EE 4301 or consent of instructor.

ELECTRICAL ENGINEERING

5376. APPLICATION OF STOCHASTIC METHODS FOR POWER SYSTEM ANALYSIS (3-0). Application of statistical techniques to evaluate integrity of power system networks. Planning and operation of power systems for maximum reliability. \$15 computer fee.

5377. POWER SYSTEM PROTECTION, MONITORING, AND CONTROL (3-0). Fundamental theories of power electronics, voltage and current sensors, and embedded controllers. Description of operating principles and design consideration of distribution monitoring systems, solid state protective relay systems, transducers, static var compensators, and motor controllers. Prerequisite: EE 4301 or consent of instructor.

5378. CONTROL CIRCUIT DESIGN FOR POWER SYSTEM APPLICATIONS (2-3). Use of embedded controllers to implement protective relay systems, transducers, and other equipment for power system applications. May be repeated when topic changes. Prerequisite: EE 5377 or consent of instructor. \$15 laboratory fee.

5379. TOPICS IN POWER SYSTEM ENGINEERING (3-0). Formal instruction in selected topics in power system engineering. May be repeated when topic changes.

APPLIED PHYSICAL ELECTRONICS

5380. PULSE ELECTRONICS (3-0). High voltage dc, ac, and pulsed power generation techniques and circuits. Topics include dc voltage multipliers, capacitive discharge circuits, Marx generators, pulse transformers, pulse forming networks, and transmission line pulsers.

5381. GASEOUS ELECTRONICS (3-0). Basic principles associated with electron emission, breakdown and conduction phenomena, magnetic insulation, magnetics, and charged particle beams.

5382. HIGH VOLTAGE ENGINEERING (3-0). Introduction to design, measurement and testing methods for high voltage systems. A study of electrical insulation materials and their properties, partial discharges and voltage breakdowns, electric field plotting methods, generation of high voltage test pulses, and high voltage measurement techniques. Prerequisite: consent of instructor. \$10 computer fee.

5385. POWER ELECTRONICS ENGINEERING (3-0). Switched mode DC-DC converters, controlled rectifiers, commutated and resonant inverters. Also, performance evaluation of specific applications by means of state space analysis will be discussed. Prerequisite: consent of instructor. \$10 computer fee.

DIRECTED STUDIES IN ELECTRICAL ENGINEERING

5190. ELECTRICAL ENGINEERING GRADUATE SEMINAR (1-0). Topics vary from semester to semester. May be repeated for credit. Prerequisite: graduate standing or consent of the department. Graded P/F.

5191, 5391. ADVANCED STUDY IN ELECTRICAL ENGINEERING. Individually approved research projects in electrical engineering. Graded P/F/R. \$10 computer fee.

5398, 5698. THESIS. 5398 graded R/F only; 5698 graded P/F/R. Prerequisite: graduate standing in electrical engineering. \$5-10 computer fee.

6397, 6697, 6997. RESEARCH IN ELECTRICAL ENGINEERING. Individually approved research projects leading to a doctoral dissertation in the area of electrical engineering. Graded P/F/R.

6399, 6699, 6999. DISSERTATION. 6399 and 6699 graded R/F only; 6999 graded P/F/R. \$10-15 computer fee.

Program in ENGINEERING MECHANICS

See Interdepartmental and Intercampus Programs.

Department of ENGLISH

Areas of Study

English
Humanities (See Interdepartmental and
Intercampus Programs.)

Degrees

M.A.

M.A., M.A.T., Ph.D.

Master's Degree Plans: Thesis and Non-Thesis

Chair: Nancy Wood

203 Carlisle 273-2692

Graduate Advisor: Philip G. Cohen

206 Carlisle 273-2739

Graduate Faculty:

Professors Estes, Faris, Kellner, T. Porter, Roemer, Swearingen

Associate Professors Beaudry, Cohen, Frank, Lacy, Moffett, Reddick, Turbeville,
Vitanza, Wood

Assistant Professors Barros, Fukuchi, Morris, L. Porter, Smith

OBJECTIVES

The Department of English offers a wide variety of graduate courses to meet the needs of students with a diversity of interests and academic backgrounds who wish to enhance their awareness of their literary and cultural environment by additional formal instruction or to increase their professional competence.

The Master of Arts program in English is designed to enable students to learn about, critique, and work in teaching, scholarship, writing, or other fields which value a strong background in language, rhetoric, and the study of culture through texts.

Early in the program each student takes two core courses. These serve as an introduction to theory as it is currently used in English scholarship, and to the history and current state of the profession of English as an institution that produces knowledge.

Each student plans an individual program of coursework, with the help of the Graduate Advisor and the chair of the student's thesis or exam committee. This program draws on the department's varied courses, which offer students ways to study literature, rhetoric, and criticism, as well as methods of studying culture through texts and traditions of discourse.

The M.A. in English provides a strong grounding in scholarly methods and in theory, making it an ideal preparation for doctoral study in disciplinary or interdisciplinary programs. M.A. graduates in English pursue careers in journalism, educational administration and services, publishing, and many business fields that demand writing and communication skills. The M.A. in English is also useful for prospective or experienced teachers who want both to sharpen their ability to teach literature and writing, and to advance professionally.

WRITING SAMPLE

In addition to the admission requirements set by the Graduate School, the English Department requires all international students to have speaking, reading, and writing competence in English and all applicants to submit to the Graduate Advisor a sample of his/her best academic writing.

DEGREE REQUIREMENTS

The Master of Arts degree in English has thesis and non-thesis options. Under either thesis or non-thesis option, the two required core courses are 5300 "Theory and Practice in English Studies" and 5302 "The Profession of English Studies." These courses must be taken within a student's first 12 hours of study.

The thesis option is a 30 hour program and requires 24 hours of coursework (six hours of core courses and 18 hours of electives) and at least six hours of thesis. The degree culminates with the defense of thesis.

ENGLISH

Those students who elect to write a thesis must select a topic in consultation with his/her thesis director. Before the student registers for thesis, a Thesis Committee (a director and two readers) must be established and the thesis prospectus must be approved by the Thesis Committee.

The non-thesis option requires a 36 hour program of coursework (six hours of core courses and 30 hours of electives) and a comprehensive examination on coursework.

Under either thesis or non-thesis option, the coursework of the master's candidate must be approved in advance by the Graduate Advisor, who should be consulted on all problems related to the student's program. New students must consult with the Graduate Advisor to obtain additional program requirements and a copy of the English Graduate Student Handbook. Regular counseling sessions will be scheduled each year. Notification of specific time and place will be sent to all students who have been accepted into the graduate program.

Graduate standing is prerequisite for the courses listed below. Courses so designated may be repeated for credit as often as their subject matter changes. The titles are general descriptions. Students should consult the Department of English each semester for more specific information about the individual offerings.

OTHER OPTIONS UNDER THE HUMANITIES

Students wishing to focus on a wider range of offerings from the English Department will find available courses in linguistics, rhetoric, and literature including the pre-modern period within the framework of the Humanities MA and PhD. See the Humanities section of this catalog for further details.

The grade of R (research in progress) is a permanent grade. An incomplete (the grade of X) cannot be given in a course which is graded R. To receive credit for an R-graded course the student must continue to enroll in the course until a passing grade is received. Three-hour thesis and three- and six-hour dissertation courses are graded R/F only. The grade of P (required for graduation) can be received in six- or nine-hour thesis courses and nine-hour dissertation courses only. In the course listings below, R-graded courses are designated either "Graded P/F/R" or "Graded R." (See also the section entitled "R" GRADE in this catalog.)

ENGLISH (ENGL)

GENERAL

5300. THEORY AND PRACTICE IN ENGLISH STUDIES (3-0). Current issues in criticism, rhetoric, and literary studies, with emphasis on library and bibliographical resources as they are brought to bear on these issues. Previously listed as ENGL 5335. Credit may not be given for both ENGL 5300 and 5335.

5302. THE PROFESSION OF ENGLISH STUDIES (3-0). Consideration of the structure of English studies, of the changes and conflicts within and among its constituent areas, and of the current situation of careers in the field.

5391. GRADUATE READINGS IN LITERATURE (3-0). Supervised individual study at the M.A. level. May be repeated for credit when content changes. Prerequisite: permission of instructor and Graduate Advisor.

5398, 5698, 5998. THESIS. The graduate student must be registered for this course (a) when in consultation over the thesis with the supervisory committee, and (b) in the semester or term in which the Master of Arts degree will be conferred. Prerequisite: permission of Graduate Advisor in English and approval of prospectus by the Committee on Graduate Studies at least 30 days before enrolling. 5398 graded R/F only; 5698 and 5998 graded P/F/R.

6391. GRADUATE READINGS IN LITERATURE (3-0). Supervised individual study at the PhD level. May be repeated for credit when the content changes. Prerequisite: permission of instructor and Graduate Advisor.

AMERICAN LITERATURE

5320. SELECTED READINGS IN AMERICAN LITERATURE BEFORE 1800 (3-0). Designed to establish the diversity of our early literature. Includes Indian oral literature, travel accounts, Puritan writing, diaries, autobiography (Franklin), poetry, drama, and fiction. Cultural context stressed.

5321. AMERICAN LITERATURE FROM 1800 TO THE CIVIL WAR (3-0). Literature of the young republic and the American Renaissance.

5322. AMERICAN LITERATURE FROM THE CIVIL WAR TO 1910 (3-0). Literature which expresses in theme and form the evolving cultural consciousness of America.

5323. AMERICAN LITERATURE SINCE 1910 (3-0). Includes representative works of multiple authors selected for the study of modern and contemporary themes and methods.

5324. AMERICAN POETRY (3-0). Concentrates each semester on two or three major poets such as Taylor, Longfellow, Dickinson, Whitman, Frost, Stevens, Williams, Eliot, Pound, and Plath. Subject poets to be announced prior to registration.

5325. AMERICAN DRAMA (3-0). Representative American drama with an emphasis on the interaction of culture and dramatic structure.

5326. TOPICS IN AMERICAN LITERATURE BEFORE 1900 (3-0). May focus on one to three major writers or the process of canon formation or a significant theme or movement. May be repeated when content changes.

5327. TOPICS IN 20TH-CENTURY AMERICAN LITERATURE (3-0). May focus on one to three major writers or on the process of canon formation or a significant theme or movement. May be repeated when content changes.

6339. TOPICS IN AMERICAN LITERATURE (3-0). Themes or issues not bound by particular historical periods, for example, women writers, canon formation, American Indian literature, utopian literature. May be repeated when content changes.

BRITISH LITERATURE

5301. MEDIEVAL ENGLISH LITERATURE (3-0). English literature of the period before 1500. May include Old English poetry, Anglo-Latin prose, William Langland, the alliterative revival, romances, Malory, and Chaucer.

5303. 17TH-CENTURY ENGLISH LITERATURE (3-0). Poetry and prose of the 17th Century. May include a study of Milton and/or a study of writers and motifs of the period.

5304. 18TH-CENTURY ENGLISH LITERATURE (3-0). May include an intensive study of the entire period or highly concentrated work in a particular genre or in one or more major authors.

5305. THE ROMANTIC PERIOD IN ENGLISH LITERATURE (3-0). Works of one or more of the major romantic poets supplemented by readings in the general literature and criticism of the period.

5306. VICTORIAN ENGLISH LITERATURE (3-0). Concepts and problems in texts by Victorian novelists, poets, and essayists (writers will vary). Attention to historical and cultural as well as literary issues.

5307. 20TH-CENTURY ENGLISH POETRY (3-0). Major poetry of this century. May vary from a concentration on specific writers to significant movements or themes.

5308. SHAKESPEARE (3-0). Representative works of Shakespeare. May vary from comprehensive readings in the dramatic literature to intensive examination of certain plays, or to other related topics.

5309. ENGLISH DRAMA (3-0). English drama, excluding Shakespeare, constituting both major playwrights and principal types of drama, in one of these periods: (1) Medieval and Tudor drama, from the beginnings to about 1590; (2) Elizabethan and Jacobean drama, 1590-1642; (3) Restoration and 18th Century drama, 1660-1800; (4) modern drama.

5310. ENGLISH FICTION (3-0). British fiction which may vary according to (1) historical periods, (2) a major figure or figures, (3) development of themes or types.

5313. 20TH-CENTURY BRITISH LITERATURE (3-0). A study of English and Irish writing in the 20th Century; may focus on major authors, themes, or topics.

6335. TOPICS IN ENGLISH LITERATURE (3-0). Studies of topics such as revolution, history, or nature as developed by selected writers from one or several chronological periods of English literature. May be repeated when content changes.

COMPARATIVE LITERATURE

5342. TOPICS IN THE CLASSICAL INFLUENCE (3-0). Hellenic, Alexandrian, and Latin masterpieces that have influenced Western literature; may concentrate on the epic, on tragedy and comedy, on lyric poetry, on the romance, and on other literary genres such as satire; may also include literature's relationship to the other arts or to historical, philosophical, or sociological structures; emphasis on Greek and Roman mythology and the various theories of myth. May be repeated when content changes.

ENGLISH

5345. COMPARATIVE LITERATURE OF THE 18TH CENTURY (3-0). The development of European literature during the century of literary ferment that sees the Age of Reason give way to the Age of Romanticism; early Romantics are contrasted to Enlightenment and Neoclassical writers; emphasizes, though not exclusively, the literatures of France, England, and Germany.

5346. COMPARATIVE LITERATURE OF THE 19TH CENTURY (3-0). Poetry and prose of this rich, contradictory era; may focus on major authors, genres, themes, topics, or literary movements such as Romanticism, Realism, Naturalism, Symbolism, and Decadence; may treat the relationships between literature, philosophy, science, politics, economics, technology, and the fine arts.

5347. COMPARATIVE LITERATURE OF THE 20TH CENTURY (3-0). Literature in a radically pluralist environment; may focus on literary movements, major genres, and the rupture of genres, critical, philosophical, and psychological schools, and the influence on literature of politics, science, technology and economics.

6329. TOPICS IN MAJOR THEMES IN COMPARATIVE LITERATURE (3-0). Themes such as "Literature and Revolution," "Psychoanalysis and Literature," "The Quest," "Alienation," or "The Initiation Experience," traced through the literatures of Western Europe, in order to illuminate cultural differences and similarities, to demonstrate intellectual, aesthetic, and social trends, and to provide a cohesive element in the formal examination of several genres; may be repeated when content changes.

6331. TOPICS IN MAJOR FIGURES IN COMPARATIVE LITERATURE (3-0). Writers whose work has strongly influenced individual writers and movements and had a significant and lasting effect on Western culture; may be repeated when content changes.

6333. TOPICS IN GENRE STUDY IN COMPARATIVE LITERATURE (3-0). Theory of literary forms or types and the conventions they embody or expectations they generate; may focus on epic, autobiography, satire, the lyric, the short story, the novel, etc.; may be repeated when content changes.

CRITICISM

5330. TOPICS IN CRITICISM (3-0). Studies in critical topics such as textual criticism, psychoanalytic criticism, philosophy and criticism, Renaissance poetics and literature, critical movements, or focus on a major theorist in criticism. May be repeated when content changes.

5340. CRITICAL THEORY: THE MAJOR TRADITIONAL TEXTS (3-0). A study of literary and cultural theory and practice from the Greco-Roman period to the early 20th Century. May include such theorists as Plato, Aristotle, Horace, Longinus, Dante, Sidney, B. Jonson, Dryden, Pope, Johnson, Coleridge, Arnold, Richards, Eliot, and others.

5360. TOPICS IN CONTEMPORARY CRITICAL THEORY (3-0). Study of contemporary theories of interpretation, concentrating on one or more schools of critical and cultural theory; may include, e.g., New Criticism, the Neo-Aristotelians, Marxist Critical Theory, hermeneutics, psychoanalysis, Russian Formalism, semiotics, speech-act theory, phenomenology, structuralism, and post-structuralism. May be repeated when content changes.

5380. TEXTUAL THEORIES OF CULTURE (3-0). Study of the interpretations of culture yielded by the traditions of semiotics and hermeneutics; may include works by the following: Lyotard, Foucault, Habermas, N.O. Brown, Derrida, Pierce, Barthes, Deleuze, Gadamer, Lévi-Strauss.

6340. METACRITICAL THEORY (3-0). A study of theories of literature from the point of view of their systems-theoretical character. Focuses on the writing of selected metatheorists such as Barbour, Braithwaite, Bruss, Hart, Lakotos, Popper, Rescher, and others, on questions of the genesis, nature, function, validity, and potential of literature theory.

6360. TOPICS IN FEMINIST CRITICISM (3-0). Studies of critical approaches patterns of thought and discourse practiced predominantly by women from the Graeco-Roman period through the 20th Century. Examination of relationships among gender, language, and discourse from theorists such as Hélène Cixous, Michel Foucault, Jane Gallop, Carol Gilligan, Julia Kristeva, Robin Lakoff, Walter Ong, and Virginia Woolf. May be repeated when content changes.

RHETORIC/COMPOSITION

5188. TOPICS IN TEACHING COLLEGE ENGLISH (1-0). Enrollment will be restricted to teaching assistants and teaching associates. May be taken for credit a second time when course content changes; may not be counted for credit toward degree requirement.

5331. HISTORY OF THE ENGLISH LANGUAGE (3-0). Internal history of English. Chronological treatment of the phonological, morphological, and syntactical development from prehistoric times to the present.

5334. TOPICS IN STYLISTICS (3-0). A study of the stylistic features of discourse. Attention may be given to the development of English prose style, to metrical and prosodic theory, to linguistic rhetorical-computational-affective approaches as well as newer methods such as narratology and phenomenological analysis. Assignments include the extensive analysis of texts. May be repeated when content changes.

5336. TOPICS CURRENT IN RHETORIC (3-0). A seminar in historical and theoretical/metatheoretical studies of rhetoric. May include one or more topics such as irony, ethos, tropes/schemes, the rhetoric of science, the Sophists, metaphor, and rhetoric as epistemic. May be repeated when content changes.

5351. HISTORY OF RHETORIC I: CLASSICAL/MEDIEVAL (3-0). A study of the history of rhetoric from the Pre-socratics to the Medieval period with emphasis on the Greco-Roman tradition. Attention given to major theorists such as Plato, Aristotle, Isocrates, Cicero, Quintilian, St. Augustine, and Boethius.

5352. TOPICS IN MAJOR FIGURES IN MODERN RHETORICAL THEORY (3-0). Intensive study of one or more modern theorists whose interests can be interpreted as rhetorical, e.g., Burke, Weaver, Richards, Perelman, Booth, Cassirer, Ricoeur, and Derrida. May be repeated when content changes.

5353. PRINCIPLES AND THEORIES OF RHETORICAL INVENTION (3-0). Examination of the art, method, and theory of rhetorical invention, with special attention given to its historical development, from the classical *topoi* and doctrine of *stasis* to more contemporary approaches; assignments include the use of such methods.

5354. ENGLISH LINGUISTICS (3-0). Introduction to the analysis of grammatical structures in English, concentrating on the goals and methods of contemporary analysts operating according to a variety of current theories, including structuralism, tagmemics, transformationalism, and discourse grammar.

5355. STUDIES IN ENGLISH DISCOURSE (3-0). Analysis of English grammatical structures above the level of the clause, including the sentence, the paragraph, and the whole text; examination of the work of major discourse theorists—Dik, Harris, Halliday, Longacre, Pike, and van Dijk. Prerequisite: English Linguistics or permission of instructor.

5356. RHETORIC OF COMPOSING (3-0). Study of research into the composing process and of the available methods of conducting research; special attention given to such researchers as Emig, Britton, Flower and Hayes, Scardamalia, Bereiter, and Perl; intensive self-analysis of the student's own composing process.

5357. RHETORIC OF READING (3-0). Study of the phenomenology of reading, focusing on the literature about and research into the reading process; attention given to aesthetic response to literary texts and the relationship between reading and composing; special attention given to Iser, Kintsch, de Man, van Dijk, Barthes, Schank, Ingarden, Holland, Derrida, and others; intensive self-analysis of the reading process.

5358. PRINCIPLES AND METHODS OF EVALUATION (3-0). Study of the available means of evaluating writing; special attention given to evaluating individual student-writing in and out of conferences and to evaluating large groups of student-writers, with such methods as holistic and primary-trait scoring; may include peer and curriculum evaluation; evaluation of student papers.

5359. ARGUMENTATION THEORY (3-0). Emphasis on theories of writing that concern the rhetorical aims of "to persuade" and "to convince." Attention to forms of argumentation, claims, case construction, revision, distinction between "rhetorical" and "logical" argumentation. Attention to such theorists as Aristotle, Cicero, Perelman, and Toulmin.

5361. HISTORY OF RHETORIC II: RENAISSANCE THROUGH 19TH CENTURY (3-0). A study of the history of rhetoric from the Renaissance through the 19th Century with emphasis on the re-emergence of the Neoclassical tradition. Attention given to major theorists such as Ramus, Vico, Campbell, Blair, and Whately.

5389. TOPICS IN TEACHING COMPOSITION (3-0). Seminar for investigating problems of and approaches to teaching composition. Special attention given to current compositional theorists. May be repeated when content changes.

Program in ENVIRONMENTAL SCIENCE AND ENGINEERING

See Interdepartmental and Intercampus Programs.

Department of EXERCISE, SPORT, and HEALTH STUDIES

Chair: Eugene W. Anderson

112 Physical Education

273-3288

Graduate Faculty:

Associate Professors Beehler, McKeown, Ridgway

OBJECTIVE

The graduate course offerings in exercise, sport, and health studies are provided to support other graduate degree programs in such areas as nursing, education, and biomedical engineering and to meet the express needs of students. No program leading to a graduate degree in exercise, sport, and health studies exists at this time.

EXERCISE AND SPORT STUDIES (EXSS)

5320. APPLICATION OF EXERCISE PHYSIOLOGY (2-2). Basic exercise physiology as related to training for bioenergetics, circulorespiratory, and neuromuscular function; physical fitness assessment; exercise prescription and leadership; body composition techniques; special problems related to physical training.

5192, 5292, 5392. SPECIAL TOPICS IN PHYSICAL EDUCATION. In-depth study of selected topics in physical education and exercise science. May be repeated when topics vary. Prerequisite: consent of instructor.

Department of FINANCE AND REAL ESTATE

Areas of Study

Real Estate

Business Administration (See Interdepartmental and Intercampus Programs.)

Degrees

M.S.

M.B.A., Ph.D.

Master's Degree Plans: Thesis and Non-Thesis

Acting Chair: David Diltz

107 Business 273-3705

Graduate Advisor: Ron Rutherford

434 Business 273-3004

Ph.D. Advisor: Steven Swidler

Graduate Faculty:

Professors Apilado, Panton, Swanson

Associate Professors Diltz, Lockwood, Swidler

Assistant Professors Buttimer, Hensler, Rutherford

OBJECTIVE

The Department of Finance and Real Estate participates in several graduate degree programs including the PhD in Business Administration, the Master of Business Administration and the Master of Science in Real Estate. In the PhD in Business Administration courses in finance and real estate prepare students for careers in teaching, research, business, and government. Concentrations in both finance and real estate are offered in the M.B.A. program (see Interdepartmental and Intercampus Programs for degree requirements). The M.S. in Real Estate provides students in-depth training in real estate decision making.

The general purpose of the Master of Science in Real Estate degree program is to provide students an opportunity to obtain a better understanding of the mechanics of real estate decision making in modern society and a greater depth of training in the discipline of real estate decision making than is possible at the baccalaureate level. The specific objectives of the program are to prepare students for careers in business, government, research, and teaching and for further graduate study. In this program, students are exposed to the theory, research, and practical applications of numerous real estate content areas, including investment analysis, appraisal, real estate development, primary and secondary mortgage markets, and mortgage backed securities. The Master of Science in Real Estate degree program is a specialized degree program designed to build upon the candidate's prior background.

ACCREDITATION: M.S. IN REAL ESTATE

The Master of Science in Real Estate is accredited by the American Assembly of Collegiate Schools of Business.

DEGREE REQUIREMENTS: M.S. IN REAL ESTATE

Applicants meeting the general admission requirements of the Graduate School, including a satisfactory score on the Graduate Management Admission Test (GMAT), may be admitted unconditionally to the program. Other applicants may be admitted if approved by the Graduate Advisor in Real Estate and the Dean of the Graduate School.

The program, which can be completed by part-time students who attend classes during the late afternoon and evening hours, is designed to accommodate students with divergent educational backgrounds and career interests. Each student's program of work must be approved by the Real Estate Graduate Advisor and it must contain a minimum of 15 semester hours in approved advanced graduate real estate courses taken at The University of Texas at Arlington.

FINANCE AND REAL ESTATE

A minimum of 30 semester hours is required if the student chooses to write a thesis. If the student chooses not to write a thesis, a minimum of 36 semester hours is required. All classes must be approved by the Graduate Advisor in Real Estate. Students who do not have a bachelor's degree in business administration may have to take additional coursework (up to 30 semester hours) to acquire a sufficient general business foundation. Students may have foundation courses waived by the Graduate Advisor if they have completed equivalent courses.

For the students who choose to write a thesis, the six hours of thesis will involve working closely with one or more members of the graduate faculty from the Department of Finance and Real Estate on a research project in a specialized area of interest in real estate.

The required foundation courses include:

- ACCT 5301 Accounting Analysis I
- ECON 5309 Economic Analysis I
- MARK 5311 Marketing
- FINA 5311 Business Financial Management
- INSY 5310 Introduction to Computer and Information Systems
- BUSA 5303 Quantitative Analysis for Business Administration
- MANA 5312 Management
- REAE 5311 Real Estate Analysis

The required advanced courses include:

- REAE 5321 Seminar in Real Estate Investment
- REAE 5334 Seminar in Real Estate Appraisal
- REAE 5319 Seminar in Real Estate Finance (integrated project course)
- THESIS OPTION

REAE 5698 Thesis

NON-THESIS OPTION (Two of the following courses)

- REAE 5314 Seminar in Real Estate Development
- REAE 5336 Seminar in Real Estate Securities
- REAE 5392 Selected Topics in Real Estate

Examples of advanced elective courses:

(Nine semester hours are required for the thesis option and 15 semester hours are required for the non-thesis option.)

- FINA 5330 Seminar in Capital Budgeting
- FINA 5326 Commercial Banking
- FINA 5325 Management of Financial Institutions
- FINA 5323 Investment Management Problems
- FINA 5328 Seminar in Portfolio Theory
- BUSA 5334 Real Property Law
- INSY 5335 Applied Database Management
- REAE 5336 Seminar in Real Estate Securities

Examples of courses in supporting fields (six semester hours):

- CIRP 5305 Land Use, Management, and Development
- CIRP 5322 Urban and Regional Economic Development
- URBA 5330 Urban and Regional Planning
- URBA 5331 Urban Design
- ARCH 5333 Construction Methods and Estimating
- ARCH 5334 Construction Management
- MASI 5330 NonParametric Statistics
- MASI 6302 Applied Linear Statistical Models I
- ECON 5312 Macroeconomic Theory
- ECON 5337 Business and Economic Forecasting

The six hours of thesis work must be conducted under the supervision of one of the members of the Graduate Studies Committee for the Master of Science in Real Estate Program.

The grade of R (research in progress) is a permanent grade. An incomplete (the grade of X) cannot be given in a course which is graded R. To receive credit for an R-graded course the student must continue to enroll in the course until a passing grade is received. Three-hour thesis and three- and six-hour dissertation courses are graded R/F only. The grade of P

(required for graduation) can be received in six- or nine-hour thesis courses and nine-hour dissertation courses only. In the course listings below, R-graded courses are designated either "Graded P/F/R" or "Graded R." (See also the section entitled "R" GRADE in this catalog.)

FINANCE (FINA)

5311. BUSINESS FINANCIAL MANAGEMENT (3-0). Study of providing the organization with funds necessary for its operation and of achieving effective utilization of funds. Primary emphasis on financial decision-making within organizations, and techniques of financial analysis and forecasting. Prerequisite: ACCT 5301 and ECON 5309 or equivalents. \$30 computer fee.

5322. ADVANCED BUSINESS FINANCIAL PROBLEMS (3-0). Analysis of financial problems of business concerns, presented in case materials. Considers determination of capital needs, choosing among alternative capital investments, planning methods of financing new capital expenditures, and planning recapitalizations, mergers, and reorganizations. Prerequisite: FINA 5311 or equivalent.

5323. INVESTMENT MANAGEMENT PROBLEMS (3-0). Application of principles and techniques of investment management in solving investment problems of individuals and financial institutions. Considers apportionment of investment funds among alternatives, analysis of risk, valuation timing of security acquisitions. Prerequisite: FINA 5311 or equivalent.

5324. SEMINAR IN FINANCIAL THEORIES (3-0). Intensive research in selected areas of business finance, investment analysis and management, financial markets, commercial banking, and non-bank financial institutions. Prerequisite: FINA 5311 or equivalent.

5325. MANAGEMENT OF FINANCIAL INSTITUTIONS (3-0). General management problems and policies of financial institutions, emphasizing the role of the major financial institutions. Use of analytical techniques through case method of instruction as an aid to the solution of significant financial problems. Prerequisite: FINA 5311 or equivalent.

5326. COMMERCIAL BANKING (3-0). Overview of the management process and the operations in many areas of the modern commercial bank. Emphasizes the economic significance of the industry and its contribution to business development. Prerequisite: FINA 5311 or equivalent.

5327. RISK MANAGEMENT AND SPECULATIVE MARKETS (3-0). Nature and functions of the various futures and options markets; hedging for risk reduction, speculative trading for profit; the role of futures and options in overall portfolio strategy, along with fundamental concepts such as basis, spreading, normal and inverted markets and money management. Prerequisite: FINA 5311 or equivalent.

5328. SEMINAR IN PORTFOLIO THEORY (3-0). The theory and practice of optimally combining securities into portfolios. Problems in the management of institutional portfolios. Prerequisite: FINA 5311 or equivalent. \$30 computer fee.

5329. SEMINAR IN SECURITY ANALYSIS (3-0). The use of economic and accounting data in the selection of securities. Examination of current and traditional techniques used by investment practitioners. Prerequisite: FINA 5311 or equivalent.

5330. SEMINAR IN CAPITAL BUDGETING (3-0). Approaches to evaluating firm capital budgeting decisions including cost of capital and risk. Techniques for making investment decisions involving physical assets of nonfinancial firms. Prerequisite: FINA 5311 or equivalent.

5331. MULTINATIONAL FINANCIAL MANAGEMENT (3-0). Examines ways in which financial decision-making processes are altered by operation in a multinational environment. Includes the effects of devaluation expectations, foreign exchange and investment controls. Also, case study materials related to actual decisions by multinational firms. Prerequisite: FINA 5311 or equivalent.

5332. SEMINAR IN INTERNATIONAL FINANCIAL MARKETS (3-0). An in-depth analysis of operations of international markets as viewed by multinational financial managers. Foreign exchange risk, capital market integration, and new innovations in off-shore financial markets. Prerequisite: FINA 5311 or equivalent.

5333. ADVANCED FINANCIAL ANALYSIS (3-0). An examination of analytical techniques useful in financial analysis and planning. Credit scoring models, bankruptcy prediction, bond ratings, and risk-return measurement and evaluation. Prerequisite: FINA 5311 or equivalent.

5334. SEMINAR IN FINANCIAL INSTITUTIONS AND MARKETS (3-0). An examination of major financial institutions and markets with emphasis on trends affecting the current operations, competitive

FINANCE AND REAL ESTATE

position, and overall future of the primary financial intermediaries and the financial markets. Prerequisite: FINA 5311 or equivalent.

5182, 5282, 5382. INDEPENDENT STUDIES IN FINANCE. Extensive analysis of a finance topic. Graded P/F/R. Prerequisite: consent of faculty member and department chair.

5392. SELECTED TOPICS IN FINANCE. In depth study of selected topics in finance. May be repeated when topics vary. Prerequisite: consent of instructor and Graduate Advisor.

6311. SEMINAR IN THE THEORY OF CORPORATE FINANCE (3-0). Advanced theory of corporate finance. Capital budgeting, dividend policy, and capital structure. Prerequisite: FINA 5311 or equivalent or consent of instructor.

6312. SEMINAR IN THE THEORY OF INVESTMENTS (3-0). Advanced theory of investments. Modern portfolio theory and the efficiency of capital markets. Prerequisite: FINA 5311 or equivalent or consent of instructor.

6313. ADVANCED RESEARCH IN FINANCE (3-0). Analytical methods commonly applied in the academic finance literature. Topics such as factor analysis in arbitrage pricing models and techniques for identification of nonstationarities in risk. Prerequisites: FINA 5311 and BUSA 5301 and consent of instructor.

6314. ADVANCED RESEARCH IN FINANCE II (3-0). Specialized and evolving techniques in financial research; topics such as identification of efficient markets, linear programming in capital budgeting, and multiple discriminant analysis in bankruptcy prediction and bond rating models. Prerequisites: FINA 5311 and BUSA 5301 and consent of instructor.

6390. SEMINAR IN SPECIAL TOPICS IN FINANCE (3-0). Doctoral level coverage of advanced topics in finance. May be repeated for credit when topics vary. Prerequisite: FINA 5311 or equivalent or consent of instructor.

6192, 6292, 6392. RESEARCH IN FINANCE (3-0). Independent study of advanced topics in finance under the direction of graduate faculty. May be repeated for credit when topics vary. Graded P/F/R. Prerequisite: FINA 5311 or equivalent or consent of instructor.

REAL ESTATE (REAE)

5311. REAL ESTATE ANALYSIS (3-0). Survey of real estate investment, appraisal and valuation, finance, market analysis, and other phases of the real estate development/management process.

5314. SEMINAR IN REAL ESTATE DEVELOPMENT (3-0). Topics relating to site selection, design, market analysis, financial feasibility, and management in the real estate development process. Prerequisite: FINA 5311 or REAE 5311 or equivalent.

5319. SEMINAR IN REAL ESTATE FINANCE (3-0). Study of real property financing methods; analysis of cost of borrowing, sources of funds, and mortgage terms; emphasis on construction and permanent financing of commercial and industrial properties. Prerequisite: FINA 5311 or REAE 5311 or equivalent.

5321. SEMINAR IN REAL ESTATE INVESTMENT (3-0). Introduction to analytical techniques, sources of financing, and other factors related to real estate investment. Stresses current developments and topics. Prerequisite: FINA 5311 or REAE 5311 or equivalent.

5334. SEMINAR IN REAL ESTATE APPRAISAL (3-0). Market, cost, and income approaches with stress on income forecasting and capitalization. Prerequisite: FINA 5311 or REAE 5311 or equivalent.

5336. SEMINAR IN REAL ESTATE SECURITIES (3-0). An in-depth analysis of the operations of secondary mortgage markets as viewed by individual and institutional investors. Mortgage pass-through securities, mortgage backed bonds, estimation of prepayment rates for mortgage securities, price and interest-rate risk, lending strategies, credit rating, and taxation. Prerequisite: FINA 5311 or REAE 5311 or equivalent.

5182, 5282, 5382. INDEPENDENT STUDIES IN REAL ESTATE. Extensive analysis of a real estate topic. Graded P/F/R. Prerequisite: consent of faculty member and department chair.

5392. SELECTED TOPICS IN REAL ESTATE (3-0). In-depth study of selected topics in real estate. May be repeated when topics vary. Prerequisite: REAE 5311 or equivalent or consent of instructor.

5398, 5698. THESIS Prerequisite: permission of the Graduate Advisor in Real Estate.

6390. SEMINAR IN SPECIAL TOPICS IN REAL ESTATE (3-0). Doctoral level coverage of advanced topics in real estate. May be repeated for credit when topics vary. Prerequisite: REAE 5311 or equivalent or consent of instructor.

6192, 6292, 6392. RESEARCH IN REAL ESTATE (3-0). Independent study of advanced topics in real estate under the direction of graduate faculty. May be repeated for credit when topics vary. Graded P/F/R. Prerequisite: REAE 5311 or equivalent or consent of instructor.

Department of FOREIGN LANGUAGES

Areas of Study

French
German
Spanish
Humanities (See Interdepartmental
and Intercampus Programs.)

Degrees

M.A.
M.A.
M.A.

M.A., M.A.T., Ph.D.

Master's Degree Plans: Thesis, Thesis Substitute, and Non-Thesis

Chair: Ruth V. Gross 230 Hammond 273-3161

Graduate Advisor: Frederick Viña 226 Hammond 273-3161

Graduate Faculty: Professors Gross, Ordóñez, Stuart, Werth
Associate Professors Capote, Israel-Pelletier, Rings, Studerus, Viña

OBJECTIVES

Acquisition of Language, Literature, and Culture (French, German, Spanish)

This graduate program in language, literature, and culture affords students the opportunity to study literary and cultural texts in their major fields as well as the structure of language as meaning and beliefs within a cultural system. Methods of teaching the above, combined with appropriate coursework in linguistics and allied fields, are offered through a supervised internship program. The specific objective is to prepare students to teach effectively foreign language and text in their cultural context.

Foreign Languages (French, German, Spanish)

Graduate programs in foreign languages are designed to enhance students' competence in the language and literature of their major language field. Specific objectives are to prepare students for a career in teaching, or in any area in private or public life in which knowledge of a foreign language is essential, and to help them develop the techniques of independent research necessary for work beyond the master's level.

DEGREE REQUIREMENTS

In addition to the Graduate School requirements for Master's degree programs, the following requirements apply in the Department of Foreign Languages:

Thesis: A written comprehensive examination may be given at the discretion of the student's committee.

Thesis Substitute: There will be a comprehensive examination on the coursework and appropriate reading list. An oral defense of the thesis substitute may be required at the discretion of the student's supervising committee. At least 30 hours must be in coursework.

Non-thesis: There will be a comprehensive written examination on the coursework and an appropriate reading list.

FOREIGN LANGUAGES

Acquisition of Language, Literature, and Culture (French, German, Spanish)

Those wishing to study in this 36 hour non-thesis program must upon admission have a baccalaureate degree with a major in the chosen language or a minimum of 18 advanced hours. In addition, candidates are required to demonstrate an advanced level of proficiency in the target language prior to acceptance in the program.

Coursework consists of two sets of courses, Block A and Block B. In Block A, one course in literary theory and five courses in language-specified literature, linguistics (philology, history of the language, structure of the language, dialectology etc.), and culture are required (18 hours). In Block B, an overview course, FORL5307, is required, in addition to one approved course each in sociolinguistics, textlinguistics, cultural anthropology, and methods of teaching language. The final course may be any approved related course (for a total of 18 hours).

The internship is a four-semester program proceeding concurrently with coursework and consisting of pre-semester orientation seminars, student teaching of lower division foreign language courses, and ongoing practica, one year of which must be completed in residence as a full-time student.

Foreign Languages (French, German, Spanish)

Those wishing to major in a foreign language or literature must upon admission have a baccalaureate degree with a major in that foreign language or have a minimum of 18 advanced hours, or the equivalent in language proficiency and course content.

A knowledge of a second foreign language will be required, including listening, speaking, reading, and writing skills, as demonstrated by the successful completion of two semesters of coursework at the second year level or by an appropriate examination.

The grade of R (research in progress) is a permanent grade. An incomplete (the grade of X) cannot be given in a course which is graded R. To receive credit for an R-graded course the student must continue to enroll in the course until a passing grade is received. Three-hour thesis and three- and six-hour dissertation courses are graded R/F only. The grade of P (required for graduation) can be received in six- or nine-hour thesis courses and nine-hour dissertation courses only. In the course listings below, R-graded courses are designated either "Graded P/F/R" or "Graded R." (See also the section entitled "R" GRADE in this catalog.)

FOREIGN LANGUAGES (FORL)

5301. FOREIGN LANGUAGES FOR GRADUATE READING (3-0). An intensive one-semester course designed for Ph.D. candidates and other graduate students to fulfill departmental foreign language requirements. Sections may be offered in French, German, Spanish, Russian, or other applicable or appropriate languages. Does not fulfill any graduate degree requirements.

5307. TOPICS IN SECOND LANGUAGE ACQUISITION (3-0). May include topics in the areas of second language acquisition, methodologies, culture, and disciplines related to second language acquisition. May be repeated for credit as topics change. \$5 computer fee.

5308. TECHNOLOGY AND LANGUAGE INSTRUCTION (3-0). Presentation and critique of research regarding the use of electronic media in language instruction; emphasis on computer and video, with attention to the application of research findings to the language classroom.

5310. THEORIES OF LITERATURE AND CULTURE (3-0). Readings, analyses, and applications of recent literary and cultural theories. Particular attention to how such theories may serve to focus or refocus literature as cultural production. Required for the M.A. in French, German, and Spanish.

FRENCH (FREN)

Students pursuing the MA degree in French are required to take FORL 5310 in their first year. Students are encouraged to take at least one course in each of (1) History of the French Language; (2) 17th Century; (3) 18th Century; (4) 19th Century; (5) 20th Century; (6) Topics in French Culture.

5101. TEACHING PRACTICUM I (1-0). Required of all teaching assistants in French in their first semester. May not be counted toward a master's degree. Graded P/F/R.

5102. TEACHING PRACTICUM II (1-0). Required of all teaching assistants in French in their second semester. May not be counted toward a master's degree. Graded P/F/R.

5190. CONFERENCE COURSE IN FRENCH LANGUAGE, CULTURE, OR LITERATURE (1-0). Graded F/R.

5300. HISTORY OF THE FRENCH LANGUAGE (3-0). Brief French phonology. A vertical tracing of the birth and development of the French language from Roman times to modern French. Includes short readings of documents representing Romance, Old French, middle and Renaissance and classical French at various stages in the development of the language. \$5 computer fee.

5321. TOPICS IN GENRES OF THE 17TH CENTURY (3-0). Investigates ideology and practice through literature, the visual arts, music and other cultural "texts." Major topics may include "Versailles: Architecture, Literature, and Politics," "Jansenism and its Discontents: Pascal, Racine, de Lafayette," "Libertins: Masks and Counter Masks." May be repeated for credit when topic changes. \$5 computer fee.

5325. TOPICS IN GENRES OF THE 18TH CENTURY (3-0). Studies oppositional discourse as expressed in the court, the salons, the family. The value of conversation and the café will be studied as will the influence of the French in politics, education, and manners on countries such as England, Russia, and the United States. May be repeated for credit when topic changes. \$5 computer fee.

5330. TOPICS IN GENRES OF THE 19TH CENTURY (3-0). Concentrates on literature, the visual arts, entertainment, and fashion as expressions of popular culture. The rise of the "petite bourgeoisie," social utopias, the rebuilding of Paris, and responses to modernity will be studied in such courses as "Paris and Its Subcultures," "Impressionism and the Bourgeoisie," "The Novel and the Body." May be repeated for credit when topic changes. \$5 computer fee.

5331. TOPICS IN GENRES OF THE 20TH CENTURY (3-0). Focuses on the work of French and Francophone writers, artists and composers in the light of modernist and post-modernist aesthetics. Literature, art, architecture, music, film, video, television, and other forms of popular production are studied as reflections of an era in crisis. May be repeated for credit when topic changes. \$5 computer fee.

5338. TOPICS IN FRENCH CULTURE (3-0). Survey of France, including social and political structures, economy, education, family, daily life. May include topics such as: "Paris, Blois, Marseille: The New France," "Feminism: Theories and Practice," "The French: Portrait and Text." May be repeated when topic changes. \$5 computer fee.

5340. STUDIES IN FRENCH-CANADIAN LITERATURE AND GENRES (3-0). Studies the French-Canadian Novel, Poetry, and Theater. Posits that there are two distinct periods of literary development separated by Québec's "Quiet Revolution" of the late 1950s and 1960s. Investigates preoccupation with form and structure, with new ideologies such as populism and feminism, and with esthetic, social, cultural, and political self-determination. \$5 computer fee.

5391. CONFERENCE COURSE IN FRENCH LINGUISTICS, CULTURE, OR LITERATURE.

5398, 5698, 5998. THESIS. 5398 graded R/F only; 5698 and 5998 graded P/F/R. Prerequisite: permission of Graduate Advisor.

6310. TOPICS IN FRENCH LITERARY STUDIES (3-0). May include such courses as "Emma Bovary and Her Sisters: Flaubert's Harem," "Rimbaud, Zola, and Impressionism," "Studies in the Renaissance," "La Belle Epoque' and Apollinaire," "The Oral Tradition and the Francophone Literature of the Caribbean," "The Literature and Politics of Quebec." May be repeated when topic changes. \$5 computer fee.

A course may be repeated for credit when the topic changes.

GERMAN (GERM)

5101. TEACHING PRACTICUM I (1-0). Required of all teaching assistants in German in their first semester. May not be counted toward a master's degree. Graded P/F/R.

5102. TEACHING PRACTICUM II (1-0). Required of all teaching assistants in German in their second semester. May not be counted toward a master's degree. Graded P/F/R.

5190. CONFERENCE COURSE IN GERMAN LANGUAGE AND LITERATURE (1-0). Graded P/F/R. Prerequisite: permission of Graduate Advisor.

5304. TOPICS IN GERMANIC LANGUAGES AND LINGUISTICS (3-0). May include topics such as history of the German language, applying German linguistics, dialectology, Middle High German, Old Icelandic. May be repeated for credit when topic changes. \$5 computer fee.

FOREIGN LANGUAGES

- 5312. ADVANCED GERMAN GRAMMAR AND STYLE (3-0).** Readings of samples of contemporary German prose, both narrative and expository, as a basis for the writing of exercises and essays stressing application of grammatical and stylistic principles. \$5 computer fee.
- 5320. TOPICS IN GERMAN LITERATURE (3-0).** May include topics from any period, genre, or author of literature in German. May be repeated for credit when topic changes. \$5 computer fee.
- 5331. TOPICS IN GERMAN NARRATIVE, 1700 TO PRESENT (3-0).** The novel, *Novelle*, short story, and other forms of German prose: historical overview, theory, and selected primary texts as illustration. Topics vary in focus and methodology; emphasis may range from individual authors, works, or themes to theoretical or interdisciplinary issues. May be repeated for credit when topic changes. \$5 computer fee.
- 5332. TOPICS IN OLDER GERMAN LITERATURE, TO 1700 (3-0).** Topics vary in focus and methodology; emphasis may range from individual authors, works, or themes to theoretical or interdisciplinary issues. May be repeated for credit when topic changes. \$5 computer fee.
- 5333. TOPICS IN GERMAN DRAMA (3-0).** History and theory of the drama in German-speaking countries; methods of drama analysis, interrelationship of drama, theatre, audience. Topics vary in focus and methodology, emphasis may range from individual authors, works, themes, or periods to theoretical or interdisciplinary issues. May also include the study of German film. May be repeated for credit when topic changes. \$5 computer fee.
- 5334. TOPICS IN GERMAN POETRY (3-0).** Study of the development of German poetry, and a close study of representative poets and poems primarily from the Baroque. Focus on selected poetic forms including the folksong, ballad, epic poem, sonnet, and religious and political poetry. Topics may vary in focus and methodology. May be repeated for credit when topic changes. \$5 computer fee.
- 5391. CONFERENCE COURSE IN GERMANIC LINGUISTICS AND LITERATURE.** Graded R.
5398, 5698, 5998. THESIS. 5398 graded R/F only; 5698 and 5998 graded P/F/R. Prerequisite: permission of Graduate Advisor.

SPANISH (SPAN)

All students pursuing the MA in Spanish must take SPAN 5300 and 5303, and FORL 5310.

- 5101. TEACHING PRACTICUM I (1-0).** Required of all teaching assistants in Spanish in their first semester. May not be counted toward a master's degree. Graded P/F/R.
- 5102. TEACHING PRACTICUM II (1-0).** Required of all teaching assistants in Spanish in their second semester. May not be counted toward a master's degree. Graded P/F/R.
- 5190. CONFERENCE COURSE IN SPANISH LANGUAGE AND LITERATURE (1-0).** Graded P/F/R. Prerequisite: permission of Graduate Advisor.
- 5300. HISTORY OF THE SPANISH LANGUAGE (3-0).** Development of the Spanish language from its earliest forms to the present. Required for the MA in Spanish, the MA in Humanities with Spanish concentration, and for the MAT with Spanish concentration. \$5 computer fee.
- 5302. SPANISH DIALECTOLOGY (3-0).** Phonological, lexical, and grammatical features in Iberia, South and North America, the Philippines, and in Sephardic dialect. \$5 computer fee.
- 5303. APPLIED SPANISH LINGUISTICS (3-0).** Pedagogy, pronunciation and orthography, morphology, syntax, semantics, and culture. Required for the MA in Spanish and the MA in Humanities with Spanish concentration unless 5302 taken. \$5 computer fee.
- 5306. GRAMMAR AND COMPOSITION (3-0).** \$5 computer fee.
- 5315. MEXICAN LITERATURE AND CULTURE (3-0).** Readings in all literary genres from various critical perspectives. Particular attention given to the novel, poetry, and essay of the 20th Century and to interrelationships between text and culture.
- 5318. TOPICS IN HISPANIC LITERATURE AND CULTURE (3-0).** \$5 computer fee.
- 5319. 20TH CENTURY SPANISH-AMERICAN NOVEL AND SHORT STORY (3-0).** \$5 computer fee.
- 5320. MODERN SPANISH NARRATIVES (3-0).** Readings of 19th and 20th Century Hispanic narrative in light of current critical theory. Connections of narrative form, content, and culture will be explored. \$5 computer fee.

FOREIGN LANGUAGES

5330. ADVANCED STUDIES IN HISPANIC POETRY (3-0). Close critical readings of Spanish and Spanish American poetry. Analysis of poetic currents across the centuries. \$5 computer fee.

5332. CHICANO LITERATURE AND CULTURE (3-0). Readings of poetry, theater, and prose in relation to the specific socio-historical and political context of Chicano life. Charts changing concepts of cultural identity and the evolution of cultural coding in texts written after 1960. \$5 computer fee.

5340. CERVANTES (3-0). \$5 computer fee.

5342. ADVANCED STUDIES IN HISPANIC DRAMA (3-0). Readings of dramatic texts from the Golden Age to contemporary period. May include the analysis of dramatic theory and its implementation in specific texts, theater as performance and spectacle, changing concepts of the esthetic and social functions of theater. \$5 computer fee.

5350. WOMEN IN HISPANIC LITERATURE (3-0). \$5 computer fee.

5391. CONFERENCE COURSE IN SPANISH LINGUISTICS AND LITERATURE. Graded R.

5398, 5698, 5998. THESIS. 5398 graded R/F only; 5698 and 5998 graded P/F/R. Prerequisite: permission of Graduate Advisor.

6300. SEMINAR IN HISPANIC LITERATURE (3-0). Changing topics in Spanish and/or Spanish-American literature.

6322. SEMINAR IN SPANISH LANGUAGE (3-0).

A topics course may be repeated for credit when the topic changes.



Department of GEOLOGY

Area of Study

Geology

Mathematical Sciences (see Interdepartmental and Intercampus Programs.)

Degree

M.S.

Ph.D.

Master's Degree Plan: Thesis only

Chair: John S. Wickham

107 Geoscience

273-2987

Graduate Advisor: Burke Burkart

107 Geoscience

273-2987

Graduate Faculty:

Professors Balsam, Burkart, Crick, Ellwood, Perkins, Wickham
Associate Professors Nestell, Reaser, Schieber, Scotese, Wolff
Assistant Professor Otto-Bliesner
Professor Emeritus McNulty

OBJECTIVE

The Master of Science program in geology provides a basic geologic background for students interested in a professional career in geology. With the thesis as a focus, the program integrates coursework and research to give the student not only a broad foundation but also a specific area of competence through participation in the research experience. Special course work and research in geology and geophysics which lead to specialization in the areas of environmental geology or natural resource development are available in addition to the more traditional areas of specialization.

The PhD program in Mathematical Sciences is available to students interested in a more quantitative approach to earth science. Emphases in statistics or numerical and computational methods are especially useful when combined with course work in the earth and environmental sciences. For more details on the PhD in Mathematical Sciences, see the section on Interdepartmental and Intercampus Programs.

ADMISSION

Students entering the graduate program in geology must meet the general Graduate School admission requirements.

DEGREE REQUIREMENTS

Applicants with degrees in geology are required to have had the following courses or their equivalents as a part of a bachelor's program, or to make up these deficiencies in residence: mineralogy (2445), petrology-petrography (2446), paleontology (3441), computers and statistics (3490), stratigraphy (3442), structural geology (3443), summer field course (3687); one year each of physics and chemistry and math through calculus II are required, also.

A program of work including foundation courses will be designed by the graduate studies committee for any student entering the program with a bachelor's degree in a field other than geology.

In the first year, a candidate must file a degree plan approved by the Graduate Studies Committee which includes coursework for the program, including undergraduate course deficiencies. Twenty-four semester hours of approved graduate level courses are required in addition to the thesis. Graduate course credit may be allowed for undergraduate courses with written approval by the Graduate Studies Committee. Enrollment in Technical Sessions, Geology 5199, is required each semester a student is enrolled in classes. A thesis proposal, written thesis, and thesis defense are required.

The grade of R (research in progress) is a permanent grade. An incomplete (the grade of X) cannot be given in a course which is graded R. To receive credit for an R-graded course the student must continue to enroll in the course until a passing grade is received. Three-hour thesis and three- and six-hour dissertation courses are graded R/F only. The grade of P (required for graduation) can be received in six- or nine-hour thesis courses and nine-hour dissertation courses only. In the course listings below, R-graded courses are designated either "Graded P/F/R" or "Graded R." (See also the section entitled "R" GRADE in this catalog.)

GEOLOGY (GEOL)

- 5301. ENVIRONMENTAL GEOCHEMISTRY AND GEOLOGY (3-0).** Geological aspects of environmental problems. Migration of waste materials through geological systems. Geochemical control of migration of hazardous waste materials. Geophysical methods of subsurface hazardous conditions.
- 5302. TECTONICS (3-0).** Regional structural features and their origin and development.
- 5304. GEOMETRY AND MECHANICS OF GEOLOGICAL STRUCTURES (2-3).** Geometries of structures associated with extensional, shortening, strike-slip, diapiric, and reactivated tectonic environments. Principles of mechanics applied to the formation of these structures. Prerequisites: GEOL 3443; MATH 2325; PHYS 1444.
- 5306. ENVIRONMENTAL GEOLOGY (3-0).** Hydrological systems, water quality, and behavior of pollutants; atmospheric systems, air quality, and effects of pollutants; occurrence, prediction, and amelioration of natural environmental hazards including floods, earthquakes, volcanism, and landslides.
- 5308. NATURAL ENVIRONMENTAL HAZARDS (3-0).** Processes, damage, prediction, and amelioration of volcanism, earthquakes, floods, storms, and landslides. Prerequisites: GEOL 2446, 4405, 4308; MATH 2325, or permission of the instructor.
- 5309. TRACE ELEMENT AND ISOTOPE GEOCHEMISTRY (3-0).** Principles controlling trace element distribution and radiogenic and stable isotopic ratios. Applications to magma genesis, crust and mantle evolution, sediments and paleoclimate. Prerequisite: GEOL 4310 or permission.
- 5311. REGIONAL STRATIGRAPHY (3-0).** Chronologic study of the stratigraphic systems, their physical properties and gross facies, their depositional and paleogeographic implications, their correlation and nomenclature, and their biostratigraphy. Coverage given to the stratigraphy and geologic development of each major landmass and continent.
- 5313. CARBONATE PETROLOGY (2-3).** Nature and composition of carbonate sediments and rocks in terms of their genesis, depositional environments, and processes involved in transport, deposition, diagenesis, and lithification. Prerequisites: GEOL 4443 or equivalent and 4345 or concurrent enrollment. \$4 lab fee. \$10 microscope fee.
- 5315. ORGANIC GEOCHEMISTRY (3-0).** Chemistry of carbon compounds. Nature and distribution of organic materials, including petroleum and coal, in sediments. Techniques used for studying petroleum source beds. Chemical evolution of life. Prerequisite: consent of instructor.
- 5325. PALEOCLIMATOLOGY AND PALEOOCEANOGRAPHY (3-0).** An in-depth analysis of fluctuations in the earth-atmosphere-ocean system. Synoptic views of climatically significant time periods will be emphasized. Prerequisite: GEOL 5311, concurrent registration, or consent of instructor.
- 5344. DEPOSITIONAL ENVIRONMENTS: TERRIGENOUS CLASTICS (3-0).** Depositional processes, physiographic and environmental components, and facies characteristics and relationships of alluvial, eolian, deltaic, clastic shoreline, shallow siliciclastic sea, and deep sea clastic depositional systems. Emphasis on interpretation of ancient analogues. Prerequisite: GEOL 4443 or equivalent.
- 5348. MARINE GEOLOGY (3-0).** Geologic processes of the oceans. Sedimentation in the oceans including biologic processes that relate to sediment production, chemistry of seawater, geochemical cycles in the oceans. Origin of seafloor topography. Seafloor spreading.
- 5350. METEOROLOGY (3-0).** Dynamics and thermodynamics of the atmosphere and its component systems. Prerequisites: MATH 2326, PHYS 1444 or permission of instructor.
- 5356. ADVANCED PHYSICAL VOLCANOLOGY (2-3).** Quantitative approach to volcanic processes. Includes physical properties of magmas, energetics of explosive eruptions, secondary processes in tuffs and lavas, rheology and mechanics of non-Newtonian fluids, magma/water interaction, and hydrothermal processes.

HISTORY

5365. TOPICS IN GEOLOGY (2-3). Topics offered depend on student and faculty interest. Such topics might include identification of fossil fragments in thin section; magmatic processes; plate tectonics and sedimentary basin evolution; stratigraphic paleontology; sedimentary or volcanogenic ore deposition; geostatistics; geophysical archeology; and various advanced subjects in sedimentology, stratigraphy, paleontology, geophysics, geochemistry, volcanology and petrology. May be repeated for credit when topic changes.

5407. ENVIRONMENTAL GEOPHYSICS (3-3). Geophysical techniques applied to solving environmental problems. The course will cover fundamentals in geophysics and include a practical field problem. Prerequisite: a physics course and a course in geochemistry or geophysics or permission of the instructor.

5409. APPLIED GEOPHYSICS (3-3). Geophysical Techniques used to determine the presence and extent of deposits of minerals and the subsurface structure of selected localities from field methods. Prerequisites: GEOL 3443 and a course in physics, or permission of the instructor.

The following research course will be graded either PFR or ABCDFR as designated by the instructor at the beginning of the semester or session. Only three hours of research course credit may be applied to the degree.

5181, 5281, 5381. RESEARCH IN GEOLOGY. Independent study in various areas of research including paleontology, stratigraphy, tectonics, structural geology, sedimentology, geochemistry, petrology, geophysics, and volcanology. May be repeated for credit. Graded R.

5199. TECHNICAL SESSIONS (1-0). Forum for presentation of results of graduate students and faculty research. Required each semester of all graduate students.

5398, 5698. THESIS. 5398 graded R/F only; 5698 graded P/F/R.

Department of HISTORY

Areas of Study

History

Humanities (See Interdepartmental and
Inter-campus Programs.)

Archival Administration

Degrees

M.A.

M.A., Ph.D.

Certificate

Master's Degree Plans: Thesis and Non-Thesis

Chair: Kenneth R. Philp

202 University Hall

273-2861

Graduate Advisor: Stanley H. Palmer

201 University Hall

273-2869

Graduate Faculty:

Professors Green, Lackner, Palmer, Philp, Richmond, Rodnitzky

Associate Professors Anders, Fairbanks, Francaviglia, Goldberg, Kyle, Maizlish,
Narrett, Reinhardt, Reinhartz, Underwood

Assistant Professors Cawthon, Dulaney, Haynes, Jalloh, Morris

Adjunct Associate Professor Saxon

OBJECTIVE

The general purpose of the Master of Arts in History program is to provide the student with a greater breadth of understanding of both the past and the contemporary world, a continued exploration of the diversity of human experiences and ideas, and a greater depth of experience in historical methods and techniques. Specific objectives are to prepare the student for a career in business, government, research,

teaching, archival and/or museum administration, or further graduate study. The program is designed to be flexible and, insofar as possible, to meet students' individual interests and career objectives.

DEGREE REQUIREMENTS

Courses taken toward a master's degree should fit into a unified program aimed at providing a student with both a comprehensive background and depth of understanding in a major field in either American (including non-U.S.) or European history. All students are required to take HIST 5339 Historical Theory and Methodology and the Issues and Interpretations course corresponding to their major field (either HIST 5340 or 5341). All students must take a minimum of six hours in both the Colloquium and the Seminar courses. Students must consult with the Graduate Advisor to determine their program.

Competency in one foreign language is required. This may be demonstrated by credit in an approved language through the sophomore level or by successful completion of an examination administered by the Department of Foreign Languages. In special cases, alternatives such as computer language or statistics may be considered on an individual basis.

The following requirements are in addition to the Graduate School requirements:

The thesis degree plan is designed for the student who wishes to research and write a substantial, original work on a historical topic of personal interest. The plan requires completion of 30 semester credit hours (24 hours of coursework, including 18 hours in a major field, plus 6 hours of thesis preparation). With the approval of the Graduate Advisor, the student may have a minor of as many as six hours of graduate and/or advanced undergraduate courses in a discipline other than history. As many as nine hours (six hours if a non-history minor is selected) of advanced undergraduate history coursework may be taken for graduate credit. In the event of failure of the oral defense of the thesis required for the degree, the student may petition the Graduate Studies Committee for re-examination.

The non-thesis degree plan requires completion of 36 semester credit hours of coursework, including 24 hours in a major field. In the final semester, the non-thesis student is required to take HIST 5395, a course that prepares the student for the comprehensive examination. With the approval of the Graduate Advisor, the student may have a minor of as many as nine hours of graduate and/or advanced undergraduate courses in a discipline other than history. A maximum of nine hours of advanced undergraduate coursework may be taken for graduate credit. A comprehensive examination (written and oral), over specific areas of concentration within the major field, is required for the degree; these areas will be defined by students in consultation with their faculty committees, the Graduate Advisor, and the Graduate Studies Committee. In the event of failure of the comprehensive examination, the student may petition the Graduate Studies Committee for re-examination.

ARCHIVAL ADMINISTRATION AND PUBLIC HISTORY

These studies involve application of historical knowledge and methodology in non-academic settings such as private businesses or public historical agencies (e.g., archives, museums, preservation societies).

Students desiring a certificate of archival administration as part of the Master of Arts in History degree must take HIST 5339 and HIST 5340 or HIST 5341, and enroll in 18 hours of content courses — in either American or European history. In addition, they must take HIST 5342 and HIST 5343, plus an additional six hours of internship, HIST 5644. Students already holding a MA or PhD degree in history or a related field, as well as students enrolled in graduate programs other than history, who desire a certificate in archival administration should consult the Graduate Advisor.

Students desiring public history as an area of study as part of the Master of Arts in History degree must take HIST 5339 and HIST 5340 or HIST 5341, and enroll in 12 hours of content courses — in either American or European history. In addition, they must take HIST 5342, HIST 5343, HIST 5345, and HIST 5348, plus an additional six hours of internship (HIST 5644 or HIST 5655). Students electing to complete an internship in archival management (HIST 5644) will also earn the certificate in archival administration (see above).

Students interested in either archival administration or public history as areas of study are encouraged to consult the Graduate Advisor to discuss a program of work.

HUMANITIES

The Department of History is an integral part of the Graduate Humanities program. The department offers courses that will qualify an area of study (Option A) or as part of an integrated program of multidisciplinary coursework organized by theme (Option B). HIST 5339 and either HIST 5340 or 5341

HISTORY

are recommended for students in the Graduate Humanities program. History 6391 is specifically designed for PhD candidates in the Humanities. See Interdepartmental and Intercampus Programs.

MASTER OF EDUCATION IN TEACHING (MET)

History may be chosen as an appropriate academic specialization or teaching field for students enrolled in the Master of Education in Teaching Degree Program, and the department offers courses that qualify as an academic area or teaching field for elementary and secondary teachers. HIST 5340 and/or HIST 5341 are especially recommended for students in the M.E.T. program, and for others who wish to broaden their historical knowledge for classroom teaching. See Master of Education in Teaching Degree Program.

The grade of R (research in progress) is a permanent grade. An incomplete (the grade of X) cannot be given in a course which is graded R. To receive credit for an R-graded course the student must continue to enroll in the course until a passing grade is received. Three-hour thesis and three- and six-hour dissertation courses are graded R/F only. The grade of P (required for graduation) can be received in six- or nine-hour thesis courses and nine-hour dissertation courses only. In the course listings below, R-graded courses are designated either "Graded P/F/R" or "Graded R." (See also the section entitled "R" GRADE in this catalog.)

HISTORY (HIST)

NOTE: A course may be repeated for credit when the topic changes. Graduate standing is prerequisite.

5300. COLLOQUIUM IN 17TH AND 18TH CENTURY AMERICAN HISTORY (3-0). An examination of the historical literature and issues in 17th and 18th Century American history. The specific literature and issues examined will vary with the instructor.

5301. COLLOQUIUM IN 19TH CENTURY AMERICAN HISTORY (3-0). An examination of the historical literature and issues in 19th Century American history. The specific literature and issues examined will vary with the instructor.

5302. COLLOQUIUM IN 20TH CENTURY AMERICAN HISTORY (3-0). An examination of the historical literature and issues in 20th Century American history. The specific literature and issues examined will vary with the instructor.

5304. COLLOQUIUM IN REGIONAL/TOPICAL HISTORY OF THE U.S. (3-0). An examination of the historical literature and issues pertaining to a region or a major topic in the history of the U.S. The specific literature and issues examined will vary with the instructor.

5309. COLLOQUIUM IN LATIN AMERICAN HISTORY (3-0). An examination of the historical literature and issues in Latin American history. The specific literature and issues examined will vary with the instructor.

5310. COLLOQUIUM IN ANCIENT AND MEDIEVAL HISTORY (3-0). An examination of the historical literature and issues in ancient and medieval history. The specific literature and issues examined will vary with the instructor.

5311. COLLOQUIUM IN EARLY MODERN EUROPEAN HISTORY (3-0). An examination of the historical literature and issues in early modern European history. The specific literature and issues examined will vary with the instructor.

5312. COLLOQUIUM IN MODERN EUROPEAN HISTORY (3-0). An examination of the historical literature and issues in modern European history. The specific literature and issues examined will vary with the instructor.

5313. COLLOQUIUM IN EUROPEAN REGIONAL/TOPICAL HISTORY (3-0). An examination of the historical literature and issues pertaining to a region or a major topic in European history. The specific literature and issues examined will vary with the instructor.

5320. SEMINAR IN 17TH AND 18TH CENTURY AMERICAN HISTORY (3-0). A detailed investigation of a major aspect of 17th and 18th century American history, involving original research and the use of historical resources. The particular aspect investigated will vary with the instructor.

5321. SEMINAR IN 19TH CENTURY AMERICAN HISTORY (3-0). A detailed investigation of a major aspect of 19th Century American history, involving original research and use of historical resources. The particular aspect investigated will vary with the instructor.

- 5322. SEMINAR IN 20TH CENTURY AMERICAN HISTORY (3-0).** A detailed investigation of a major aspect of 20th Century American history, involving original research and use of historical resources. The particular aspect investigated will vary with the instructor.
- 5324. SEMINAR IN REGIONAL/TOPICAL HISTORY OF THE U.S. (3-0).** A detailed investigation of a major aspect of a region or a major topic in the history of the U.S., involving research and use of historical resources. The particular aspect investigated will vary with the instructor.
- 5329. SEMINAR IN LATIN AMERICAN HISTORY (3-0).** A detailed investigation of a major aspect of Latin American history, involving original research and use of historical resources. The particular aspect investigated will vary with the instructor.
- 5330. SEMINAR IN ANCIENT AND MEDIEVAL HISTORY (3-0).** A detailed investigation of a major aspect of ancient and medieval history, involving original research and use of historical resources. The particular aspect investigated will vary with the instructor.
- 5331. SEMINAR IN EARLY MODERN EUROPEAN HISTORY (3-0).** A detailed investigation of a major aspect of early modern European history, involving original research and use of historical resources. The particular aspect investigated will vary with the instructor.
- 5332. SEMINAR IN MODERN EUROPEAN HISTORY (3-0).** A detailed investigation of a major aspect of modern European history, involving original research and use of historical resources. The particular aspect investigated will vary with the instructor.
- 5333. SEMINAR IN EUROPEAN REGIONAL/TOPICAL HISTORY (3-0).** A detailed investigation of a region or a major topic in European history, involving research and use of historical resources. The particular aspect investigated will vary with the instructor.
- 5339. HISTORICAL THEORY AND METHODOLOGY (3-0).** An examination of theories of historical knowledge, the history of the discipline, various historical methodologies, and research techniques. Required for all History M.A. students.
- 5340. ISSUES AND INTERPRETATIONS IN AMERICAN HISTORY (3-0).** A critical survey of American historical scholarship from colonial times to the present. Required for all students who are emphasizing American history.
- 5341. ISSUES AND INTERPRETATIONS IN EUROPEAN HISTORY (3-0).** A critical survey of European historical scholarship from ancient times to the present. Required for all students who are emphasizing European history.
- 5342. PRINCIPLES OF ARCHIVES AND MUSEUMS I (3-0).** The historical evolution of archival science, the development of the archives profession, archival principles and theories, appraisal and acquisition techniques, the laws affecting archives, programming and outreach, automation, conservation and preservation, and administration of collections. HIST 5342 is a prerequisite for HIST 5343.
- 5343. PRINCIPLES OF ARCHIVES AND MUSEUMS II (3-0).** Training in the methods and techniques of processing archives and historical manuscripts. Focuses on the day-to-day responsibilities of archivists and curators, such as appraising, accessioning, arranging, and describing collections. Prerequisite: HIST 5342.
- 5345. INTRODUCTION TO PUBLIC HISTORY (3-0).** An overview of the field of public history focusing on public historians, their work, their relationship to academic historians, their accomplishments, and the ethical principles under which they operate.
- 5348. TOPICS IN PUBLIC HISTORY (3-0).** A detailed examination of some aspect of public history (e.g. historical editing, oral history, historic preservation). The particular topic will vary with the instructor. Prerequisite: HIST 5345.
- 5349. TOPICS ON WORLD CIVILIZATION (3-0).** Examines subjects of immediate interest relating to world civilization not covered in other existing courses.
- 5350. HISTORY OF CARTOGRAPHY (3-0).** A history of maps and their making and cartographic documentation as a source for understanding historical development. An aspect of the history of science and technology and the history of discovery and exploration.
- 5391, 5691. INDEPENDENT STUDY.** For graduate students whose needs are covered by no course immediately available. Graded R.

INDUSTRIAL ENGINEERING

5392. HISTORICAL PERSPECTIVES ON THE HUMANITIES (3-0). An historical inquiry into problems and issues of contemporary relevance in the humanistic disciplines. The particular problems and issues investigated will vary with the instructor.

5395. NON-THESIS CAPSTONE (3-0). Readings in the non-thesis student's final semester, directed by the three-person faculty committee supervising the student's program of work. Required of all non-thesis students.

5398, 5698, 5998. THESIS. 5398 graded R/F only; 5698 and 5998 graded P/F/R.

5644. ARCHIVAL INTERNSHIP. Hands-on experience in archives, records centers, or historical manuscripts repositories. Graded P/F/R. Prerequisites: HIST 5342 and 5343.

5655. PUBLIC HISTORY INTERNSHIP (3-0). Placement in a history-oriented position in a private or public agency or organization in the community. Prerequisites: HIST 5345 and 5348. Graded P/F/R.

6391. INDEPENDENT STUDY (3-0). Graded R.

Program in HUMANITIES

See Interdepartmental and Intercampus Programs.

Department of INDUSTRIAL ENGINEERING

Area of Study

Industrial Engineering

Degrees

M.S., M.Engr., Ph.D.

Master's Degree Plans: Thesis, Thesis Substitute and Non-Thesis

Chair and Graduate Advisor:

G. T. Stevens, Jr.

420 Engineering

273-3092

Graduate Faculty:

Professors Corley, Liles, Meier, Pape, Priest, Stevens

Associate Professor Imrhan

Assistant Professor Del Castillo

OBJECTIVE

The graduate program in industrial engineering is designed to provide the student with fundamental knowledge in the various areas of industrial engineering and with the opportunity to specialize in a particular area. A student pursuing a master's or doctoral degree may specialize in one of the following areas:

1. **General Industrial Engineering**—The design, analysis, and control of modern production systems.
2. **Human Factors**—The analysis of the physiological and behavioral characteristics of humans in the industrial environment.
3. **Operations Research and Systems Analysis**—Formulation and analysis of quantitative models of engineering and management problems, and their application to complex integrated systems.
4. **Engineering Management**—The management of resources in technological enterprises.
5. **Manufacturing Systems**—The design and analysis of automated and computer integrated manufacturing systems.

In addition, special programs of study may be arranged.

ADMISSION

Applicants for the master's degree who hold a baccalaureate degree in engineering must meet the general requirements of the Graduate School as stated under the section entitled "Admission Requirements and Procedures." Applicants not meeting all criteria will be admitted on provisional or probationary basis only under exceptional circumstances.

For applicants with no prior training in engineering, the same minimum criteria will apply, and, in addition, their records will be reviewed in relation to the intended program of study and specific remedial work may be required.

The acceptance of applicants who have already received a master's degree in engineering will be based on the above-mentioned minimum criteria and results of graduate work.

CONTINUATION

The Industrial Engineering Graduate Program, in fulfillment of its responsibility to graduate highly qualified professional engineers, has established certain policies and procedures. In addition to requirements of the Graduate School listed elsewhere, to continue in the program each industrial engineering graduate student must:

1. Maintain at least a B (3.0) overall GPA in all coursework, and
2. Demonstrate suitability for professional engineering practice.

At such time as questions are raised by industrial engineering graduate faculty regarding either of the above, the student will be notified and will be provided the opportunity to respond to the Committee on Graduate Studies in Industrial Engineering. The Committee on Graduate Studies will review the student's performance and make a recommendation concerning the student's eligibility to continue in the program. Appeal of a decision on continuation may be made through normal procedures outlined in the section of this catalog entitled "Grievances Other than Grades."

DEGREE REQUIREMENTS

Students with degrees in other engineering disciplines may qualify for graduate study in industrial engineering after the completion of prescribed deficiency courses. Entering graduate students who are not proficient in engineering economy, probability and statistics, operations research, or industrial engineering design and analysis may be required to take deficiency courses to provide an appropriate background for graduate study in industrial engineering. For applicants with no prior training in engineering, the same deficiency courses will apply, and, in addition, courses in mathematics, physics, computer science, and engineering science may be required depending on the applicant's background.

Each graduate student will be required to take four courses as part of an industrial engineering core curriculum. The rest of the student's program will be elective, subject to the approval of the student's supervisory committee. The core curriculum is as follows:

1. Three hours of coursework in probability and statistics approved by the Graduate Advisor
2. Three hours of coursework in operations research approved by the Graduate Advisor
3. Three hours of coursework in human factors approved by the Graduate Advisor
4. Three hours of industrial engineering design approved by the Graduate Advisor.

A final examination covering the coursework is required for each master's candidate. In the option involving a thesis, this final examination will be oral and will also cover the thesis. The final examination involved in the other two options will be written and/or oral.

Master of Science

The Master of Science Degree is a research-oriented program which consists of a thesis option, thesis-substitute option, and a non-thesis option.

Master of Engineering

The Master of Engineering Degree is an engineering practice-oriented program. The degree is a 36 credit-hour program in which a maximum of six credit hours may be earned by an acceptable design project report, internship, or additional coursework. Applicants for this degree must have a baccalaureate degree in an engineering discipline.

INDUSTRIAL ENGINEERING

General degree requirements for the Master of Engineering are given under the catalog section entitled "Advanced Degrees and Requirements."

Doctor of Philosophy

The PhD degree should normally require four years of full-time study or less after completion of the BS degree. There is no foreign language requirement for the PhD degree.

The PhD requirements are listed in the catalog section entitled "Advanced Degrees and Requirements." A student's program will consist of coursework, independent study, and a dissertation in fields pertinent to the student's areas of interest. The program for each student will be planned by the student and a committee of faculty members. Students with undergraduate degrees in fields other than engineering will be required to take the necessary courses to establish a background in science, mathematics, and the engineering courses equivalent to that required in the undergraduate programs.

The grade of R (research in progress) is a permanent grade. An incomplete (the grade of X) cannot be given in a course which is graded R. To receive credit for an R-graded course the student must continue to enroll in the course until a passing grade is received. Three-hour thesis and three- and six-hour dissertation courses are graded R/F only. The grade of P (required for graduation) can be received in six- or nine-hour thesis courses and nine-hour dissertation courses only. In the course listings below, R-graded courses are designated either "Graded P/F/R" or "Graded R." (See also the section entitled "R" GRADE in this catalog.)

INDUSTRIAL ENGINEERING (IE)

5300. TOPICS IN INDUSTRIAL ENGINEERING (3-0). A study of selected topics in industrial engineering. May be repeated when topics vary. Prerequisite: consent of instructor and Graduate Advisor.

5301. ADVANCED OPERATIONS RESEARCH (3-0). Advanced techniques in operation research. Identification of current research areas. Prerequisite: IE 5323 or equivalent.



- 5303. TOPICS IN QUALITY CONTROL (3-0).** Principles and practices of industrial quality control. Includes the theory of statistical sampling and control. Prerequisite: IE 5317 or equivalent.
- 5304. ENGINEERING ECONOMY II (3-0).** Probabilistic cash flow models and the use of simulation for the evaluation of capital investments. Prerequisites: IE 5316 and 5317 or equivalent.
- 5305. LINEAR PROGRAMMING AND EXTENSIONS (3-0).** Theory of linear programming including the simplex method, duality, sensitivity analysis, decomposition principles, the transportation problem, and integer programming. Prerequisite: IE 5323 or equivalent.
- 5306. DYNAMIC OPTIMIZATION (3-0).** Multi-stage decision problems are characterized as dynamic programming problems. Numerical approximation schemes for dynamic programming problems are discussed. Solution of variational problems studied both from a classical and dynamic programming approach. Prerequisite: IE 5323 or equivalent.
- 5307. THEORY OF QUEUES (3-0).** Theory of queues with particular emphasis on industrial applications. Prerequisite: IE 5317 and 5323 or equivalent.
- 5309. ANALYSIS OF STOCHASTIC PROCESS (3-0).** Background for probabilistic model building. Stationary and non-stationary processes, counting processes, renewal theory. Markov chains, and random walk. Prerequisite: IE 5317 and 5323 or equivalent.
- 5310. PRODUCTION SYSTEMS DESIGN (3-0).** Problems and methods of systems design will be made. Particular emphasis is given to the construction of models representing the system, their optimization, and the presentation of results. Prerequisite: IE 5344 and 5323 or equivalent.
- 5311. STATISTICAL METHODS FOR INDUSTRIAL DECISION (3-0).** Statistical decision theory with applications. Prerequisite: IE 5317 or equivalent.
- 5312. ADVANCED PRODUCTION AND INVENTORY CONTROL SYSTEMS (3-0).** Continuation of the undergraduate course. Emphasis on mathematical model building and optimization. Prerequisite: IE 5323 or equivalent.
- 5313. RELIABILITY AND ADVANCED QUALITY CONTROL TOPICS (3-0).** Includes advanced quantitative topics in reliability design and quality control. Management of reliability and quality control functions are also included. Prerequisite: IE 4308 or 5303.
- 5314. SAFETY ENGINEERING (3-0).** A study of safety engineering as it relates to hazard identification, accident investigation, and prevention. Prerequisite: graduate standing.
- 5316. ECONOMIC DECISION MAKING (3-0).** Criteria used for making decisions about proposed capital investments and the implementation of selected criteria in engineering design and investment decisions. Emphasis on model building and optimization.
- 5317. ENGINEERING STATISTICS I (3-0).** Sets and set algebra; sample spaces; combinatorics; random variables; discrete and continuous density functions; emphasis on binomial, Poisson, normal, and gamma distributions; statistical concepts; hypothesis testing; point and interval estimation. Prerequisite: MATH 2325.
- 5318. ENGINEERING STATISTICS II (3-0).** Multivariate normal distribution and related functions—Chi-square, t , and F ; a matrix approach to regression analysis and analysis of variance; a survey of nonparametric statistical techniques. Prerequisite: IE 5317.
- 5319. ADVANCED STATISTICAL PROCESS CONTROL AND TIME SERIES ANALYSIS (3-0).** Design of control schemes for statistical monitoring and control of modern manufacturing processes. Topics include Time Series approach to controlling autocorrelated data, Short Run Statistical Process Control, and the Economic Design of Control Charts. Prerequisites: IE 5303 and IE 5317 or equivalent.
- 5320. ENTERPRISE ENGINEERING METHODS (3-0).** A survey of enterprise engineering methods. Topics include a system development methodology, a discussion of enterprise architectures, activity modeling (IDEFO), business modeling (IDEFIX), activity based performance analysis, simulation, and process improvement. Prerequisite: graduate standing. \$10 computer fee.
- 5321. ENTERPRISE ANALYSIS AND DESIGN (3-0).** An in-depth study of techniques useful for the analysis and design of the manufacturing enterprise. This course presents an advanced process description technique which is used, with simulation and activity based costing, to facilitate analysis and design. Prerequisite: IE 5320. \$10 computer fee.
- 5322. SIMULATION AND OPTIMIZATION (3-0).** Survey and applications of computer languages suitable for Monte Carlo simulation of random processes. Optimization and search techniques of functions introduced. Prerequisites: IE 5317 and consent of instructor. \$10 computer fee.

INDUSTRIAL ENGINEERING

5323. OPERATIONS RESEARCH (3-0). Introduction for graduate students to the techniques of operations research. Prerequisites: probability and statistics, calculus.

5326. BIOMECHANICS (3-0). Fundamentals and objectives of biomechanics. Discussion will concern anthropometry, link system of the body, kinematic aspects of extremity joints, biomechanical aspects of injury and prosthesis.

5327. INFORMATION SYSTEMS FOR ENGINEERING MANAGEMENT DECISIONS (3-0). Rigorous and quantitative treatment of financial information systems to assist engineering managers in capital and cost allocation, cost control, and performance evaluation. Prerequisite: graduate standing.

5329. MODELING AND CONTROL OF INDUSTRIAL SYSTEMS (3-0). Study and design of mathematical models for the effective control of industrial systems. Prerequisite: IE 5318. \$10 computer fee.

5330. INDUSTRIAL AUTOMATION (3-0). The design, control, and specification of automated production processes for manufacturing. Topics include numerical control, robotics, group technology, just-in-time, automated inspection, and flexible manufacturing systems. Prerequisite: graduate standing.

5331. ERGONOMICS (3-0). Relationships of humans with their work environment. Physiological and anatomical characteristics of people. Considerations of fatigue, accidents, and other human problems in industry. Prerequisite: IE 4344 or 5345.

5332. NONLINEAR PROGRAMMING (3-0). Optimization theory for unconstrained, equality constrained, and inequality constrained problems is first developed. Specific techniques then studied. Convex programming, geometric programming, quadratic programming, and optimum seeking methods presented. Prerequisite: IE 5305.

5339. CONCURRENT ENGINEERING, PRODUCIBILITY, AND RELIABILITY (3-0). Concurrent engineering techniques for developing products to insure producibility and reliability; product simplification, thermal analysis, testability, technical risk analysis, design for manufacture and quality. Prerequisite: graduate standing.

5342. JOB DESIGN AND STANDARDIZATION (2-3). Advanced study of work center design and methods of improving human work. Factors affecting work, such as fatigue, learning and physiology considered. Prerequisite: IE 3343 or 5344. \$2 lab fee.

5343. ENVIRONMENTAL BIOTECHNOLOGY (2-3). Physical, physiological, and psychological aspects of interaction between humans and thermal, atmospheric, radiant, and mechanical agents and energies in the environment. Biological and physical requirements for engineering design and control of the environment; applications to design of complex systems. Prerequisite: IE 4344 or 5345. \$2 lab fee.

5345. HUMAN ENGINEERING (2-3). Background in industrial human factors engineering. Emphasis placed on study of human structural, physiological, and psychological limitations and their effects on design of work systems. Prerequisites: IE 5344 or consent of the instructor and IE 5318. \$2 lab fee.

5349. INDUSTRIAL ROBOT APPLICATIONS (2-3). A study of the requirements and selection criteria for the integration of robots into simple and complex industrial activities. Prerequisite: IE 5330 or equivalent. \$2 lab fee.

5191, 5291, 5391. ADVANCED STUDIES IN INDUSTRIAL ENGINEERING. Individually approved research projects selected from the various branches of industrial engineering. Work performed as a thesis substitute normally will be accomplished under IE 5391, with prior approval of the Industrial Engineering Committee on Graduate Studies. Graded R.

5398, 5698, 5998. THESIS. 5398 graded R/F only; 5698 and 5998 graded P/F/R. Prerequisite: graduate standing in industrial engineering.

6197-6997. RESEARCH IN INDUSTRIAL ENGINEERING. Supervised research projects directed toward the dissertation. Prerequisites: graduate standing in industrial engineering and approval of advisor. Graded P/F/R.

6301. ENTERPRISE ARCHITECTURES AND FRAMEWORKS (3-0). A survey of enterprise architectures and analysis frameworks that have been proposed for the integration of large complex enterprise systems. Emphasis is placed on state-of-the-art approaches. Prerequisite: IE 5320. \$10 computer fee.

6302. MANUFACTURING FACILITIES PLANNING (3-0). Advanced techniques for the selection, location, and integration of manufacturing equipment and facilities for developing or expanding manufac-

turing organizations; significant design project required. Prerequisites: IE 5323, 5329, and 5344 or consent of the instructor.

6305. ENGINEERING MANAGEMENT (3-0). The engineering function as it relates to managing productive processes through the use of organization and management theory. Prerequisite: graduate standing.

6307. NETWORK ANALYSIS AND PROJECT MANAGEMENT (3-0). Methods for the analysis of transportation and scheduling networks including max-flow, min-cost, shortest route and minimum spanning tree. Also includes project management methods such as PERT, CPM, and GERT. Prerequisite: IE 5329. \$15 computer fee.

6308. DESIGN OF EXPERIMENTS FOR QUALITY (3-0). Statistical designs are studied for industrial process and product improvement. Fractional factorial, central composite, and customized designs are included. Prerequisite: IE 5318 or consent of instructor. \$15 computer fee.

6309. RESPONSE SURFACE METHODOLOGY (3-0). Empirical model building and response surface analysis using experimental design. Topics include first order models and multiresponse experiments and mixture designs. Prerequisite: IE 6308. \$10 computer fee.

6399, 6699, 6999. DISSERTATION. 6399 and 6699 graded R/F only; 6999 graded P/F/R.

A limited number of undergraduate courses may be applicable toward the graduate program if approved in advance by the Graduate Advisor.

Department of INFORMATION SYSTEMS AND MANAGEMENT SCIENCES

Areas of Study

Degrees

Business Administration (See Interdepartmental and Intercampus Programs.)

M.B.A., Ph.D.

Information Systems

M.S.

Mathematical Sciences (See Interdepartmental and Intercampus Programs.)

Ph.D.

Master's Degree Plans: Thesis or Thesis Substitute

Chair: Mary M. Whiteside

132 Business 273-3502

M.B.A. Graduate Advisor: David Gray

434 Business 273-3004

M.S.I.S. Graduate Advisor: Raja Iyer

125 Business 273-3538

Ph.D. Graduate Advisor: John Hassell

434 Business 273-3004

Graduate Faculty:

Professors Baker, Raja, Schkade, Whiteside

Associate Professors Eakin, Guynes, Huq, Iyer, Mykytyn, Pinney, Sircar, Slinkman

Assistant Professors Bordoloi, Sarkis, Semple

OBJECTIVE: M.B.A. PROGRAM

Information Systems emphasizes the preparation required for developing and managing computer-based information systems. The comprehensive curriculum includes the study of applicable computer

INFORMATION SYSTEMS AND MANAGEMENT SCIENCES

hardware, software, and database technology; the design of information systems; and management and control of information technologies and applications.

Management Sciences emphasize the development of quantitatively-based decision-making, including problem recognition and definition, system modeling capabilities, and the determination of optimal courses of action from various decision alternatives. Management Science exposes the student to a variety of decision-making frameworks and an extensive array of quantitative modeling tools.

OBJECTIVE: MASTER OF SCIENCE IN INFORMATION SYSTEMS

The objective of the Master of Science degree in Information Systems is to provide qualified students with both a general knowledge of business and a specialized knowledge of information systems. Students are exposed to the theory, research, and practical applications of numerous information systems areas including management information systems, database management systems, systems analysis and design, and data communications; and may take electives in distributed systems, information resource management, general system concepts, expert systems, decision support systems, problem formulation, computer science, management sciences, research, and other related fields. The program is designed to prepare students for information systems careers in government and non-profit organizations as well as in business and industry.

OBJECTIVE: PhD IN BUSINESS ADMINISTRATION PROGRAM

The objective of the PhD degree in Business Administration with a major field in either information systems or management sciences is primarily to develop scholars with an ability to teach and conduct independent research. The program is designed to provide the student with fundamental knowledge in the various areas of information systems or management sciences. Within management sciences, students can concentrate in one of the following: 1) production operations management, 2) business statistics, and 3) management science.

ACCREDITATION

The Master of Science degree in Information Systems is accredited by the American Assembly of Collegiate Schools of Business (AACSB).

DEGREE REQUIREMENTS

Along with meeting the admission requirements of the Graduate School, applicants must obtain a satisfactory score on the Graduate Management Admission Test (GMAT) and provide evidence of exceptional academic performance at the undergraduate level.

For students who have earned a Bachelor of Business Administration (BBA) degree (or equivalent), the program consists of a minimum of 30 semester hours, including six hours of thesis work. Nine semester hours of advanced electives approved by the Graduate Advisor can be substituted for the thesis, in which case the advanced program will be 33 semester hours. Students who do not have a BBA may have to take additional coursework (up to 27 semester hours) to acquire sufficient general business knowledge for effective performance as an information systems professional. Foundation courses may be waived if equivalent coursework has been completed.

The minimum advanced program of 30 semester hours contains six hours of required work in research and statistical methods; 12 hours of required work in management information systems (MIS), database management systems, systems analysis and design, and distributed information systems and data communications; six hours of electives (to be selected from an approved list of elective courses, or to be approved upon selection by the Graduate Advisor); and six hours of thesis demonstrating acceptable performance on a major systems project or an approved nine-semester-hour thesis substitute.

The required curriculum is as follows:

1. Foundation Courses (27 semester hours)

ACCT 5301 Accounting Analysis I

ACCT 5302 Accounting Analysis II

ECON 5309 Economic Analysis I

INSY 5310 Introduction to Computer and Information Systems

BUSA 5303 Quantitative Analysis for Business Administration

MASI 5321 Introduction to Management Science

INFORMATION SYSTEMS AND MANAGEMENT SCIENCES

MARK 5311 Marketing
FINA 5311 Finance
MANA 5312 Management

2. Advanced Courses (24 semester hours)

(a.) Required Research courses (6 semester hours)

BUSA 5325 Advanced Statistical Methods in Business

Approved Research Elective (3 hours)

(b.) Required Information Systems courses (12 semester hours)*

INSY 5330 Information Systems

INSY 5335 Data Base Management

INSY 5341 Information Systems Analysis and Design

INSY 5343 Distributed Information Systems and Data Communications

(c.) Approved Electives (6 semester hours)

Approved elective courses may be selected from areas such as accounting, computer science, finance, industrial engineering, information systems, management, management science, marketing, mathematical sciences, and psychology.

3. Thesis (BUSA 5698) or Thesis Substitute (nine approved semester hours)

*Courses may be substituted if equivalent courses have been taken.

The grade of R (research in progress) is a permanent grade. An incomplete (the grade of X) cannot be given in a course which is graded R. To receive credit for an R-graded course the student must continue to enroll in the course until a passing grade is received. Three-hour thesis and three- and six-hour dissertation courses are graded R/F only. The grade of P (required for graduation) can be received in six- or nine-hour thesis courses and nine-hour dissertation courses only. In the course listings below, R-graded courses are designated either "Graded P/F/R" or "Graded R." (See also the section entitled "R" GRADE in this catalog.)

INFORMATION SYSTEMS (INSY)

5310. INTRODUCTION TO COMPUTERS AND INFORMATION SYSTEMS (3-0). Introduction to the terminology and use of computers in organizations, including hardware and software technology, business data processing, distributed processing and networking, management information systems, database management systems, decision support systems, expert systems, and office information systems. Major software packages for business are presented and selectively utilized. \$30 computer fee.

5320. INFORMATION TECHNOLOGY AND SOCIETY (3-0). An examination of the societal aspects of computing and emerging information technologies. Topics include personal, organizational, ethical, legal, and economic issues. Prerequisite: INSY 5310 or equivalent. \$15 computer fee.

5330. INFORMATION AND DECISION SYSTEMS CONCEPTS (3-0). Concepts, frameworks, research, and practice covering the entire spectrum of the field of information systems: structure, development, and implementation of information systems; computer-based applications; management and control of corporate information systems; decision-support systems and expert systems; current trends. Prerequisite: INSY 5310 or equivalent. \$15 computer fee.

5335. APPLIED DATABASE MANAGEMENT (3-0). The objectives and methods of database approach to Information Processing are presented. Topics include data models (with emphasis on E/R the model and the Relational model), database design and implementation, SQL, and DBMS evaluation. Use of a commercial mainframe DBMS is required. Prerequisite: Working knowledge of a procedural language (3GL) and INSY 5330 or concurrent enrollment. \$30 computer fee.

5341. ANALYSIS AND DESIGN (3-0). Analysis and design phase of systems development life cycle. Topics include systems survey, functional specification, interface specification, data design, program design, system testing, and implementation. Prerequisites: programming language and INSY 5335. \$20 computer fee.

5342. AUTOMATED SYSTEMS DEVELOPMENT (3-0). The use of automated tools for systems development. Selection and implementation of automated tools and CASE technology, evaluation of automated tools for systems development and use of commercial tools such as EXCELLERATOR, REF, IEW. Prerequisite: INSY 5341. \$30 computer fee.

INFORMATION SYSTEMS AND MANAGEMENT SCIENCES

5343. COMPUTER NETWORKS AND DISTRIBUTED SYSTEMS (3-0). Characteristics, feasibility, configuration and design of distributed processing systems. Various business applications of distributed processing discussed. Computer programming in an interactive computer language. Prerequisite: INSY 5330. \$15 computer fee.

5344. ADVANCED INFORMATION ENGINEERING (3-0). Advanced topics in Information Engineering including graphical user interfaces, temporal data modeling, advanced activity analysis, cooperative processing, technical design, and construction. Prerequisites: INSY 5335, 5342. \$30 computer fee.

5346. ECONOMIC ISSUES IN INFORMATION TECHNOLOGY (3-0). Applications of economic concepts, technology selection, business value of computing, outsourcing, risk management, and disaster recovery decisions. Prerequisite: INSY 5330. \$15 computer fee.

5347. GLOBAL INFORMATION SYSTEMS ISSUES (3-0). Information, computers, and communication technologies in multinational businesses and strategic management of transborder information flows to optimize worldwide operations and profitability. Prerequisite: INSY 5330.

5350. HEALTH CARE INFORMATION SYSTEMS (3-0). Addresses issues in the development, integration, and management of health care information systems. Specifically, topics in financial information systems, patient care systems, and health care delivery applications will be discussed. Both case studies and real life applications will be studied. Prerequisite: INSY 5310 or consent of instructor. \$20 computer fee.

5352. OBJECT-ORIENTED DEVELOPMENT METHODOLOGIES (3-0). Discussion of various systems development methodologies. Emphasis on an object-oriented methodology. The focus is on developing and deploying information systems using the methodology. Prerequisite: INSY 5342. \$30 computer fee.

5354. ARTIFICIAL INTELLIGENCE IN BUSINESS (3-0). An examination of the theory and development of application of artificial intelligence to task performance and decision making in business. Includes knowledge based/expert systems, neural networks, use of system building shells/justification. Prerequisite: INSY 5330 or equivalent. \$30 computer fee.

5355. DECISION SUPPORT TECHNOLOGIES (3-0). Conceptual foundations and research for decision support systems involving groups, organizations, and the integration of expert systems. Includes design and implementation of a major decision support system case-based project. Prerequisites: INSY 5330, BUSA 5325. \$15 computer fee.

5356. CLIENT/SERVER SYSTEM DEVELOPMENT (3-0). Presentation of emerging areas of information technology especially client/server systems. Focus on information system development and deployment using client/server architecture. Prerequisite: INSY 5342. \$30 computer fee.

5358. HUMAN ASPECTS OF INFORMATION TECHNOLOGIES (3-0). Human issues in information systems. Task performance, decision styles, ergonomics, information acquisition, group dynamics, information technology, and organizations. Prerequisite: INSY 5330. \$15 computer fee.

5375. MANAGEMENT OF INFORMATION SYSTEMS (3-0). Issues related to the administration of computer-based systems including planning and development; control and evaluation; organization and personnel. Societal and technological issues are also addressed from a managerial viewpoint. Prerequisite: INSY 5310. \$15 computer fee.

5182, 5282, 5382. INDEPENDENT STUDIES IN INFORMATION SYSTEMS. Extensive analysis of an information systems topic. Graded P/F/R. Prerequisite: consent of faculty member and department chair. \$15 computer fee.

5192, 5292, 5392. SELECTED TOPICS IN INFORMATION SYSTEMS. In-depth study of selected topics in information systems. May be repeated when topics vary. Prerequisite: consent of instructor and Graduate Advisor. \$20 computer fee.

5398, 5698. THESIS. Prerequisite: permission of Graduate Advisor in Information Systems. 5398 graded R/F; 5698 graded P/F/R.

6301. SYSTEMS CONCEPTS (3-0). Intellectual foundations, primary concepts, theoretical frameworks for systems applied to fields such as system development, systems management, and decision making. Prerequisite: INSY 5330 or consent of instructor.

6302. SEMINAR IN ADVANCED SYSTEMS DEVELOPMENT (3-0). Research issues and current topics in systems development. Development automation, object-oriented technologies, applications of AI

INFORMATION SYSTEMS AND MANAGEMENT SCIENCES

technologies, real-time systems development, prototyping and distributed applications. Prerequisite: INSY 5342. \$30 computer fee.

6304. SEMINAR IN ARTIFICIAL INTELLIGENCE IN BUSINESS (3-0). Advanced topics on artificial intelligence in business. Topics include artificial intelligence architectures, artificial intelligence systems development, knowledge acquisition and representation, decision models and applications, and emerging decision support technologies. Prerequisite: INSY 5330 or equivalent. \$30 computer fee.

6305. DECISION SUPPORT SYSTEMS (3-0). An examination of the managerial decision making process and the contributions of information systems and management science models linked together in a comprehensive DSS framework. Prerequisites: proficiency in one programming language, INSY 5330, MASI 5321, BUSA 5325. \$15 computer fee.

6306. SEMINAR IN ADVANCED INFORMATION TECHNOLOGIES (3-0). Research issues and future trends in technological aspects of MIS. Emphasis on distribution and integration of information as a corporate resource. Prerequisites: INSY 5335 and 5343. \$30 computer fee.

6307. INFORMATION RESOURCE MANAGEMENT (3-0). Impact of information technology on organizational structure/strategy. MIS resources such as data, personnel, hardware/software. Management issues: computer center operations/administration, project management. Prerequisite: INSY 5345.

6308. SEMINAR IN HUMAN ASPECTS OF INFORMATION TECHNOLOGIES (3-0). Advanced study of human issues including human-computer interaction, group dynamics, ergonomics, cognitive functioning, and information acquisition and evaluation. Prerequisite: INSY 5330. \$15 computer fee.

6311. INFORMATION SYSTEMS RESEARCH SEMINAR (3-0). Integrative analysis of research in information systems, including research philosophies and methodologies, contemporary research topics, dissertation research and future directions for information systems research. Prerequisite: INSY 6301.

6380. RESEARCH IN INFORMATION SYSTEMS (3-0). Independent research under the supervision of a faculty member; may be repeated when topic varies. Graded P/F/R. Prerequisite: consent of instructor. \$15 computer fee.

DISSERTATION—See Business Administration entry for students in the PhD Program in Business Administration; see Mathematical Science entry for students in the PhD Program in Mathematical Sciences.

MANAGEMENT SCIENCE (MASI)

5321. INTRODUCTION TO MANAGEMENT SCIENCES (3-0). Introduction to the scientific approach to management problems. Special topics with applications taken from the areas of probability theory, linear programming, game theory, simulation, queuing theory, inventory theory, Markov chains, network analysis and other areas of management sciences and operations research. Prerequisites: BUSA 5301 and 5302 or equivalents. \$15 computer fee.

5323. APPLIED DECISION THEORY (3-0). Investigation of the analysis of decisions under risk and uncertainty. Concepts of both classical and Bayesian statistics will be integrated and applied to the decision-making process. Includes a treatment of subjective probability, utility theory, risk analysis, and the value of information. Prerequisites: BUSA 5301 and 5302, or equivalents. \$20 computer fee.

5324. APPLICATIONS OF COMPUTER MODELS IN MANAGEMENT SCIENCES (3-0). Examines the use of computer software packages for the solution of management science problems. Focuses on problem recognition and formulation and post optimality analysis, utilizing commercially available main frame and personal computer based software packages for solution of problems. Prerequisite: MASI 5321 or equivalent. \$30 computer fee.

5326. SIMULATION AND BUSINESS MODELS (3-0). Theory and practices in the simulation of stochastic and mathematical models of business and industrial processes. Application of mathematical models to problems of resource allocation, economic analysis, inventory systems, management planning models, queuing systems. Emphasis on the formulation, construction and simulation of realistic business problems. Prerequisite: MASI 5321. \$30 computer fee.

5327. APPLIED MATHEMATICAL PROGRAMMING (3-0). Optimization techniques including linear, quadratic, non-linear, dynamic integer, and geometric programming. Emphasis on problem identification, technique association, and solution formulation. Investigates applications of game theory. Prerequisite: MASI 5321. \$15 computer fee.

INFORMATION SYSTEMS AND MANAGEMENT SCIENCES

- 5330. NONPARAMETRIC STATISTICS (3-0).** A survey of statistical techniques which may be used when the normal assumptions of parametric statistics cannot be made; inclusion of procedures for cross-classified data, methods involving ranks, and Kolmogorov-Smirnov type techniques. Prerequisite: BUSA 5301 or equivalent. \$20 computer fee.
- 5331. STATISTICAL GRAPHICS AND GRAPHICAL PERCEPTION (3-0).** Graphical depiction and analysis of data structure, graphical software, and graphical perception. Statistical topics would include exploratory analysis of univariate and multivariate data using graphical software, e.g., Lowess Smoothing and Sunflower Plots. Graphical perception topics include mental imaging theory, Weber's and Steven's Laws, decision support, and review and critiques of current literature. Prerequisite: MASI 5325 or equivalent. \$30 computer fee.
- 5332. DESIGN OF EXPERIMENTS (3-0).** The theoretical and practical aspects of experimental design especially as related to business and economic research. Emphasis is placed on the design decision that will most efficiently answer the research question. In addition to simpler designs, incomplete blocks, splits, plots, and nested designs with fixed, random, and mixed effects will be considered. Prerequisites: MASI 5325 or equivalent and MANA 6329. \$20 computer fee.
- 5182, 5282, 5382. INDEPENDENT STUDIES IN MANAGEMENT SCIENCE.** Extensive analysis of a management science topic. Graded P/F/R. Prerequisite: consent of faculty member and department chair. \$15 computer fee.
- 5392. SELECTED TOPICS IN MANAGEMENT SCIENCE.** In-depth study of selected topics in management science. May be repeated when topics vary. Prerequisite: consent of instructor and Graduate Advisor. \$20 computer fee.
- 6301. SYSTEMS CONCEPTS (3-0).** Intellectual foundations, primary concepts, theoretical frameworks for systems applied to fields such as system development, systems management, and decision making. Prerequisite: INSY 5330 or consent of instructor.
- 6302. APPLIED LINEAR STATISTICAL MODELS I (3-0).** The theoretical and practical aspects of regression analysis. Topics include simple and multiple linear regression, the matrix formulation of regression models, regression diagnostics and remedial measures, collinearity and ridge regression, normal correlation models, and nonlinear least squares. Practical applications of statistical software packages are emphasized. Prerequisite: BUSA 5325 or equivalent. \$30 computer fee.
- 6303. APPLIED LINEAR STATISTICAL MODELS II (3-0).** The design and analysis of statistical linear models using analysis of variance. Topics include single and multiple factor analysis of variance, estimation of factor effects, multiple comparison procedures, and the more common experimental designs. Prerequisite: MASI 6302 or permission of instructor. \$30 computer fee.
- 6305. DECISION SUPPORT SYSTEMS (3-0).** An examination of the managerial decision making process and the contributions of information systems and management science models linked together in a comprehensive DSS framework. Prerequisites: proficiency in one programming language, INSY 5330, MASI 5321, BUSA 5325. \$15 computer fee.
- 6306. PROBLEM FORMULATION AND DECISION STRUCTURING (3-0).** Explores the concepts of formulating and structuring problems arising in relatively unstructured decision environments. Techniques used for problem identification, formulation and decision structuring and the uses of computer-based models and algorithms in problem solutions emphasized. Prerequisites: INSY 5330 and MASI 5321. \$20 computer fee.
- 6309. MULTIVARIATE STATISTICAL METHODS (3-0).** Focuses on methods of analyzing mean and covariance structures. Topics include commonly applied multivariate methods such as multiple analysis of variance, repeated measures, discriminant analysis, profile analysis, canonical correlations, and factor analytic methods. The use of matrix algebra and available computer packages will be stressed. Prerequisite: BUSA 5325. \$30 computer fee.
- 6370. SEMINAR IN MANAGEMENT SCIENCES (3-0).** Comprehensive and integrative study of management sciences, including epistemology, theoretical structures, and considerations for application of models and methods of analysis.
- 6380. RESEARCH IN MANAGEMENT SCIENCE (3-0).** Independent research under the supervision of a faculty member, may be repeated for credit. Prerequisite: consent of instructor. \$15 computer fee.

PRODUCTION AND OPERATIONS MANAGEMENT (POMA)

5361. INTRODUCTION TO PRODUCTION AND OPERATIONS MANAGEMENT (3-0). Design and control of systems for the use of raw materials, personnel, equipment and facilities in manufacturing products and providing services. Mathematical models are applied to decisions in a manufacturing setting. Prerequisite: MASI 5321. \$10 computer fee.

5363. MATERIAL RESOURCES PLANNING (3-0). The issues facing managers who are involved with the production and inventory control systems of a manufacturing firm. Practical and theoretical models examined. Prerequisite: POMA 5361. \$30 computer fee.

5365. MANUFACTURING TECHNOLOGY MANAGEMENT (3-0). Current technologies and their managerial implications. Strategic issues such as justification, adoption, implementation/integration of manufacturing technologies including CIM, FMS, MRP, OPT, and JIT. Prerequisite: POMA 5361. \$10 computer fee.

5367. QUALITY PLANNING, ANALYSIS, AND MANAGEMENT (3-0). An investigation of qualitative and quantitative tools employed in the control, planning, and analysis of quality in manufacturing and service industries. These tools, with supporting management information and decision systems, are covered, along with current issues related to quality standards and applications. Prerequisite: POMA 5361. \$15 computer fee.

5369. LOGISTICS MODELING AND TECHNOLOGY (3-0). Analytical and technological aspects of logistics and distribution systems for firms engaged in the production and service functions. The issues of logistics management including procurement, inventory control, warehousing, and transportation are discussed from a modeling and management perspective. Technological advances within these functional areas are covered, including the use of various automated manufacturing and control technology, and information and communications technology. Prerequisite: POMA 5361. \$30 computer fee.

6371. INTEGRATED MANUFACTURING STRATEGY AND RESEARCH (3-0). Linkages between the manufacturing and strategy development functions. Research issues within production/operations management. Current techniques/designs for achieving effective research. Prerequisite: POMA 5361. \$10 computer fee.

DISSERTATION—See Mathematical Sciences entry for students in the PhD Program in Mathematical Sciences; see Business Administration entry for students in the PhD Program in Business Administration.

Program in INTERDISCIPLINARY STUDIES

See Interdepartmental and Intercampus Programs.

Program in LANDSCAPE ARCHITECTURE

Area of Study
Landscape Architecture

Degree
M.L.A.

Master's Degree Plans: Thesis

<i>Dean of Architecture:</i> Edward M. Baum	203 ED Architecture	273-2801
<i>Director, Landscape Architecture:</i> Pat D. Taylor	203B Architecture	273-2801
<i>Graduate Advisor:</i> Richard C. Rome	420 Architecture	273-2801

Graduate Faculty:

Professor Baum
Associate Professors Robinette, Taylor
Assistant Professors Harwood, Rome
Adjunct Assistant Professors Bass, Makowski
Appropriate members of the graduate faculty from Architecture

OBJECTIVE

The mission of the Landscape Architecture Program is to provide students with the necessary verbal, intellectual, and design process skills required to achieve the highest level of practice as landscape architects. The Masters of Landscape Architecture Program has the dual objectives of providing students with a core of design and technical skills in combination with experiences in pure and applied research. The Landscape Architecture Program enables students to enter practice as landscape architects in private, public, academic, and research organizations.

In order to meet this objective the program offers a wide range of specializations which reflect the diversity of the landscape architecture profession. The specializations are (1) Advanced Landscape Architecture, (2) Computer-Aided Design and Planning, (3) Environmental Art and Aesthetics, (4) Park Planning and Resource Management, and (5) Urban, Suburban, and Regional Planning and Design. (See Graduate Landscape Architecture Program Handbook for details.)

DEGREE REQUIREMENTS

The applicant must meet the general requirements of the Graduate School. A personal interview is recommended and letters of reference are required. All students in the Landscape Architecture Program are required to consult the Graduate Advisor to obtain course and schedule approval each semester prior to registration.

Students are evaluated for admission to the graduate program using three criteria: a) grade point average from previous degree(s) and coursework, b) graduate record examination results, and c) a portfolio review/interview.

A student whose native language is not English must have a demonstrated speaking ability in English in addition to meeting the Graduate School's minimum score on the Test of English as a Foreign Language.

There are three basic degree programs in landscape architecture (Paths A, B, & C). These paths serve students with varying levels of prior education and professional experience.

Students with a degree from a non-design background may apply to Path A. Students from a design discipline other than landscape architecture may apply to Path B. Students with an accredited landscape architecture degree and a minimum of five years professional experience may apply to Path C.

First Professional Degree Program: Path A

For students holding a college degree in a field other than design. Some prerequisite courses are usually required such as design, plant materials, technology, drawing, theory, and history. The extent and number of such courses will depend upon the student's previous college experience and demonstrated skills.

The core curriculum prepares students holding a college degree in a field other than landscape architecture or a related design discipline for the specializations. The core curriculum in the Landscape Architecture Program provides students with the basic equivalent of a bachelor's degree in landscape architecture. For full-time students with degrees from other non-design disciplines, the core usually takes three semesters to complete. Upon completion of the core area of study, the students are required to choose a specialization that best meets their research and career goals.

The First Professional Program: Path A in landscape architecture consists of 92 credit hours for thesis or design thesis. Electives must be concentrated in a specialization.

Coursework is a suggestion to meet the program focus. Each student will be counseled, based upon interests and background, to develop an appropriate degree plan.

FIRST PROFESSIONAL DEGREE IN LANDSCAPE ARCHITECTURE: PATH A

All students are required to consult their Graduate Advisor to obtain course and schedule approval each semester prior to enrollment and registration. An approved degree plan must be submitted no later than the start of the student's second semester of graduate work.

Path A Total Hours: 92

Semester 1

- LARC 5661 Design Studio I
- LARC 5320 Communications for Landscape Architects
- LARC 5341 Landscape Technology I
- LARC 5330 Plant Identification and Ecology
- Total Credit Hours: 15

Semester 2

- LARC 5662 Design II
- LARC 5342 Landscape Technology II
- LARC 5312 History and Theory of Landscape Architecture I
- LARC 5332 Planting Design
- Total Credit Hours: 15

Semester 3

- LARC 5663 Design III: Site Planning
- LARC 5343 Landscape Technology III
- LARC 5313 History and Theory of Landscape Architecture II
- LARC 5321 Advanced Communications
- Total Credit Hours: 15

After completing 45 credit hours, the Path A student is evaluated by means of an academic and portfolio review by the Graduate Studies Committee. The committee identifies areas of strength and weakness in the student's performance and recommends appropriate action.

Upon completion of the three core semesters, a student is required to pursue study in one of the specializations. The student should consult the faculty advisor to select and develop a program of study in the chosen specialization. If the student chooses Advanced Landscape Architecture, this is the probable program of study.

ADVANCED LANDSCAPE ARCHITECTURE

Semester 4

- LARC 5664 Design IV
- LARC 5340 Professional Practice
- LARC 5380 Research Methods in Landscape Architecture
- LARC 5302 Land Development Planning
- Total Credit Hours: 15

Semester Between Academic Year 2 and 3

- LARC 5681 Professional Practicum or
- LARC 5695 Independent Study Abroad or
- LARC 5683 Independent Study Area of Specialization or Controlled Electives
- LARC 5660 Enrichment Design Studio Enrichment (if necessary)
- Total Credit Hours: 6

LANDSCAPE ARCHITECTURE

Semester 5

LARC 5665 Design V
Advanced or Independent Study in
Landscape Architecture (9 hours)
Total Credit Hours: 15
Total Credit Hours: 11

Students pursuing other specializations are required to meet with faculty advisors in their specialization and the landscape architecture advisor for approval of their specialization course selection.

Semester 6

LARC 5698 Thesis
LARC 5294 Master's Comprehensive Examination
Advanced or Independent Study in
Landscape Architecture (3 hours)

Professional Degree Program: Path B

Path B is for students holding a college degree in a design discipline such as landscape architecture, architecture, interior design. Path B prepares students for a professional role in the field of landscape architecture and offers experiences in pure and applied landscape architectural research with opportunities for specialization in (1) Advanced Landscape Architecture, (2) Computer-Aided Design and Planning, (3) Environmental Art and Aesthetics, (4) Park Planning and Resource Management, and (5) Urban, Suburban, and Regional Planning and Design. Those holding degrees in other design fields such as architecture, interior design or city planning are required to take selected preparatory courses in plants, history, theory, and landscape design. A portfolio of previous work is required in addition to the general requirements of the Graduate School.

The Professional Program: Path B in landscape architecture consists of 62 credit hours for thesis. Electives must be utilized to concentrate in one of the specializations.

Students are evaluated for admission to Path B of the graduate program using three criteria: a) grade point average from previous degree(s) and coursework, b) graduate record examination results, and c) a portfolio/interview. The minimum requirements are a GPA of 3.0 or better, a GRE score of 1000 or better on the first two components of the GRE, and a portfolio/interview score of 1000 or better. The maximum score for each category of evaluation criteria: a) GPA= 4000 points maximum, b) GRE= 1600 points maximum, and c) portfolio/interview= 1600 points maximum. The maximum total admissions score is 7200. In addition to these requirements Path B students must hold a college degree in a design discipline from an accredited college or university.

All students are required to consult the Graduate Advisor to obtain course and schedule approval each semester prior to enrollment and registration. An approved degree plan must be submitted no later than the start of the student's second semester of graduate work. Students from disciplines other than landscape architecture may be required to complete prerequisite courses in the core curriculum based on conditions of admission and recommendation of the Graduate Advisor. Experienced students in the Path B program may be allowed to modify their degree plan to reflect past experience. Students who wish to modify their degree plan in this manner must submit individual waiver forms for each course they wish to waive. These will be submitted for review and approval by their Graduate Advisor, the Director of the Landscape Architecture Program, and the Graduate Studies Committee. Students who waive courses must substitute courses from their specialization for the waived core course.

PROFESSIONAL DEGREE IN LANDSCAPE ARCHITECTURE: PATH B

Path B Total Hours: 62

Semester 1

LARC 5663 Design III
LARC 5330 Plant Identification and Ecology
LARC 5321 Advanced Communications
LARC 5313 History and Theory of
Landscape Architecture II
Total Credit Hours: 15

Semester 2

LARC 5664 Design IV
LARC 5342 Landscape Technology II
LARC 5332 Planting Design
LARC 5302 Land Development Planning
Total Credit Hours: 15

Semester Between Academic Year 1 and 2

LARC 5681 Professional Practicum or
LARC 5695 Independent Study Abroad or
LARC 5683 Independent Study Specialization
Total Credit Hours: 6

Semester 3

LARC 5665 Design V
 LARC 5340 Professional Practice
 LARC 5380 Research Methods in
 Landscape Architecture
 Study in specialization (3 hours)
 Total Credit Hours: 15
 Total Credit Hours Required for Path B Graduation: 62

Semester 4

LARC 5698 Thesis
 LARC 5294 Master's Comprehensive Examination
 Study in specialization (3 hours)
 Total Credit Hours: 11

Post Professional Degree Program: Path C

Path C is for students holding an accredited college degree in landscape architecture, with a minimum of five years of professional practice. Path C focuses on preparing experienced students for an advanced professional role in the field of landscape architecture. The Path C program allows professionals to develop a new specialization and concentrates on the development of their research and teaching skill through an individualized program of study specializing in one of the following: (1) Advanced Landscape Architecture, (2) Computer-Aided Design and Planning, (3) Environmental Art and Aesthetics, (4) Park Planning and Resource Management, and (5) Urban, Suburban, and Regional Planning and Design.

Students are evaluated for admission to the graduate program using three criteria: a) grade point average from previous degree(s) and coursework, b) graduate record examination results, and c) a portfolio review/interview. The minimum requirements are a GPA of 3.0 or better, a GRE score of 1000 or better in the first two components of the GRE, and a portfolio/interview score of 1000 or better. The maximum score for each category of evaluation criteria is as follows: a) GPA= 4000 points maximum, b) GRE= 1600 points maximum, c) Portfolio/Interview= 1600 points maximum. The maximum total admissions score is 7200. Path C students must hold a degree in landscape architecture and have five years of related experience.

All students are required to consult the Graduate Advisor to obtain course and schedule approval one semester prior to enrollment and registration. An approved degree plan must be submitted one semester prior to the start of a student's first semester of graduate work. Experienced students in the Path C program designation may be allowed to modify their degree plan to reflect past experience. Students who wish to modify their degree plan in this manner must submit individual waiver forms for each course they wish to waive. These will be submitted for review and approval by the Graduate Advisor, the Director of the Landscape Architecture Program, and the Graduate Studies Committee. Students who waive courses must substitute courses from their specialization for the waived core course.

Semester 1

LARC 5665 Design V
 LARC 5380 Research Methods in
 Landscape Architecture
 Specialization Option Courses (6 hours)
 Total Credit Hours: 15

Semester 2

LARC 5698 Thesis
 LARC 5294 Master's Comprehensive Examination
 LARC 5302 Land Development Planning
 Specialization Option Courses,
 Independent Study (4 hours)
 Total Credit Hours: 15

Total Credit Hours required for a MLA Degree in Path C: 30

The grade of R (research in progress) is a permanent grade. An incomplete (the grade of X) cannot be given in a course which is graded R. To receive credit for an R-graded course the student must continue to enroll in the course until a passing grade is received. Three-hour thesis and three- and six-hour dissertation courses are graded R/F only. The grade of P (required for graduation) can be received in six- or nine-hour thesis courses and nine-hour dissertation courses only. In the course listings below, R-graded courses are designated either "Graded P/F/R" or "Graded R." (See also the section entitled "R" GRADE in this catalog.)

LANDSCAPE ARCHITECTURE (LARC)

5294. MASTER'S COMPREHENSIVE EXAMINATION. Must be taken concurrently with Thesis. Directed study, consultation, and comprehensive examination of coursework, leading to and including the thesis. Oral presentation required. Required of all Master of Landscape Architecture students in the semester in which they plan to graduate. Graded P/F/R.

LANDSCAPE ARCHITECTURE

5301. SITE PLANNING AND DEVELOPMENT PROCESSES (3-0). (Previously LARC 5337) Presents the processes and practices of site planning and development. Site inventory, analysis, and assessment of potential building sites. Students examine the natural, cultural, and social systems that affect design decisions.

5302. LAND DEVELOPMENT PLANNING (3-0). (Formerly LARC 5353) The process of land development planning for landscape architects. Detailed expansion of LARC 5301. Uses case studies in land development planning to instruct students in the environmental, economic, legal, and visual issues associated with the land planning process. Prerequisites: LARC 5301, 5663.

5312. HISTORY AND THEORY OF LANDSCAPE ARCHITECTURE I (3-0). Traces landscape planning and design from pre-history through Egypt, Rome, Islamic, and Medieval gardens to Renaissance, Italian, French, and English landscape approaches, culminating in the mid-19th Century. Relates landscape design to the societal, cultural, technological, and belief systems of the period.

5313. HISTORY AND THEORY OF LANDSCAPE ARCHITECTURE II (3-0). The contemporary history of the profession from Andrew Jackson Downing to present day. The growth and development of the ASLA, professional education, the environmental movement, large scale regional planning, and significant 20th Century landscape architectural projects. Prerequisite: LARC 5312.

5320. COMMUNICATIONS FOR LANDSCAPE ARCHITECTS (2-4). Primary class for the development of graphic and communication skills in landscape architecture. Provides a method for transferring conceptual ideas into legible graphic presentations. Should be taken concurrently with LARC 5661 Design I. \$13 lab fee.

5321. ADVANCED COMMUNICATIONS (2-4). Presentation techniques; expansion on graphic thinking and communication presented in LARC 5320. Prerequisite: LARC 5320 or permission of the instructor. \$13 lab fee. \$5 computer fee.

5324. LANDSCAPE ARCHITECTURE AND ENVIRONMENTAL ART SEMINAR (2-2). Siting and creating works of art; analysis of the creative processes of the two different-yet-related disciplines. Case studies of built works. Communication of ideas through environmental media. Prerequisites: completion of landscape architecture core, permission of the instructor. \$13 lab fee.

5325. COLLABORATIVE WORKS SEMINAR (2-2). Examines the professional roles of each of the associated disciplines in the specialization tracks. Case studies, internship presentations, and guest lecturers from each area serve as the basis for discussion, analysis, and discovery of the workings of collaborative processes. Investigates the communication processes of successful collaborative works. Prerequisites: completion of landscape architecture core, permission of the instructor. \$13 lab fee.

5330. PLANT IDENTIFICATION AND ECOLOGY (2-4). Examines the ecology, growth characteristics, and design applications of plant materials. Local field trips are required. Prerequisite: LARC 5301 or permission of instructor.

5331. PLANTING DESIGN (2-4). Design applications of plant material. Students apply the design problem-solving approach to the detailed aspects of planting design and complete a progressively-more-difficult series of problems to practice techniques and methods of plant manipulation that encompass both the aesthetic and functional purposes of planting design. Prerequisites: LARC 5663, 5330, and 5341, or permission of instructor. \$13 lab fee.

5340. PROFESSIONAL PRACTICE (3-0). Ethical, legal, and administrative aspects of the public, private, and academic spectrums of practice in landscape architecture.

5341. LANDSCAPE TECHNOLOGY I (2-4). Provides a working knowledge of surveying, site grading, storm water management, vertical and horizontal curves and an overview of the construction documentation process employed by landscape architects. Prerequisite: LARC 5301 or permission of instructor. \$13 lab fee.

5342. LANDSCAPE TECHNOLOGY II (2-4). Materials and techniques employed in the construction process. Materials are examined through completion of design details that specify how they may be used as part of a landscape construction. Detailed methods of design evaluation such as drawings, scale models, and actual constructions will be used. Prerequisite: LARC 5341 or permission of instructor. \$13 lab fee.

5343. LANDSCAPE TECHNOLOGY III (2-4). Students prepare a set of construction drawings for a design project from a previous studio. Layout, grading, irrigation, utilities, planting, construction, detailing, specifications, and cost estimating. Prerequisite: LARC 5342 or permission of the instructor. \$13 lab fee.

5344. PARK AND RECREATION DESIGN AND PLANNING (2-2). History, data collection, program formulation, and design principles for public and private park and recreation systems and sites. Includes management objectives, operations and maintenance, and public input as planning components. Prerequisites: LARC 5320, 5661. \$13 lab fee.

5346. IRRIGATION TECHNIQUES (2-4). The structural and technical aspects of irrigation design and application, including effective use and care of native plant materials and designing for native environments. Prerequisites: completion of landscape architecture core, permission of the instructor. \$13 lab fee.

5350. LANDSCAPE ARCHITECTURE COMPUTER APPLICATIONS (2-4). Computer applications currently used in office practice. Computer applications used for office management, site analysis, design development, construction documentation, and cost estimating. Introduction to computer aided design applications and the underlying theories of application. \$13 lab fee. \$15 computer fee.

5351. ADVANCED COMPUTER-AIDED DESIGN (2-4). Expansion of LARC 5350. Students complete a typical design problem utilizing computer-aided methods and examine the differences between traditional manual methods of design and computer-aided techniques. Instruction in data standards, methods of translation, layering of design information, and connections between the phases of the design process. Prerequisite: LARC 5350, or permission of the instructor. \$13 lab fee. \$15 computer fee.

5352. GIS: APPLICATIONS IN ENVIRONMENTAL PLANNING (2-4). Geographic Information System technology as a tool for environmental planning problems. Instruction in software for use in environmental inventory and in analysis and assessment of various design and planning alternatives. Prerequisite: LARC 5350, or permission of the instructor. \$13 lab fee. \$15 computer fee.

5353. THE FUTURE OF COMPUTING IN LANDSCAPE ARCHITECTURE (2-4). Current models for increased levels of computer-aided decision-making in landscape architecture and affiliated disciplines. Formal and informal processes of design are investigated to determine the potential for expanding the computer-aided design and planning process. Prerequisite: LARC 5351 or permission of instructor. \$13 lab fee. \$15 computer fee.

5380. RESEARCH METHODS IN LANDSCAPE ARCHITECTURE (3-0). Theories of practical research and methods of achieving them as they relate to landscape architecture. Includes research program development, funding source location, proposal writing, research techniques and tools, and research reporting methods. Prerequisite: LARC 5663 or permission of instructor.

5382. SEMINAR IN URBAN DESIGN (3-0). Advanced presentation and discussion of issues related to contemporary and historic urban design. Students present and lead informed discussions on topics such as population density, environmental management, waterfront development, allocation of open space, public art, urban form, and cultural determination. Prerequisite: LARC 5663 or permission of instructor.

5383. SEMINAR IN LANDSCAPE AESTHETICS (3-0). Advanced presentation and discussion of issues related to contemporary and historic aspects of landscape aesthetics. Students present and lead informed discussions and debate on topics such as landscape beauty, values, and perception in exterior space, aesthetics versus function, and philosophic interpretations of beauty applied to the landscape. Prerequisites: LARC 5663 and 5313, or permission of instructor.

5623. STUDIO TEACHING PRACTICUM (0-9). Students will spend one semester as a teaching assistant in the studio sequence under the supervision of the assigned faculty member. They will observe the methods employed in the studio and prepare a comprehensive evaluation of the studio in conjunction with the instructor. The students will oversee one short studio project and evaluate its success or failure based on the criteria learned in LARC 5322 and the goals and objectives of the test project. Prerequisites: LARC 5322, completion of landscape architecture core, or permission of the instructor. \$13 lab fee.

5660. ENRICHMENT DESIGN STUDIO (3-9). Review of the principles and processes of design presented in Design Studios I, II, and III. Provides an opportunity for students with weak design and graphic skills to improve those skills to meet requirements for Design IV. \$13 lab fee.

5661. DESIGN STUDIO I (3-9). A design course for students with no background in landscape architecture or design. Outlines the site planning and site design decision-making process. Focuses on providing students with the verbal, intellectual, and graphic tools necessary to successfully tackle a design problem and bring it to a schematic level of completion. It is highly recommended that this course be taken concurrently with LARC 5320.

5662. DESIGN STUDIO II (3-9). A continuation of 5661. Basic design principles and their application to three-dimensional spaces. Examines how humans occupy exterior space and combines this information with the principles of design to create garden scale models. Models as a media for design expression.

LANDSCAPE ARCHITECTURE

Landscape character, design simulation, landscape media, landscape context, and human spatial experience. Prerequisites: LARC 5320 and 5661, or permission of instructor. \$13 lab fee.

5663. DESIGN STUDIO III: SITE PLANNING (3-9). Features the process of solving complicated site planning and site design problems. Each phase of the site planning process will be examined in detail by undertaking one or more studio problems that involve resolution of issues related to existing site conditions, program development, conceptual design, design development, and design detailing. Prerequisites: LARC 5661, 5662, 5320, 5301, 5340, 5312, 5329, and portfolio review, or permission of instructor. \$13 lab fee.

5664. DESIGN STUDIO IV: ENVIRONMENTAL PLANNING (3-9). Seeks to expand the student's concept of the environment as a large scale ecologic unit independent of political boundaries. Presents a process of solving large scale planning problems through the examination of data gathering and information processing techniques commonly utilized by landscape architects who are employed in the endeavor of environmental planning. Prerequisite: LARC 5663 or permission of instructor. \$13 lab fee.

5665. DESIGN STUDIO V: THE URBAN LANDSCAPE (3-9). The summary studio of the design sequence. Basic design principles are reiterated and problems are introduced which require interaction with architects, planners, urban designers, developers, or administrators, on complex urban projects. Prerequisite: LARC 5664 or permission of instructor. \$13 lab fee.

5666. DESIGN STUDIO IV: SPECIALIZATION OPTION TOPICS (3-9). In each specialization option, a section of Studio IV will be offered to address specific design issues within the given area of study. Landscape architectural problems utilizing skills from the landscape architectural core to bring unique, specialized skills to the problem-solving process. May be repeated for credit. Prerequisite: LARC 5663, or permission of instructor. \$13 lab fee.

5667. DESIGN STUDIO V: SPECIALIZATION OPTION TOPICS (3-9). In each specialization option, a section of Studio V will be offered to address specific design issues within the given area of study. Landscape architectural problems utilizing skills from the landscape architectural core to bring unique, specialized skills to the problem-solving process. Prerequisite: LARC 5664 or LARC 5666 or permission of the instructor. \$13 lab fee.

5668. DESIGN PRACTICUM. An internship program which includes approved work done in a landscape architect's office or one of the related design fields. The purpose of the practicum is to provide students with practical design experience. Grades P/F.

5191, 5391, 5691. SPECIAL TOPICS IN LANDSCAPE ARCHITECTURE. Special subjects and issues in landscape architecture that may be studied independently under faculty supervision. Prerequisite: LARC 5663 or permission of instructor.

5195, 5295, 5395, 5695. SELECTED TOPICS IN LANDSCAPE ARCHITECTURE. Selected studio or lecture course offerings in specific areas of expertise or interest. Course allows the program the flexibility to address the ever-changing needs of students and profession by offering courses beyond the scope of the core curriculum and specializations. Prerequisite: LARC 5380 or permission of instructor. Graded P/F/R.

5698. THESIS. Independent research and presentation of findings under the direction of a supervising committee. The findings of the thesis should extend the boundaries of the professional discipline by either presenting new and unique ideas or information or by interpreting existing knowledge from a different perspective. Prerequisites: LARC 5380, 5665, and must be taken concurrently with LARC 5294. Graded P/F/R.

Program in LINGUISTICS

Areas of Study

Linguistics

Humanities (See Interdepartmental
and Intercampus Programs.)

Degrees

M.A.

M.A., M.A.T., Ph.D.

Master's Degree Plans: Thesis, Thesis Substitute, and Non-Thesis

Program Director: Jerold A. Edmondson 408 Hammond 273-3133

Graduate Advisor: Irwin Feigenbaum 226 Hammond 273-3161

Graduate Faculty:

Professor Edmondson

Associate Professors Burquest, Feigenbaum, Herring

Assistant Professors Paolillo, Silva

Adjunct Professors Grimes, Headland, G. Huttar, Longacre, Merrifield, Pike,
Rensch, Robbins

Adjunct Associate Professors Franklin, Gregerson, Hwang

Adjunct Assistant Professors Diehl, Gallman, M. Huttar, Larson, McElhanon, C.

McKinney, N. McKinney, Moore, Morgan, Morren, Simons, Stark, Walter,
Wendell, L. Yost, W. Yost

OBJECTIVES

Linguistics, the systematic study of human language, is situated at the crossroads of the humanities, the social sciences, and the physical sciences. The program in linguistics at The University of Texas at Arlington provides comprehensive training in current linguistic theory as informed by data from a variety of languages, and, optionally, in the application of linguistics to teaching English as a second or foreign language. Students receive instruction in the analysis of sound systems (phonetics and phonology) and grammar (morphology and syntax); in addition, the program has strengths in field linguistics, ESL teaching, discourse analysis, and sociolinguistics. Graduates of the program may find employment in fieldwork, international affairs and development, research, teaching, translation, and other fields.

Graduate programs in linguistics are primarily designed for those with a background in one or more foreign languages and/or a background in the linguistic aspects of the English language, but others who are willing to fulfill the listed prerequisites are invited to apply. Linguistic science has applications in language learning and teaching, literary analysis and criticism, psychology, communication, anthropology, philosophy, neurology, sociology, speech recognition and synthesis, and artificial intelligence.

DEGREE REQUIREMENTS

Prerequisites for Admission: consult Program Director.

In addition to the Graduate School requirements for Master's degree programs, the following requirements apply to linguistics students:

Thesis: A written comprehensive examination may be given at the discretion of the student's committee.

Thesis Substitute: There will be a written examination on the coursework and an oral defense of the thesis substitute. At least 30 hours must be in coursework.

Non-thesis: There will be a comprehensive written examination on the coursework and an appropriate reading list.

Candidates, upon admission or early in the graduate program, must present the following prerequisite undergraduate courses (or pass appropriate examinations): introductory courses in articulatory phonetics,

LINGUISTICS

phonology, grammar, and a problems course in grammatical analysis, or equivalents. Candidates may also wish to include in their coursework offerings in other programs and departments, e.g. in humanities, anthropology, etc.

Students pursuing the MA degree in Linguistics must take: 1) LING 5301 and 5304; 2) LING 5303 and one of 5306, 5312, 5313, 5348; 3) LING 5316 or 5317 or 5320; 4) LING 5332 or 5333. Students interested in teaching English as a Foreign Language (EFL) or English as a Second Language (ESL) should take LING 5327, 5353, 5354, 5355, and 5356. LING 5304 may be waived at the discretion of the student's committee.

Further, all degree candidates must demonstrate analytical knowledge of the linguistic structure of a non-Indo European language. This requirement may be fulfilled by taking LING 5340. A student may be exempt from taking LING 5340 by successfully completing 1) a master's thesis on the linguistic structure of a non-Indo European language, or 2) a detailed examination on the structure of a non-Indo European language together with a substantial paper (in finished manuscript form) on the structure of the language examined.

THE INTERNATIONAL LINGUISTICS CENTER

(The Summer Institute of Linguistics)

The International Linguistics Center in Dallas (near Duncanville) and The University of Texas at Arlington offer cooperatively a program in linguistic training and research. This program leads to the MA and the PhD degree at UT Arlington. Participants must apply for admission to UT Arlington.

Persons who wish to pursue the program at ILC but who are not eligible for admission to UT Arlington may make arrangements with ILC.

Registration is administered by UT Arlington on campus. Students may take the courses on either or both campuses. Refer to the semester Schedule of Classes for location of courses.

The grade of R (research in progress) is a permanent grade. An incomplete (the grade of X) cannot be given in a course which is graded R. To receive credit for an R-graded course the student must continue to enroll in the course until a passing grade is received. Three-hour thesis and three- and six-hour dissertation courses are graded R/F only. The grade of P (required for graduation) can be received in six- or nine-hour thesis courses and nine-hour dissertation courses only. In the course listings below, R-graded courses are designated either "Graded P/F/R" or "Graded R." (See also the section entitled "R" GRADE in this catalog.)

LINGUISTICS (LING)

5190. CONFERENCE COURSE IN LINGUISTICS (1-0). Graded P/F/R. Prerequisite: permission of Graduate Advisor.

5300. LINGUISTIC ANALYSIS (3-0). An overview of the study of human language from a linguistic perspective. Topics covered may include the analysis of language structures, the study of language in social contexts, the principles governing language change, and the application of linguistic analysis to language teaching, literary studies, literacy, and translation. May not be used to fulfill the MA degree requirements in linguistics. \$5 computer fee.

5301. PHONOLOGICAL THEORY I (3-0). Explores the principles governing sound systems in human languages.

5303. GRAMMATICAL THEORY I (3-0). Explores grammatical systems in human languages. May be repeated for credit when topic changes.

5304. PHONOLOGICAL THEORY II (3-0). A continuation of LING 5301. Topics may include autosegmental analysis, lexical phonology, metrical phonology, and phonological feature geometry. May be repeated for credit when topic changes. Prerequisite: LING 5301.

5305. FIELD METHODS (3-0).

5306. GRAMMATICAL THEORY II (3-0). A continuation of LING 5303. Taught alternately as government and binding theory, functional-typological grammar, discourse grammar, and other current theoretical approaches. May be repeated for credit when topic changes. Prerequisite: LING 5303.

5307. TOPICS IN LINGUISTICS, LITERACY, AND LANGUAGE TEACHING (3-0).

- 5308. TOPICS IN SOCIOLINGUISTICS (3-0).** Selected topics relating the scientific methodologies of linguistics to the larger concerns of society and culture including cognition, motivation, description and analysis.
- 5309. LANGUAGE USE IN MULTILINGUAL SOCIETIES (3-0).** An overview of linguistics and some of its applications, with primary focus on language use in developing nations. May not be used to fulfill the MA degree requirements in linguistics.
- 5310. ACOUSTIC PHONETICS (3-0).** An investigation into the physical properties of human speech. Students will gain hands-on experience with computer-assisted speech analysis. No prior computer experience is assumed. \$10 computer fee.
- 5311. PRINCIPLES OF TRANSLATION I (3-0).** Theory and procedures in cross-language transfer with emphasis on basic linguistic notions such as form vs. meaning, multiple senses, and types of lexical equivalences and sociolinguistic factors involved in idiomatic translation. Prerequisite: LING 5303, or permission of the instructor. May not apply toward degree requirements if LING 5336 and ANTH 3322 are applied.
- 5312. MORPHOLOGY (3-0).** A theoretical and typological investigation into the nature of word-structure and word-formation processes in human languages.
- 5313. LANGUAGE UNIVERSALS AND LINGUISTIC TYPOLOGY (3-0).** Consideration of universals in human language, their explanation and description, and language types.
- 5316. SOCIOLINGUISTICS OF SOCIETY (3-0).** The study of macro-sociolinguistics, including topics such as multilingualism, language standardization and planning, literacy, language dominance, maintenance and death, language and identity, diglossia, and pidgins and creoles.
- 5317. SOCIOLINGUISTICS (3-0).** The study of language in its social context, including topics such as linguistic variation, address and reference, speech levels, bilingualism, code switching, speech acts, conversational analysis, and language and gender.
- 5320. HISTORICAL AND COMPARATIVE LINGUISTICS (3-0).** The study of language development and change; the comparative method and its use in linguistic reconstruction; laws of language change.
- 5327. LANGUAGE ACQUISITION (3-0).** Study of the processes of first and second language acquisition, their similarities and differences, language disorders, language perception and production, and implications of language acquisition research for linguistic theory and language teaching.
- 5330. THE COMPUTER AND NATURAL LANGUAGE (3-0).** Applications of computers to linguistic analysis, and applications of linguistic analysis to computing. Topics may include natural language processing, speech recognition and synthesis, language prostheses, statistical analysis, text processing, and corpus analysis. \$10 computer fee.
- 5332. SURVEY OF LINGUISTIC THEORIES (3-0).** A comparison and contrast of various linguistic theories, with consideration of their assumptions and problem-solving capacities.
- 5333. READINGS IN LINGUISTICS (3-0).**
- 5336. PRINCIPLES OF LITERACY (3-0).** Principles involved in the introduction of literacy to pre-literate societies. Includes consideration of motivational factors, stimulation of indigenous authorship, orthography design, elements of reading methodology and alternative strategies for literacy programs. May not apply toward degree requirements if LING 5311 and SOCI 5342 are applied.
- 5337. LITERACY INSTRUCTION AND APPLIED LINGUISTICS (3-0).** A study of the linguistic, pedagogical, and socio-cultural bases for training literacy teachers in languages of preliterate societies. Surveys current trends in literacy instruction, issues of language choice, and the use of linguistically appropriate material.
- 5338. READING THEORY AND APPLIED LINGUISTICS (3-0).** Survey of reading theory, with practical application to the preparation of literary materials for preliterate societies. Attention given to specific linguistic and psycholinguistic factors involved. Prerequisites: LING 5301.
- 5339. SOCIOLINGUISTIC ASPECTS OF LANGUAGE PROGRAMS (3-0).** Survey of the linguistic and social factors involved in the development of language programs for preliterate speakers of vernacular languages. Special attention given to the effect of using the mother tongue and/or a second language in such programs, and accompanying measurement and documentation.
- 5340. NON-INDO EUROPEAN LINGUISTIC STRUCTURES (3-0).** Theoretical study of a selected non-Indo European language, language family, or language area based on descriptive linguistic analysis. May be repeated once for credit as the topic varies.

LINGUISTICS

5342. READINGS IN NON-INDO EUROPEAN LANGUAGE (3-0). May not be used to fulfill the non-Indo European language requirement. Prerequisite: LING 5340 or equivalent.

5345. SEMANTICS (3-0). Considerations of meaning in language with special reference to words and concepts in relation to semantic domains, componential features of meaning, and case roles, with resulting implications for cross-cultural communication.

5346. SPOKEN DISCOURSE (3-0). Techniques for collecting, transcribing, and analyzing conversation and other forms of spoken communication, with attention to social, cognitive, and linguistic constraints on their production and use. Prerequisite: LING 5303.

5348. TEXT ANALYSIS (3-0). Methods of charting and analyzing texts to reveal the systematic contributions of pragmatic choices to their organization and meaning. Prerequisite: LING 5303.

5353. TEACHING ENGLISH AS A SECOND OR FOREIGN LANGUAGE (3-0). Presentation and critique of methodologies of teaching English to speakers of other languages, with emphasis on techniques of teaching aural comprehension; speaking, reading, and writing skills; attention to testing, language laboratory, and linguistic-cultural differences. Prerequisite: introductory course in linguistics or permission of instructor.

5354. METHODS AND MATERIALS TO TEACH ENGLISH AS A SECOND OR FOREIGN LANGUAGE (3-0). Systematic study of the application of linguistic theory and findings; emphasis on pedagogical strategies, materials, and tests; attention to current and past research and practices. Prerequisite: LING 5353.

5355. CONTRASTIVE ANALYSIS AND ERROR ANALYSIS IN THE TEACHING OF ENGLISH AS A SECOND OR FOREIGN LANGUAGE (3-0). A study of contrastive analysis and error analysis as means of defining student problems and progress; emphasis on current research; application to specific problems and contexts. Prerequisite: LING 5353.

5356. PEDAGOGICAL GRAMMAR OF ENGLISH (3-0). Grammaticality, variation, and acceptability applied to teaching English as a second or foreign language. Problems of description; means of application; adaption to current pedagogical methods. Prerequisite: LING 5353.

5391. CONFERENCE COURSE IN LINGUISTICS. Graded R.

5631. LINGUISTIC WORKSHOP (6-0).

5398, 5698, 5998. THESIS. 5398 graded R/F only; 5698 and 5998 graded P/F/R. Prerequisite: permission of Graduate Advisor.

6310. SEMINAR IN LINGUISTICS (3-0).

A course may be repeated for credit when the topic changes.

Department of MANAGEMENT

Areas of Study

Personnel and Human Resource Management
Business Administration (See Interdepartmental
and Intercampus Programs.)

Degrees
M.S.

M.B.A., Ph.D.

Master's Degree Plans: Thesis and Non-Thesis

Chair: Dan L. Worrell

209 Business 273-3166

Graduate Advisor: Kenneth G. Wheeler

229 Business 273-3866

Graduate Faculty:

Professors Dess, Gerloff, Quick, Wofford, Worrell
Associate Professors Gray, Price, Rasheed, Wheeler
Assistant Professors Farnsworth, Harrison, Priem

OBJECTIVE

The basic purpose of the Master of Science degree in Personnel and Human Resource Management is to provide students with both a general knowledge of management and a specialized knowledge in personnel and human resources. Students are exposed to the theory, research, and practical applications of numerous personnel content areas, including personnel strategy and policy, human resource planning and forecasting, human resource information systems, career planning and development, personnel and employee relations law, employee selection, compensation, and training and development. The program is designed to prepare students for personnel, human resource management, and industrial relations careers in government and non-profit organizations, as well as business and industrial firms.

ACCREDITATION

The Master of Science in Personnel and Human Resource Management is accredited by the American Assembly of Collegiate Schools of Business.

DEGREE REQUIREMENTS

Along with meeting the admission requirements of the Graduate School, applicants must obtain a satisfactory score on the Graduate Management Admission Test (GMAT) and provide evidence of exceptional academic performance at the undergraduate level.

The program is designed primarily for the student who has a bachelor's degree in business administration. A minimum of 30 semester hours is required if the student chooses to write a thesis. If the student chooses not to write a thesis, a minimum of 36 semester hours is required. Students who do not have bachelor's degrees in business administration may have to take additional coursework (up to 30 semester hours) to acquire sufficient general business knowledge for effective performance as a personnel director.

Coursework for the program includes six hours of required work in research and statistical methods (MANA 5329 and BUSA 5325), six hours of required work in personnel and policy (MANA 5340 and BUSA 5333), and elective hours in personnel and human resources to complete the 30 or 36-hour requirements for the thesis or non-thesis options, respectively. For the students who choose to write a thesis, the six hours of thesis will involve working closely with one or more members of the graduate faculty from the Department of Management on a research project in a specialized area of interest in personnel and human resource management.

The grade of R (research in progress) is a permanent grade. An incomplete (the grade of X) cannot be given in a course which is graded R. To receive credit for an R-graded course

MANAGEMENT

the student must continue to enroll in the course until a passing grade is received. Three-hour thesis and three- and six-hour dissertation courses are graded R/F only. The grade of P (required for graduation) can be received in six- or nine-hour thesis courses and nine-hour dissertation courses only. In the course listings below, R-graded courses are designated either "Graded P/F/R" or "Graded R." (See also the section entitled "R" GRADE in this catalog.)

MANAGEMENT (MANA)

- 5311. BEHAVIORAL SCIENCES IN MANAGEMENT (3-0).** Examination of basic and applied concepts and research findings in the individual behavior areas including perception, attitudes, learning and motivation and the group behavior areas including small group behavior, leadership, conformity, and intergroup behavior.
- 5312. MANAGEMENT (3-0).** Basic exploration of organizations in their environments. The elementary tools of management, which include: organizational objectives, social responsibility and ethics, policies, plans, and decision making; the design of organizations and jobs; the production and technology aspects of organization; the elements of leadership, behavior, and communication; and the elements of control and performance evaluation.
- 5320. ORGANIZATIONAL BEHAVIOR (3-0).** Systematic study of behavioral problems in the complex organization. Analyzes the interaction of environmental and internal factors and their effects upon organizational behavior. The course is placed within the context of the organization process. Prerequisite: MANA 5312 or equivalent.
- 5321. COMPLEX ORGANIZATIONS (3-0).** Provides the foundation for an in-depth knowledge of several important theories of management and organization. Attention to study of organizations, organizational effectiveness, comparative analysis of organizations, and the organization and its environment. Relates empirical findings and theoretical hypotheses with applied management concepts. Prerequisite: MANA 5312 or equivalent.
- 5322. COMPENSATION ADMINISTRATION (3-0).** Administration of compensation systems in public and private organizations; concepts, models, and practices related to wage and salary levels and structures; perceived equitable payments; individual appraisal, rewards, performance, and satisfaction; benefits and compensation controls.
- 5324. GROUP AND INTERGROUP RELATIONSHIPS (3-0).** A survey of the group dynamics literature. Topics include: individual behavior within groups, group influences on individuals, group problem solving, group composition, conflict, leadership, training groups and work groups within organizations. Prerequisite: MANA 5312 or equivalent.
- 5325. INDUSTRIAL RELATIONS (3-0).** Examines union-management relations and considers the structure and functioning of the economic and social forces of importance at the policy level within both the firm and the union. Also considers non-union employee relationships. Prerequisite: MANA 5312 or equivalent.
- 5326. ORGANIZATION DEVELOPMENT AND CHANGE (3-0).** Examines the process of organization development, change, and renewal at the individual, group, and organization level; central topics including diagnostic and intervention procedures at the three levels of analysis. Prerequisite: MANA 5312 or equivalent.
- 5327. EMPLOYEE RELATIONS LAW (3-0).** This course covers provisions of contemporary labor and employment law. Emphasis will be placed on case law precedents established under various federal statutes. Prerequisite: MANA 5340.
- 5328. OPERATIONS MANAGEMENT (3-0).** Analysis of managerial decisions in the production function with consideration of the planning and design of systems and processes. Prerequisites: BUSA 5301 and 5302 or equivalents and MANA 5312 or equivalent. \$10 computer fee.
- 5329. METHODS OF ORGANIZATIONAL RESEARCH (3-0).** Experimental methodology and its application to organizational problems. Research design, data collection, test construction and an awareness of experimental methods as applied to organizational problems.
- 5330. ARBITRATION AND DISPUTE SETTLEMENT (3-0).** Theory and practice of dispute settlement, with special attention to the role of voluntary arbitration in the settlement of labor-management disputes over contract rights. Attention to the nature of conflict and conflict resolution generally. Considers economic and public implications of arbitration. Prerequisite: MANA 5312 or equivalent.

5331. MANAGEMENT OF INTERNATIONAL OPERATIONS (3-0). Managerial implications of conducting business in foreign countries. Provides a framework for analyzing and dealing with the management of foreign and multinational organizations as influenced by cultural, political, and economic constraints. Prerequisite: MANA 5312 or equivalent.

5333. MANAGEMENT OF TECHNOLOGY (3-0). Problems of managing research and development and other similar technologies which involve one-of-a-kind products and substantial numbers of professional skills. Explores what is known about the management of professionals and professional enterprises. Prerequisite: MANA 5312 or equivalent or consent of instructor.

5340. PERSONNEL-HUMAN RESOURCE MANAGEMENT (3-0). Presents modern human resources management from both theoretical and practical viewpoints. Topics include manpower planning, staffing, job design, compensation administration, employment discrimination and affirmative action, training and development, performance appraisal, and occupational health and safety. Prerequisite: MANA 5312 or equivalent.

5341. EMPLOYEE STAFFING AND PERFORMANCE APPRAISAL (3-0). This course will cover the areas of personnel selection, placement, and performance appraisal. Topics include: recruitment strategies, methods of selection, development and validation of appraisal instruments, and the implementation and conduct of performance appraisal.

5342. PREVENTIVE STRESS MANAGEMENT (3-0). Examines the organizational demands that cause stress. Identifies the psychophysiology of the stress response and the individual/organizational costs of distress. Emphasis is placed on the principles and methods of preventive stress management, such as social support, exercise, and the relaxation response. Prerequisite: MANA 5312 or equivalent or consent of instructor.

5182, 5282, 5382. INDEPENDENT STUDIES IN MANAGEMENT. Extensive analysis of a management topic. Graded R. Prerequisite: consent of faculty member and department chair.

5390. APPLIED ORGANIZATIONAL RESEARCH (3-0). Experimental approach to methods and topics in organizational research, highlighting practical constraints and problems. Students work in teams on chosen research projects. Satisfies MBA research requirement. Prerequisites: BUSA 5325 and consent of instructor.

5192, 5292, 5392. SELECTED TOPICS IN MANAGEMENT. In-depth study of selected topics in management. May be repeated when topics vary. Prerequisite: consent of instructor and Graduate Advisor.

5698. THESIS. Prerequisite: permission of Graduate Advisor in Personnel and Human Resources Management. Graded P/F/R.

6318. SEMINAR IN ORGANIZATIONAL THEORY AND LABOR RELATIONS (3-0). Advanced study in the theory and research of the organizational theory and labor relations fields. Prerequisite: ADMN 6308 or consent of instructor.

6328. SEMINAR IN BUSINESS POLICY (3-0). Advanced study in the theory and research bases of business policy and strategic management. Prerequisite: ADMN 6308 or consent of instructor.

6329. ADVANCED RESEARCH METHODS (3-0). In-depth coverage of selected topics in the design of research and analysis of data; topics include philosophy of science, theory of measurement, complex experimental and quasi-experimental designs. Prerequisite: BUSA 5325 or equivalent.

6338. SEMINAR IN ORGANIZATIONAL BEHAVIOR (3-0). Advanced study in the theory and research of organizational behavior. Prerequisite: ADMN 6308 or consent of instructor.

6348. SEMINAR IN PERSONNEL/HUMAN RESOURCE MANAGEMENT (3-0). Advanced study in employee selection, performance appraisal, compensation, training and development, human resource policy and strategy, and other areas of human resource management.

6392. RESEARCH IN ADMINISTRATION (3-0). Independent research under supervision of a faculty member. Graded P/F/R. Prerequisite: consent of instructor.

Program in MANAGEMENT SCIENCES

See Department of Information Systems & Management Sciences.

Department of MARKETING

Areas of Study

Marketing Research
Business Administration (See Interdepartmental
and Intercampus Programs.)

Degrees
M.S.

M.B.A., Ph.D.

Master's Degree Plans: Non-Thesis

Chair: Carl McDaniel

234 Business

273-2876

Graduate Advisor: Glen Jarboe

202 Business

273-2273

Graduate Faculty:

Professors Dickinson, Gates, McDaniel

Associate Professor Bahn, Jarboe

OBJECTIVE

The comprehensive marketing curriculum allows specialization in product management, retailing, and promotion. Specialized courses in international marketing and physical distribution management are available also. A capstone course provides preparation for strategic marketing planning and decision making.

OBJECTIVE: M.S. PROGRAM

The objective of the Master of Science in Marketing Research is to prepare qualified students for careers as managers in marketing research, marketing planning, product/brand management, and related fields. Students are exposed to a range of coursework related to the theory and practice of marketing research. In addition, courses in information systems and management science focus on the latest theory and practice in those areas relevant to marketing research. Students are required to participate in the design and execution of two actual marketing research projects.

ACCREDITATION

The Master of Science degree in Marketing Research is accredited by the American Assembly of Collegiate Schools of Business (AACSB).

DEGREE REQUIREMENTS

Along with meeting the admission requirements of the Graduate School, applicants must obtain a satisfactory score on the Graduate Management Admission Test (GMAT) and provide evidence of exceptional academic performance at the undergraduate level.

The program is designed primarily for students who have earned a Bachelor of Business Administration (BBA) degree (or equivalent). For this student, the program consists of a minimum of 36 semester hours. Students who do not have a BBA may have to take additional coursework (up to 30 semester hours) to acquire sufficient general business knowledge for effective performance as a marketing research professional. Foundation courses may be waived if equivalent coursework has been completed.

The minimum advanced program of 36 semester hours contains 30 hours of marketing courses including six hours of actual marketing research field work; three hours of applied database management; and three hours of nonparametric statistics.

The required curriculum is as follows:

1. Foundation Courses (30 semester hours)

ACCT 5301 (Financial) Accounting Analysis I

ACCT 5302 (Managerial) Accounting Analysis II

ECON 5309 (Micro) Economic Analysis I
 ECON 5311 (Macro) Economic Analysis II
 MARK 5311 Marketing
 FINA 5311 Business Finance
 INSY 5310 Introduction to Computers
 BUSA 5303 Quantitative Analysis
 BUSA 5325 Advanced Statistical Methods
 MANA 5312 Management

2. Advanced Courses (36 semester hours)

MARK 5320 Buyer Behavior
 MARK 5327 Research for Marketing Decisions
 MARK 5328 Product Management
 MARK 5336 Advanced Marketing Research
 MARK 5340 Marketing Strategy
 MARK 5345 Creative Problem Solving
 MARK 5375 Advanced Business Communication Theory Practice
 MARK 5395 Field Research I
 MARK 5398 Field Research II
 MARK 6305 Marketing Models
 INSY 5335 Applied Database Management
 MASI 5330 Nonparametric Statistics

The grade of R (research in progress) is a permanent grade. An incomplete (the grade of X) cannot be given in a course which is graded R. To receive credit for an R-graded course the student must continue to enroll in the course until a passing grade is received. Three-hour thesis and three- and six-hour dissertation courses are graded R/F only. The grade of P (required for graduation) can be received in six- or nine-hour thesis courses and nine-hour dissertation courses only. In the course listings below, R-graded courses are designated either "Graded P/F/R" or "Graded R." (See also the section entitled "R" GRADE in this catalog.)

MARKETING (MARK)

5311. MARKETING (3-0). Survey of all the activities involved in marketing. Emphasis on developing a managerial point of view in planning and evaluating marketing decisions of the firm. Analyzes decisions with respect to products, price, channel, and promotional variables and appraises questions relating to cost efficiency, demand and regulations.

5320. BUYER BEHAVIOR (3-0). Examines the theoretical and empirical material on the individual and group behavior of people performing in the consumer role. Topics covered include perception, learning, attitude formation and change, personality, culture, social class, and reference groups. Behavioral science data provides a basis for the explanation of consumer behavior and the integration of these findings into current marketing practices. Prerequisite: MARK 5311 or equivalent.

5325. LOGISTICS DISTRIBUTION MANAGEMENT (3-0). Descriptive study of logistics systems for firms engaged in marketing and/or manufacturing. Analyzes the logistical components of transportation, warehousing, inventory control, communications, and location theory, including physical supply, in-plant movement and handling, and physical distribution. Explores the problems in and the development of national policy toward macro- and micro-logistics. Suggests concepts in total logistics systems design. Prerequisites: MARK 5311 and BUSA 5301 or equivalent. \$10 computer fee.

5326. ADVERTISING AND NONPERSONAL COMMUNICATION (3-0). Takes a managerial approach to advertising in business, audience analysis, advertising media, appeals, campaign development, cost analysis, and legal and ethical problems in advertising. Also examines communications processes, diffusion of innovation and other promotional activities: public relations and publicity, sales promotion devices, and packaging. Prerequisite: MARK 5311 or equivalent.

5327. RESEARCH FOR MARKETING DECISIONS (3-0). Overview of information needs of the marketing decision-maker. Emphasis on methods and techniques that may be employed for the collection and analysis of primary data. Major topics include design of research projects, generating primary data,

MARKETING

questionnaire design, samplings for survey research, experimental design, controlling data collection, and data analysis. Prerequisites: MARK 5311 and BUSA 5301 or equivalents. \$25 computer fee.

5328. PRODUCT MANAGEMENT (3-0). Management of the firm's product or service offerings. Topics include new product development, new product screening, evaluation of existing products, product line and mix analysis, product abandonment decisions, the brand manager's role, the new product planning department, and others. Emphasis on the development of meaningful criteria for decision-making in the product area and on the development of information systems to suggest, screen, and monitor products. Prerequisite: MARK 5327 or equivalent. \$20 computer fee.

5329. SALES AND SALES MANAGEMENT (3-0). Examines the unique characteristics of both the industrial and consumer markets from the personal selling viewpoint, with emphasis upon industrial selling. Covers personal selling fundamentals as well as vital sales management topics. Uses role playing and case analysis. Prerequisite: MARK 5311 or equivalent.

5330. SERVICE MARKETING MANAGEMENT (3-0). Addresses marketing theory and applications in healthcare, financial, and other service industries. Focus is on solving marketing problems unique to service organizations. Prerequisite: MARK 5311. \$5 computer fee.

5331. INTERNATIONAL MARKETING (3-0). Management of marketing in international business. Includes marketing research, pricing, promotion, and distribution in the international environment. Examines marketing problems arising from various degrees of foreign involvement (exports, licensing, foreign subsidiaries). Prerequisite: MARK 5311 or equivalent.

5332. INDUSTRIAL MARKETING (3-0). Marketing strategy examined from the standpoint of a firm's transactions with intermediate customers and industrial users. Included are frameworks for analysis of marketing opportunities. Student challenged to develop marketing programs directed toward professional buyers. Prerequisite: MARK 5311 or equivalent.

5335. RETAIL MARKETING MANAGEMENT (3-0). Planning, organizing, directing, and controlling retail institutions. Special emphasis on merchandise management includes quantitative research tools designed to improve the buying, handling, control, and pricing of a store's inventory. Also, concentration on sales promotion and customer services. Prerequisite: MARK 5311 or equivalent. An undergraduate retailing course cannot be substituted for MARK 5335.

5336. ADVANCED RESEARCH ANALYSIS (3-0). Focuses on problems of data analysis in marketing research. Considers application of multivariate statistics, including multiple regression, discriminant analysis and factor analysis to marketing research problems. Considerable time also devoted to multi-attribute preference models such as conjoint analyses. Prerequisite: MARK 5327 or equivalent. \$30 computer fee.

5340. MARKETING STRATEGY (3-0). A case course designed to give the student an opportunity to utilize the managerial and analytical tools that he or she has acquired. Uses case studies which require a realistic diagnosis of company problems, development of alternative courses of action, and the formulation of specific recommendations. Prerequisite: MARK 5311 and six hours of advanced marketing or consent of instructor. \$20 computer fee.

5345. CREATIVE PROBLEM SOLVING (3-0). Explains the relationship between the creative process and marketing decisions. Students develop a repertoire of techniques to expand their creativity and learn to enhance their flexibility in generating divergent, dramatic solutions to problems.

5182, 5282, 5382. INDEPENDENT STUDIES IN MARKETING. Extensive analysis of a marketing topic. Graded P/F/R. Prerequisite: consent of faculty member and department chair.

5395. FIELD RESEARCH I (3-0). Students will execute research design for client as developed by students in MARK 5398. Involves survey, experiment, observation-based research, and research based on secondary data analysis. Students develop skills in sampling, questionnaire/data collection form design, working with data collection contractors, data processing and analysis, and report preparation. Prerequisite: consent of MSMR Advisor. \$30 computer fee.

5398. FIELD RESEARCH II (3-0). Capstone course focuses on research design, management of marketing research, client relations, the relationship between research findings and marketing strategy, and the presentation of research findings. Students will work with corporate clients to translate client needs into an appropriate research design, supervise team of students in MARK 5395 Field Research I. Prerequisite: consent of MSMR Advisor. \$30 computer fee.

6301. MARKETING THEORY (3-0). Study of the history of marketing thought, evolution of marketing theory and latest theoretical developments.

6302. ADVANCED CONSUMER BEHAVIOR (3-0). Advanced study of current research underlying individual and group behavior of consumers and industrial buyers. Theories from the behavioral sciences will be applied to consumer behavior from descriptive, predictive, and normative perspectives.

6305. MARKETING MODELS I (3-0). Study of basic models of market and consumer behavior with particular attention to the use of classical statistical methods such as ordinary and generalized least squares, factor analysis, correspondence analysis, cluster analysis, and canonical correlation. Applications include perceptual mapping, multi-attribute modeling of preference and choice, and sales forecasting. \$30 computer fee.

6306. MARKETING MODELS II (3-0). Study of advanced models of market and consumer behavior with particular attention to non-metric methods such as Monanova, Lisrel, Multidimensional Scaling, Probit and LOGIT. Applications emphasize large-systems models of customer and organizational behavior, conjoint analysis, media planning and new product development models.

6310. MARKETING STRATEGY AND MANAGEMENT (3-0). Examination of latest theories in corporate and marketing strategies. In-depth review and analysis of latest theories and research in product/service development, pricing, promotion, and distribution.

6390. TOPICS IN MARKETING (3-0). Advanced doctoral level work in special topics in marketing. May be repeated when topics vary.

6192, 6292, 6392. INDEPENDENT STUDY IN MARKETING (3-0). Doctoral level analysis of marketing topic. Graded P/F/R. Prerequisite: consent of faculty member. May be repeated when topic changes.

Program in MATERIALS SCIENCE AND ENGINEERING

See Interdepartmental and Intercampus Programs.

Program in MATHEMATICAL SCIENCES

See Interdepartmental and Intercampus Programs.

Department of MATHEMATICS

Areas of Study

Mathematics

Mathematical Sciences (See Interdepartmental
and Intercampus Programs.)

Degrees
M.S.

Ph.D.

Master's Degree Plans: Thesis, Thesis Substitute and Non-Thesis

Chair: George J. Fix 469 Nursing Bldg. 273-3261

Graduate Advisor: A. Gillespie 440 Nursing Bldg. 273-3261

Graduate Faculty:

Professors Bernfeld, Corduneanu, Dragan, Dyer, Eisenfeld, Fix, Greenspan,
Han, Kannan, Ladde

Associate Professors Chen, Gillespie, Hawkins, Heath, Korzeniowski, Levine,
Liao, Moore, Nestell, Warren

Assistant Professors Lin, Luo, Newcomb, Semper, Su, Ye

OBJECTIVE

The objectives of the Mathematics Department's program at the master's level are (1) to develop the student's ability to do independent research and prepare for more advanced study in mathematics, and (2) to give advanced training to professional mathematicians, mathematics teachers, and those employed in engineering, scientific, and business areas.

Graduate work will be offered in algebra, complex and real variables, differential equations, functional analysis, geometry, mathematical education, numerical analysis, operations research, probability and statistics, and topology.

DEGREE REQUIREMENTS

The Department of Mathematics offers master's degree programs in mathematics with additional emphasis in applied mathematics, computer science, mathematical education, pure mathematics, and statistics. All students are to use either the thesis or the thesis-substitute plan.

All students must complete the following:

(a.) General core requirement: MATH 5300, 5307, 5308, and 5333;

(b.) One of the following tracks:

Applied Mathematics: MATH 5350, 5351, and either 5320 or 5321;

Computer Science: MATH (5348 and 5349) or (5338 and 5339), and either 5371 or 5373, and six approved hours in computer science engineering;

Mathematical Education: Nine hours from MATH 5341, 5342, 5344, 5345, or 5346;

Pure Mathematics: MATH 5317, and two from MATH 5304, 5331, 5334;

Statistics: MATH 5305, 5312, and 5313.

In addition:

1. Those students enrolled in the thesis substitute plan must take at least three hours of MATH 5395-5695, and all except those in the computer science track must take at least six other hours of electives;
2. Those students enrolled in the thesis plan must take at least six hours of MATH 5398-5698, and all except those in the computer science track must take at least three other hours of electives.

Students in every degree plan must pass a preliminary and a comprehensive exam. For thesis students, these examinations are in addition to the thesis defense. No credit hours from MATH 5380 or 5391 will be applicable toward a graduate mathematics program without prior approval of the Graduate Advisor.

The grade of R (research in progress) is a permanent grade. An incomplete (the grade of X) cannot be given in a course which is graded R. To receive credit for an R-graded course the student must continue to enroll in the course until a passing grade is received. Three-hour thesis and three- and six-hour dissertation courses are graded R/F only. The grade of P (required for graduation) can be received in six- or nine-hour thesis courses and nine-hour dissertation courses only. In the course listings below, R-graded courses are designated either "Graded P/F/R" or "Graded R." (See also the section entitled "R" GRADE in this catalog.)

MATHEMATICS (MATH)

5300. COMPUTER PROGRAMMING AND APPLICATIONS (3-0). Introduction to computing techniques utilizing an algorithmic language such as Fortran. Applications from various areas of numerical analysis. Prerequisite: consent of the instructor. \$15 computer fee.

5301. MATHEMATICAL COMPUTER RESOURCES (3-0). Introduction to hardware and software available to the scientific graduate student whose studies involve numerical computations. Utilization of the various mathematic/statistical libraries is emphasized rather than programming of mathematic/statistical routines. Prerequisite: MATH 5300 or its equivalent. \$15 computer fee.

5302. FUNDAMENTALS OF MATHEMATICAL SCIENCES I (3-0). Matrices and operators, linear spaces, multivariable calculus, dynamical systems, applications. Prerequisites: MATH 3318 and 3330 or consent of instructor.

5303. FUNDAMENTALS OF MATHEMATICAL SCIENCES II (3-0). Wave propagation, potential theory, complex variables, transform techniques, perturbation techniques, diffusion, applications. Prerequisite: MATH 5302 or consent of instructor.

5304. GENERAL TOPOLOGY (3-0). Introduction to fundamentals of general topology. Topics include product spaces, the Tychonoff theorem, Tietzes Extension theorem, and metrization theorems. Prerequisite: MATH 4304 or 4335.

5305. STATISTICAL METHODS (3-0). Topics include descriptive statistics, numeracy, and report writing; basic principles of experimental design and analysis; regression analysis; data analysis using the SAS package. Prerequisite: consent of the instructor.

5307. MATHEMATICAL ANALYSIS I (3-0). Elements of topology, real and complex numbers, limits, continuity, and differentiation, functions of bounded variation, Riemann-Stieltjes integrals. Prerequisite: MATH 4335 or consent of Graduate Advisor.

5308. MATHEMATICAL ANALYSIS II (3-0). Analysis in R_n , limits, continuity, Jacobian, extremum problems, multiple integrals, sequences and series of functions, Lebesgue integral. Prerequisite: MATH 5307 or consent of Graduate Advisor.

5311. APPLIED PROBABILITY AND STOCHASTIC PROCESSES (3-0). Topics include conditional expectations, law of large numbers and central limit theorem, stochastic processes, including Poisson, renewal, birth-death, and Brownian motion. Prerequisite: MATH 3313 or equivalent.

5312. MATHEMATICAL STATISTICS I (3-0). Basic probability theory, random variables, expectation, probability models, generating functions, transformations of random variables, limit theory. Prerequisite: MATH 5307 or concurrent registration or consent of instructor.

5313. MATHEMATICAL STATISTICS II (3-0). Theories of point estimation (minimum variance unbiased and maximum likelihood), interval estimation and hypothesis testing (Neyman-Pearson and likelihood ratio tests), regression analysis and Bayesian inference. Prerequisite: MATH 5312.

5314. EXPERIMENTAL DESIGNS (3-0). Completely randomized and randomized complete block designs with fixed and random effects, Latin Squares, factorial experiments, and analysis of covariance. Emphasis placed on development of models from underlying experimental situations and use of the appropriate analysis of variance table. Prerequisite: MATH 4313 or 5312.

5315. GRAPH THEORY (3-0). Classical graph theory and algorithms for problems on graphs. Topics selected from graph isomorphism, trees, connectivity, Euler tours and Hamilton cycles, matchings, Ramsey's Theorem, coloring graphs, graph planarity, directed graphs, network flows. Prerequisite: MATH 3314.

5316. COMBINATORIAL OPTIMIZATION (3-0). Topics selected from the Hungarian method for the assignment problem, trees and matroids and the greedy algorithm, integer programming, complexity theory

MATHEMATICS

including P vs NP, the Travelling Salesman Problem and other NP-hard and NP-complete problems. Prerequisite: MATH 3314.

5317. REAL ANALYSIS FOR THE MATHEMATICAL SCIENCES (3-0). Lebesgue measure and integration on \mathbb{R} . Study of LP spaces. Abstract measure and integration. Prerequisite: MATH 5308.

5318. FUNDAMENTALS OF STOCHASTIC ANALYSIS (3-0). General properties of stochastic processes, processes with independent increments, martingales, limit theorems including invariance principle, Markov processes, stochastic integral, stochastic differential. Prerequisite: MATH 5308.

5319. PROBABILITY THEORY (3-0). Probability spaces, random variables, filtrations, conditional expectations, martingales, strong law of large numbers, ergodic theorem, central limit theorem, Brownian motion and its properties. Prerequisite: MATH 5308.

5320. APPLIED DIFFERENTIAL EQUATIONS (3-0). Fundamentals of the theory of systems of ordinary differential equations: existence, uniqueness, and continuous dependence of solutions on data; linear equations, stability theory and its applications, periodic and oscillatory solutions. Prerequisites: MATH 5307 and 5333.

5321. APPLIED PARTIAL DIFFERENTIAL EQUATIONS (3-0). General first order equations. Basic linear theory for elliptic, hyperbolic, and parabolic second order equations, including existence and uniqueness for initial and boundary value problems. Prerequisites: MATH 5307 and 5333.

5322. COMPLEX VARIABLES I (3-0). Fundamental theory of analytic functions, residues, conformal mapping and applications. Prerequisite: MATH 5307.

5324. APPLIED COMPLEX VARIABLES (3-0). Analytic functions of a complex variable; the line integral, residues, applications; conformal mappings; harmonic functions and applications to physical problems; elements of transform theory. Prerequisite: MATH 3335 or consent of the instructor.

5327. FUNCTIONAL ANALYSIS I (3-0). Introduction to Hilbert and Banach spaces: Hahn-Banach, Banach-Steinhaus, and closed graph theorems. Riesz representation theorem and bounded linear operators in Hilbert space. Prerequisite: MATH 5308.

5328. FUNCTIONAL ANALYSIS II (3-0). The theory of distributions and Sobolev spaces, with applications to differential equations. Compact operators and Fredholm theory. Spectral theory for unbounded operators. Prerequisite: MATH 5327.

5331. ABSTRACT ALGEBRA I (3-0). Zorn's Lemma, groups, including free groups and dihedral groups. Rings including factorization, localization, rings of polynomials, and formal power series. An introduction to modules. Prerequisite: MATH 3321.

5332. ABSTRACT ALGEBRA II (3-0). Modules, including free, projective, and injective. Exact sequences and tensor products of modules. Chain conditions, primary decomposition, Noetherian rings and modules. Prerequisite: MATH 5331.

5333. LINEAR ALGEBRA AND MATRICES (3-0). Linear spaces, linear transformations, vector norms, Gaussian elimination, Jordan form, eigenvalues, quadratic forms, and related topics. Prerequisite: MATH 3330 or consent of instructor.

5334. DIFFERENTIAL GEOMETRY (3-0). Introduction to the theory of curves and surfaces in three dimensional Euclidean space. Prerequisite: MATH 4334 or 4335.

5335. APPLIED VECTOR AND TENSOR ANALYSIS (3-0). Vector algebra, vector and tensor calculus; applications to differential geometry, engineering sciences, and dynamics including surface theory, geodesics, minimal surfaces, elasticity, particle dynamics, special relativity, and general relativity. Prerequisite: MATH 5302.

5338. NUMERICAL ANALYSIS I (3-0). Solution of equations, interpolation and approximation, numerical differentiation and quadrature, and solution of ordinary differential equations. Prerequisite: MATH 3345. \$15 computer fee.

5339. NUMERICAL ANALYSIS II (3-0). Rigorous treatment of numerical aspects of linear algebra and numerical solution of boundary value problems in ordinary differential equations; also, an introduction to numerical solution of partial differential equations. Prerequisite: MATH 3345. \$15 computer fee.

5341. MATHEMATICS FOR TEACHERS—GEOMETRY (3-0). Selected materials from geometry.

5342. MATHEMATICS FOR TEACHERS—ALGEBRA (3-0). Selected materials from algebra, including probability, statistics, and theory of equations.

- 5344. MATHEMATICS FOR TEACHERS—COMPUTER (3-0).** Selected materials from the literature on the usage of micro-computers in the classroom. \$10 computer fee.
- 5345. MATHEMATICS FOR TEACHERS—ANALYSIS (3-0).** Selected materials from analysis including concepts and topics consistent with precalculus and elementary calculus.
- 5346. MATHEMATICS FOR TEACHERS—PROBLEM SOLVING (3-0).** Instruction in the application of various heuristics or general problem strategies.
- 5348. ANALYSIS OF NUMERICAL METHODS I (3-0).** Rigorous treatment of topics in numerical analysis including roundoff error effects, solution of linear and nonlinear systems, interpolation, and numerical integration. Emphasis on analysis of methods as well as computation. Prerequisites: MATH 3335 and 3345. \$15 computer fee.
- 5349. ANALYSIS OF NUMERICAL METHODS II (3-0).** Continuation of MATH 5348. Topics include QR decomposition, eigenvalue approximation, singular value decomposition, least squares problems, numerical approximation of ODE's and PDE's, and iterative methods for large sparse systems. Emphasis on analysis of methods as well as computation. Prerequisite: MATH 5348. \$15 computer fee.
- 5350. APPLIED MATHEMATICS I (3-0).** Development of models arising in the natural sciences and in engineering. Emphasis will be on the mathematical techniques and theory needed to analyze such models; these include aspects of the theory of differential and integral equations, boundary value problems, theory of distributions and transforms. Prerequisites: MATH 5307 and 5333.
- 5351. APPLIED MATHEMATICS II (3-0).** Continuation of MATH 5350; models arising in the physical sciences whose analysis includes such topics as the theory of operators in a Hilbert space, variational principles, branching theory, perturbation and stability analysis. Prerequisite: MATH 5350.
- 5355. STATISTICAL THEORY FOR RESEARCH WORKERS (3-0).** Designed for graduate students not majoring in mathematics. Topics include basic probability theory, distributions of random variables, point estimation, interval estimation, testing hypotheses, regression, and an introduction to analysis of variance. Graduate credit not given to math majors. Prerequisite: MATH 2325.
- 5356. APPLIED MULTIVARIATE STATISTICAL ANALYSIS (3-0).** Statistical analysis for data collected in several variables, topics including sampling from multivariate normal distribution, Hotelling's T^2 , multivariate analysis of variance, discriminant analysis, principal components, and factor analysis. Prerequisite: MATH 5312 or consent of instructor.
- 5357. SAMPLE SURVEYS (3-0).** A comprehensive account of sampling theory and methods, illustrations to show methodology and practice, simple random sampling, stratified random sample, ratio estimates, regression estimates, systematic sampling, cluster sampling, and nonsampling errors. Prerequisite: MATH 5312 or consent of instructor.
- 5361. APPLIED CALCULUS OF VARIATION (3-0).** Functionals, variation, extremization, Euler's equation, direct and indirect approximation methods; applications to mechanics and control theory. Prerequisite: MATH 5302.
- 5362. MATHEMATICS OF LINEAR PROGRAMMING (3-0).** The simplex method and the revised simplex method. Linear algebra for polyhedra and polytopes. Duality theory. Sensitivity analysis. Applications to transportation problems, network flow problems, matrix-games and scheduling problems. Integer programming. Quadratic programming. Prerequisite: MATH 3330.
- 5363. OSCILLATIONS AND WAVES (3-0).** Development of methods and results related to phenomena in nature that exhibit oscillatory motion; mathematical techniques include Fourier series, ordinary and partial differential equations, and the theory of almost periodic functions. Prerequisite: MATH 3318.
- 5364. INTRODUCTION TO MATHEMATICAL CONTROL THEORY (3-0).** Systems in science, engineering, and economics and their mathematical description by means of functional equations (ordinary, partial, integral, delay-type). Basic properties of various classes of systems: observability, controllability, stability, and oscillating systems; optimal control problems and applications. Prerequisite: MATH 3318 or 4320.
- 5365. BIOMATHEMATICS (3-0).** Mathematical techniques used in modeling such as perturbation theory, dimensional analysis, Fourier analysis, and differential equations. Applications to morphogenetics, population dynamics, compartmental systems, and chemical kinetics. Prerequisite: consent of instructor.
- 5366. INTRODUCTION TO NEURAL AND COGNITIVE MODELING (3-0).** Principles of neural network modeling; application of these principles to the simulation of cognitive processes in both brains

MATHEMATICS

and machines; models of associative learning, pattern recognition, and classification. Prerequisite: consent of instructor.

5372. NUMERICAL FUNCTIONAL ANALYSIS (3-0). Numerical implementation of abstract operator methods, including Newton's method for linear and nonlinear algebraic, transcendental, differential, integral, and functional equations; some aspects of approximation theory. Prerequisite: MATH 5308.

5373. NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS (3-0). Theoretical analysis of methods for approximating solutions of initial value problems, boundary value problems, and problems with periodic solutions; existence, uniqueness, convergence, stability, and error analysis are stressed for both single equations and for systems. Prerequisite: MATH 5338 or consent of instructor. \$5 computer fee.

5374. NUMERICAL SOLUTION OF PARTIAL DIFFERENTIAL EQUATIONS (3-0). Theoretical analysis for numerical methods for approximating solutions of elliptic, parabolic, hyperbolic, mixed, and systems of partial differential equations problems; existence, uniqueness, convergence, stability, and error analysis are stressed. Prerequisite: MATH 5339 or consent of instructor. \$5 computer fee.

5380. SEMINAR (3-0). Current topics in mathematics, may be repeated for credit twice. Prerequisite: consent of instructor.

5391. SPECIAL TOPICS IN MATHEMATICS (3-0). Topics in mathematics assigned individual students or small groups. Faculty members closely supervise the students in their research and study. In areas where there are only three hours offered, the special topics may be used by students to continue their study in the same area. Graded P/F/R. Prerequisite: permission of instructor.

5392, 5492. SELECTED TOPICS IN MATHEMATICS (3-0)/(3-1). May vary from semester to semester depending upon need and interest of the students. May be repeated for credit. Prerequisite: permission of instructor.

5395, 5695. SPECIAL PROJECT. Graded P/F/R. Prerequisite: permission of Graduate Advisor.

5398, 5698. THESIS. 5398 graded R/F only; 5698 graded P/F/R. Prerequisite: permission of Graduate Advisor.

6313. TOPICS IN PROBABILITY AND STATISTICS (3-0). May be repeated for credit when the content changes.

6391. SPECIAL TOPICS IN MATHEMATICS (3-0). Faculty directed individual study and research. May be repeated for credit when the content changes. Graded P/F/R.

6392. SELECTED TOPICS IN MATHEMATICS (3-0). May vary from semester to semester depending upon needs and interests of students. May be repeated for credit. Prerequisite: consent of instructor.

DISSERTATION—See Mathematical Sciences.

A limited number of undergraduate mathematics courses may be applicable to a graduate program in mathematics if approved by the Graduate Advisor. These must be chosen from the following list and shall not exceed six hours total credit.

4303. INTRODUCTION OF TOPOLOGY

4313. APPLICATIONS OF MATHEMATICAL STATISTICS

4314. ADVANCED DISCRETE MATHEMATICS

4320. ADVANCED DIFFERENTIAL EQUATIONS

4321. INTRODUCTION TO ABSTRACT ALGEBRA II

4322. INTRODUCTION TO COMPLEX VARIABLES

4324. INTRODUCTION TO PARTIAL DIFFERENTIAL EQUATIONS

4334. ADVANCED MULTIVARIABLE CALCULUS

4335. ANALYSIS II

4345. NUMERICAL ANALYSIS AND COMPUTER APPLICATIONS II

Department of MECHANICAL AND AEROSPACE ENGINEERING

Area of Study

Mechanical Engineering

Degrees

M.S., M.Engr., Ph.D.

Master's Degree Plans: Thesis (M.S.) and Non-Thesis (M.Engr.)

Chair: Kent L. Lawrence 204 Engineering 273-2561

Graduate Advisor: A. Haji-Sheikh 204 Engineering 273-2561

Graduate Faculty:

Professors Barker, Haji-Sheikh, Hullender, Johnson, Lawley, Lawrence, Mills,
Wang

Associate Professors Chan, Goolsby, Nomura, Tong, Woods

Assistant Professors Aswath, Kugle, You

President Emeritus and Professor Emeritus Woolf

Professor Emeritus Wiseman

OBJECTIVE

The graduate program provides opportunities for professional development in such forms as: instructional courses to enhance technical competence in areas of mechanical engineering practice; training through a variety of experiences in design, development, research, experimentation, and/or analysis in joint efforts with faculty and peers; specialized courses of study required for entry into career fields allied to the mechanical engineering discipline; guided individual study under faculty supervision; and supportive coursework for programs leading to careers that require interdisciplinary competence.

A student with aid from a faculty advisor plans a program which will be consistent with his or her technical interests and the available facilities and course offerings. Typically, programs are classified as:

1. Automatic Control and Systems
2. Design
3. Fluid Mechanics
4. Heat Transfer
5. Manufacturing Processes
6. Solid Mechanics and Dynamics
7. Thermodynamics

ADMISSION REQUIREMENTS

Applicants for the Master's degree who hold a baccalaureate degree in engineering must meet the general requirements of the Graduate School as stated in the section entitled "Admission Requirements and Procedures." Applicants not meeting all criteria will be admitted on provisional or probationary basis only under exceptional circumstances.

For applicants with no prior training in engineering, the same minimum criteria will apply and, in addition, their records will be reviewed in relation to the intended program of study. Probationary status with specific remedial work required may be a basis for acceptance of such applicants.

The acceptance of applicants who have already received a master's degree in engineering will be based on the above-mentioned minimum criteria and results of graduate work, including the master's thesis.

MECHANICAL AND AEROSPACE ENGINEERING

CONTINUATION

The Mechanical Engineering Graduate Program, in fulfillment of its responsibility to graduate highly qualified professional engineers, has established certain policies and procedures. In addition to the requirements of the Graduate School listed elsewhere, to continue in the program each mechanical engineering graduate student must:

1. Maintain at least a B (3.0) overall GPA in all coursework, and
2. Demonstrate suitability for professional engineering practice.

At such time as questions are raised by mechanical engineering graduate faculty regarding either of the above, the student will be notified and will be provided the opportunity to respond to the Committee on Graduate Studies in Mechanical Engineering. The Committee on Graduate Studies will review the student's performance and make a recommendation concerning the student's eligibility to continue in the program. Appeal of a decision on continuation may be made through normal procedures outlined in the section of this catalog entitled "Grievances Other than Grades."

DEGREE REQUIREMENTS

The following coursework is required of all MS and MEng candidates in Mechanical Engineering

1. CORE COURSES: One course in each of the following areas (12 credit hours):
 - Thermal Sciences: ME 5317 Convection Heat Transfer, or ME 5321 Advanced Classical Thermodynamics, or ME 5316 Thermal Conduction
 - Fluid Science: ME 5313 Fluid Dynamics, or ME 5342 Advanced Gas Dynamics I, or ME 5344 Viscous Flows, or AE 5305 Laminar Boundary Layers
 - Design, Mechanics & Manufacturing: ME 5339 Structural Aspects of Design, or ME 5310 Structural Statics, or ME 6314 Mechanisms
 - Controls & Systems: ME 5303 Classical Methods of Control Systems Analysis and Synthesis, or ME 5305 Dynamic Systems Modeling, or ME 5307 Modern Methods of Control System Analysis and Synthesis, or ME 5341 Control Systems Components.
2. ANALYSIS COURSES: Two courses (six credit hours) in Engineering Analysis (ME 5331 and ME 5332 or approved mathematics courses).

Master of Science in Mechanical Engineering

The Master of Science degree is a research-oriented program in which completion of a thesis is mandatory. A minimum of 30 credit hours is required as follows: four core courses and two courses from the engineering analysis or mathematics general degree requirements listed above; two courses (six credit hours) related to a specialty in mechanical engineering; and six credit hours of thesis. The student must enroll in ME 5398 or ME 6397 every semester in which the student is actively involved in thesis preparation or research, except that the student must enroll in ME 5698 in the semester of graduation.

Master of Engineering in Mechanical Engineering

The Master of Engineering degree is an engineering practice-oriented program. A minimum of 36 credit hours is required as follows: four core courses and two engineering analysis or approved math courses from the general degree requirements list above; eight courses (24 credit hours) of elective courses in engineering, mathematics, and/or science relating to the student's interest areas. The elective courses may include as many as six hours of special project courses (ME 5391).

Manufacturing Engineering Option

Students desiring a program in manufacturing engineering may achieve this goal while meeting the requirements for a graduate degree in mechanical engineering. This is accomplished by selecting a specific program of courses. Upon completion, the student receives a Manufacturing Engineer's Certificate along with the MSME or MEME. Specifics are available in the Mechanical Engineering office.

Doctor of Philosophy

The PhD degree should normally require four years of full-time study after completion of the BS degree. There is no foreign language requirement for the PhD degree.

MECHANICAL AND AEROSPACE ENGINEERING

To meet the educational goal of a broad-based technical background in mechanical engineering, it is expected that each student will take sufficient coursework to obtain in-depth knowledge in at least two areas of mechanical engineering. Consequently, the Department expects all PhD candidates to complete at least the following minimum requirements:

1. Four core courses (12 credit hours) listed for the MS and MEngr degrees.
2. One additional course (three credit hours) at the graduate level in one of the broad areas of mechanical engineering outside the student's major area of specialization. Core courses are also acceptable for meeting this requirement.
3. Five additional courses (15 credit hours) in the student's major area of interest.
4. Two courses (six credit hours) of engineering analysis (ME 5331, 5332, or other approved graduate level course).
5. Two courses (six credit hours) of mathematics, numerical analysis, computer science, or statistics, outside of mechanical engineering.
6. Two courses (six credit hours) in science and/or engineering outside of mechanical engineering.
7. Nine credit hours (ME 6999) for Dissertation.

Final course requirements are determined by the student's supervising committee. The student must submit the Application for Candidacy and Final Program of Work to the Mechanical Engineering Committee on Graduate Studies immediately after completion of the comprehensive examination. Courses taken for the MS degree at this institution or another institution may be used to meet these requirements; however, courses listed for the MS degree or any other degree cannot be listed as the actual course requirement on the Final Program of Work.

A diagnostic examination will be administered to the student within the first two semesters after an MS degree or before the first 39 hours have been taken beyond the BS degree. The diagnostic examination tests for fundamental knowledge at the undergraduate level in five areas of mechanical engineering (thermodynamics, heat transfer, fluid mechanics, design and mechanics, dynamic systems and control) and mathematics. The mathematics portion of the exam will be at the level covered in ME 5331 and 5332. The diagnostic examination for PhD students is offered the first month of the Fall and Spring Semesters.

A comprehensive examination will be administered to the student after the successful completion of all phases of the diagnostic examination and before the student starts research work for the dissertation. The comprehensive examination is used to determine if the student has the necessary background and specialization required for the dissertation research and if the student can organize and conduct the research.

The student must enroll in at least three hours of dissertation course (ME 6399-6999) or research course (ME 6397-6999) every semester in which the student is actively involved in dissertation preparation or research, except that the student must enroll in ME 6999 in the semester of graduation.

The grade of R (research in progress) is a permanent grade. An incomplete (the grade of X) cannot be given in a course which is graded R. To receive credit for an R-graded course the student must continue to enroll in the course until a passing grade is received. Three-hour thesis and three- and six-hour dissertation courses are graded R/F only. The grade of P (required for graduation) can be received in six- or nine-hour thesis courses and nine-hour dissertation courses only. In the course listings below, R-graded courses are designated either "Graded P/F/R" or "Graded R." (See also the section entitled "R" GRADE in this catalog.)

MECHANICAL ENGINEERING (ME)

5303. CLASSICAL METHODS OF CONTROL SYSTEMS ANALYSIS AND SYNTHESIS (3-0). Intended to equip the student with detailed familiarity with historically significant tools of the control engineer. Detailed discussion of block diagram algebra, the root locus, the Bode diagram, and state variable methods for simulation and control system design are presented. \$5 computer fee.

5305. DYNAMIC SYSTEMS MODELING (3-0). To equip the student with the capability of determining the necessary equations to model a system of mixed physical types in an orderly, logical fashion. Lumped and distributed parameter modeling techniques formulated for computer simulation of mechanical, fluid, and thermal systems are presented. \$5 computer fee.

5306. FLUID POWER CONTROL (3-0). Mathematical models for hydraulic and pneumatic control components and systems including hydraulic pumps, motors, and spool valves. The application of electrohydraulic and hydromechanical servomechanisms for position and velocity control are treated.

MECHANICAL AND AEROSPACE ENGINEERING

Theory supported by laboratory demonstrations and experiments. Prerequisite: ME 4310 or ME 5303. \$5 computer fee.

5307. MODERN METHODS OF CONTROL SYSTEM ANALYSIS AND SYNTHESIS (3-0). To equip the student with knowledge of systems applications of the state-space concept and realtime solution techniques. State-space formulations, reference trajectory, linearization, linear vector spaces, the state transition matrix and its properties; and controllability and observability concepts treated. \$5 computer fee.

5310. STRUCTURAL STATICS (3-0). Finite element method in the study of the static response of complex structures and of continua; applications to field problems; analytical methods emphasized, and digital computer application undertaken. Also offered as EM 5317. \$5 computer fee.

5311. STRUCTURAL DYNAMICS (3-0). Natural frequencies; forced and random response of complex structural systems studied through the use of the finite element method; computational aspects of these problems discussed, and digital computer applications undertaken. Also offered as EM 5318. \$5 computer fee.

5312. CONTINUUM MECHANICS (3-0). Study of the underlying physical and mathematical principles relating to the behavior of continuous media; interrelationships between fluid and solid mechanics. Also offered as EM 5332.

5313. FLUID DYNAMICS (3-0). Basic conservation laws, flow kinematics, special forms of the governing equations, two-dimensional potential flows, surface waves and some exact solutions of viscous incompressible flows.

5314. FRACTURE MECHANICS IN STRUCTURAL DESIGN (3-0). Linear elastic fracture mechanics, general yielding fracture mechanics, damage tolerance and durability design, fail safe and safe life design criteria, analysis of fatigue crack growth, residual strength analysis.

5316. THERMAL CONDUCTION (3-0). Fundamental laws, initial and boundary conditions, basic equations for isotropic and anisotropic media, related physical problems and steady and transient temperature distributions in solid structures. \$5 computer fee.

5317. CONVECTION HEAT TRANSFER (3-0). Equations of motion of viscous fluids are reviewed and the energy equations are introduced. Exact and approximate solutions are made for forced convective problems with non-isothermal and unsteady boundaries. Free convection and combined free- and forced-convection problems are solved. \$5 computer fee.

5318. RADIATIVE TRANSFER (3-0). General equations of radiative transfer derived and solved for special problems, and the elements of atomic, molecular and continuum radiation are introduced. \$5 computer fee.

5319. ADVANCED FINITE ELEMENT METHODS (3-0). Continuation of ME 5310. Modeling of large systems, composite and incompressible materials, substructuring, mesh generation, solids applications. Prerequisite: ME 5310 or equivalent. \$15 computer fee.

5321. ADVANCED CLASSICAL THERMODYNAMICS (3-0). Fundamentals of thermodynamics reviewed. Different treatments of principles studied, compared and formal relationships developed and applied to chemical, magnetic, electric and elastic systems.

5322. ADVANCED STRUCTURAL DYNAMICS (3-0). Normal mode method for undamped and proportionally damped systems, component mode synthesis, generally damped systems, complex modes, effect of design modification on system response. Prerequisite: ME 5311 or equivalent. \$15 computer fee.

5325. COMBUSTION (3-0). Fundamental treatment of problems involving simultaneous occurrence of chemical reaction and transfer of heat, mass and momentum. Topics include kinetically controlled combustion phenomena; diffusion flames in liquid fuel combustion; combustion of solids; combustion of gaseous fuel jets; flames in premixed gases. Also offered as AE 5325. Credit may not be received for both courses.

5329. COMPUTER CONTROL OF MANUFACTURING SYSTEMS (3-0). Fundamentals in NC and CNC for machine tools; motion control, interpolation techniques and programming; industrial robot concepts, control, programming and application; shop floor communication; programmable controllers.

5330. MECHATRONICS (3-0). Analog and digital circuits in mechanical systems; electrical-mechanical interfacing; analysis and application of computerized machinery; motor, actuator and mechanical component selection; position, velocity and force measurement; performance prediction and testing techniques.

MECHANICAL AND AEROSPACE ENGINEERING

5331. ANALYTIC METHODS IN ENGINEERING (3-0). Introduction to advanced analytic methods. Applied transform and matrix methods, and elements and engineering applications of complex variables. Prerequisite: undergraduate degree in engineering, physics, or mathematics.

5332. ENGINEERING ANALYSIS (3-0). Construction of mathematical models of physical situations of interest to the engineer and the subsequent reduction of the mathematical problem to a numerical solution.

5333. MICROPROCESSORS AND APPLICATIONS (3-0). Microprocessor and microcomputer based systems for applications in mechanical engineering are studied. Programming, interfacing, and applications design are included. \$15 computer fee.

5334. APPLICATION OF THEORY OF STATISTICS AND PROBABILITY TO MECHANICAL ENGINEERING SYSTEMS (3-0). Fundamentals of probability theory and statistics as related to conventional mechanical engineering problems. These principles applied to problems in random vibrations and in the behavior of dynamic systems due to random disturbances and conditions.

5337. INTRODUCTION TO ROBOTICS (3-0). An overview of industrial robots. Coordinate systems and homogeneous transformations, kinematics of manipulators; motion characteristics and trajectories; dynamics and control of manipulators. Demonstration of robot programming using an industrial robot. \$10 computer fee.

5339. STRUCTURAL ASPECTS OF DESIGN (3-0). Emphasis on determination of stresses and prediction of failure in machine and structural components; stress-strain relations in elastic and plastic regions; static failure and failure criteria; residual stress and strain due to yielding; contact stress; notched sensitivity; strain-fatigue life relationship; characteristics of crack in structural components; creep and creep rupture. \$5 computer fee.

5340. AUTOMOTIVE ENGINEERING (2-2). Analysis and design of automotive systems including power train, suspension, frame and chassis, braking systems, and control systems. Emphasis on racing applications and performance. Lectures are augmented with hands-on experience.

5341. CONTROL SYSTEM COMPONENTS (3-0). The components and hardware used in electronic, hydraulic, and pneumatic control systems; techniques of amplification, computation, compensation, actuation, and sensing; modeling of multipoint systems as well as servo systems analysis. Prerequisite: ME 4310 or ME 5303.

5342. GASDYNAMICS (3-0). Review of fundamental compressible flow theory, method of characteristics for perfect gases, the Rankine-Hugoniot conditions, linearized flow theory. Also offered as AE 5342. \$10 computer fee.

5343. TWO-PHASE FLOW AND BOILING HEAT TRANSFER (3-0). This is to introduce significant progress in phase change heat transfer and two-phase flow. Boiling heat transfer will be followed by the study of pressure drop and heat transfer in the pipes of two-phase flow. Boiling heat transfer includes pool boiling, forced convection boiling, and critical heat flux. Also selected topics by the instructor (heat pipe, condensation, Helmholtz wave instability, etc.)

5344. VISCOUS FLOWS (3-0). Navier-Stokes equations and Prandtl's boundary layer approximations; laminar and turbulent boundary layers including internal and external flows.

5345. NUMERICAL HEAT TRANSFER (3-1). Discussion of numerical methods for conduction and convection heat transfer problems includes introduction to various computational techniques suitable for digital computers. The finite difference method is emphasized. \$10 computer fee.

5346. COOLING OF ELECTRONIC PACKAGES (3-0). This course deals with the development and application of analytical models of thermal phenomena occurring in electronic equipment. The calculation of heat loads and temperature fields using different cooling techniques. Includes parameter evaluation and design studies. Prerequisite: ME 3311.

5347. HEAT EXCHANGER DESIGN (3-0). Design procedures, system evaluations, and design parameters in heat exchangers. Heat exchanger configurations; student design projects. Prerequisite: ME 3302.

5348. FUNDAMENTALS OF COMPOSITES (3-0). Fundamental mechanics concepts of fiber-reinforced composites; relationships between the properties of the constituents and those of the unit composite ply; lamina and laminate anisotropic behavior; structural characteristics of A, B, and D matrices; lamination theory; strength criteria; hygrothermal analysis; interlaminar stress analysis. Also offered as MSE 5348, EM 5333, or AE 5315.

MUSIC

- 5349. APPLIED COMPOSITES (3-0).** Review of current state-of-the-art applications of composites; structural properties including section property; laminate sizing in preliminary design; notched sensitivity; delamination; fatigue characteristics; composite material testing; characteristics of composite joints. Also, offered as MSE 5349. Prerequisite: ME 5348 or MSE 5348.
- 5390. SPECIAL TOPICS IN MECHANICAL ENGINEERING (3-0).** Seminar to provide formal instruction in special topics pertinent from semester to semester depending on the availability of faculty. May be repeated provided topics differ.
- 5191, 5291, 5391. ADVANCED STUDIES IN MECHANICAL ENGINEERING.** May be repeated for credit as topics change. Work performed as a thesis substitute will normally be accomplished under this course number, with prior approval of the Committee on Graduate Studies. Graded P/F.
- 5398, 5698, 5998. THESIS.** 5398 graded R/F only; 5698 and 5998 graded P/F/R. Prerequisite: graduate standing in mechanical engineering. \$15 computer fee.
- 6314. MECHANISMS (3-0).** Rational design of linkages to satisfy various design requirements is studied. Two- and three-dimensional motions considered. Computer-aided mechanism design used as a tool. \$5 computer fee.
- 6332. ESTIMATION THEORY (3-0).** Means of treating measurements to obtain a best estimate of the quantities measured. Emphasis on application to dynamic systems. Prerequisites: ME 5303, 5307, 5334. \$15 computer fee.
- 6337. COMPUTER AIDED DESIGN (3-0).** Role of graphics; image representation, batch and interactive computing, methods of automated mathematical model generation, mainframe and microcomputing in engineering design. Application in mechanical, structural, thermal, controls areas of mechanical engineering are considered. \$15 computer fee.
- 6344. HEAT TRANSFER IN TURBULENT FLOW (3-0).** Introduction to heat transfer in turbulent boundary layers including internal and external flows, turbulence structure, the Reynolds analogy, van Driest hypothesis, high and low Prandtl number two equation model, effects of surface roughness on heat transfer.
- 6197-6997. RESEARCH IN MECHANICAL ENGINEERING.** May be repeated for credit. Graded P/F/R.
- 6399, 6699, 6999. DISSERTATION.** 6399 and 6699 graded R/F only; 6999 graded P/F/R. \$15 computer fee.

Department of MUSIC

Area of Study

Humanities (See Interdepartmental
and Intercampus Programs.)

Degrees

M.A., Ph.D.

Chair: Gary Ebensberger
Graduate Faculty:

101 Fine Arts 273-3471

Professor Powell

OBJECTIVE

The graduate course offerings in music are provided to support other graduate degree programs and to meet the express needs of students. No program leading to a graduate degree in music exists at this time.

MUSIC (MUSI)

5102, 5202, 5302. SEMINAR IN SPECIAL TOPICS IN MUSIC. May include topics in Music History, Music Theory, and Music Education. May be repeated for credit as the topic changes.

5191, 5291, 5391. CONFERENCE COURSE IN MUSIC. Prerequisite: permission of instructor and Graduate Advisor.

**School of
NURSING**

<i>Area of Study</i>	<i>Degree</i>
Nursing	M.S.N.

Master's Degree Plans: Thesis and Non-Thesis

<i>Dean:</i> Myrna R. Pickard	669 Nursing	273-2776
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Assistant Dean of Nursing and Graduate

<i>Advisor:</i> Susan K. Grove	659 Nursing	273-2776
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Graduate Faculty:

Professors Burns, Grove, Pickard, Wyers

Associate Professors Armstrong, Bond, Hegstad, Heusinkveld, Jones, Okimi, St. Clair, Tolbert, Winslow

Assistant Professors Courtney, Handy, Johnson, O'Quinn, Stuppy, Summerlin

Adjunct Assistant Professors Barr, Clark, Gordon, Qudah, Rice, Smith, Snow, Speer, Thomas

OBJECTIVE

Graduate nursing education builds on a foundation of undergraduate nursing education and provides an opportunity for professional nurses to develop a specialty practice that is congruent with an expanding theoretical and empirical knowledge base. The graduate program in nursing is designed to assist professional nurses to prepare for advanced clinical and functional roles that demand increased accountability, expertise, and leadership. The master's program facilitates the use of the research process through the course of study and prepares the graduate to be a critical thinker and a self-directed professional who collaborates with consumers and other health care providers.

The major areas of study are:

Adult Nursing
Nursing Administration

Nurse Practitioner Programs
Child Health Nursing
Critical Care Nursing
Family Nursing
Gerontological/Adult Nursing
Psychiatric-Mental Health Nursing

ACCREDITATION

The Master of Science in Nursing degree program is accredited by the National League for Nursing.

DEGREE REQUIREMENTS

The applicant for the Master's degree in Nursing must meet the general requirements of the Graduate School and have a Bachelor of Science in Nursing degree from a program accredited by the National League for Nursing or proof of equivalent education at a foreign institution. Individual consideration may be given to applicants who hold a BSN degree from non-NLN accredited programs and to applicants with baccalaureate degrees in other areas.

In addition to the general admission requirements of the Graduate School, applicants must have completed a basic statistics course with a satisfactory grade prior to enrolling or during the first semester of graduate study, and present evidence of inclusion of basic physical assessment content in the undergraduate program or completion of a course in physical assessment. Students selecting nurse practitioner, educator, and clinical nurse specialist roles must have current physical assessment within the last three years. Students selecting Nursing Administration must have a computer background as designated by the Administration faculty. A current Texas RN license number, proof of professional liability insurance coverage, and a health history must be on file.

Foreign students whose native language is not English must take, in addition to the Test of English as a Foreign Language (minimum score of 550), the Test of Spoken English. The foreign student must possess a current Texas RN license and have professional liability insurance coverage before registering for the selected clinical nursing area courses.

Students are required to have each semester's planned program approved by the Graduate Advisor prior to registration. A minimum of 43 semester hours, thesis or non-thesis, is required for the degree. Six semester hours of elective coursework that supports the selected nursing study area are required and must be approved by the Graduate Advisor prior to registration. Students selecting Family Nursing, Gerontological/Adult Nursing or Child Health Nursing and electing the thesis option are required to complete 49 semester hours for the degree. Students selecting Family Nursing, Child Health Nursing or Gerontological/Adult Nursing must select Nurse Practitioner as their functional area.

All non-thesis candidates for the degree of Master of Science in Nursing shall pass a written examination over the candidate's graduate coursework as determined by the School of Nursing. All thesis candidates for the degree of Master of Science in Nursing shall present the completed thesis in a final oral examination.

Required Courses

- NURS 5327. Analysis of Theories for Nursing
- NURS 5301. Research in Nursing
- NURS 5205. Professional Nursing-Issues and Influences
- NURS 5328. Theory and Research Application in Nursing

Nursing Areas

Each student must complete the required courses in at least one nursing area:

- Adult Nursing: NURS 5315, 5316, 5420, 5421
- Critical Care Nursing: NURS 5315, 5316, 5416, 5417
- Nursing Administration: NURS 5311, 5382, 5340, 5342
- Nurse Practitioner Programs:
 - Child Health Nursing: NURS 5315, 5316, 5234, 5442, 5543, 5944
 - Family Nursing: NURS 5315, 5316, 5234, 5431, 5532, 5933
 - Gerontological/Adult Nursing: NURS 5315, 5316, 5234, 5445, 5546, 5947
 - Psychiatric-Mental Health Nursing: NURS 5315, 5316, 5524, 5425

Functional Areas

Each student must complete the required courses in at least one functional area:

- Administration: NURS 5339, 5341
- Clinical Nurse Specialization: NURS 5234, 5330, 5350, 5630
- Nurse Practitioner: NURS 5350 or 5234, 5330, 5630
- Educator: NURS 5302, 5429

Electives/Independent Study

Elective courses may be taken in an area of concentration in other departments of the University. Independent study offers the student the opportunity to explore topics of special interest.

DUAL DEGREE PROGRAM

Students in nursing may participate in a dual degree program whereby they can earn a Master of Science in Nursing and a Master of Public Administration. By participating in a dual degree program, students can apply a number of semester hours jointly to meet the requirements of both degrees, thus reducing the total number of hours which would be required to earn both degrees separately. The number of hours which may be jointly applied ranges from nine to 18 hours, subject to the approval of Graduate Advisors from both programs. To participate in the dual degree program, students must make separate application to each program and must submit a separate program of work for each degree. Those interested in a dual degree program should consult the appropriate Graduate Advisor(s) for further information on course requirements. See also the statement on "Dual Degree Programs" in the general information section of this catalog.

The grade of R (research in progress) is a permanent grade. An incomplete (the grade of X) cannot be given in a course which is graded R. To receive credit for an R-graded course the student must continue to enroll in the course until a passing grade is received. Three-hour thesis and three- and six-hour dissertation courses are graded R/F only. The grade of P (required for graduation) can be received in six- or nine-hour thesis courses and nine-hour dissertation courses only. In the course listings below, R-graded courses are designated either "Graded P/F/R" or "Graded R." (See also the section entitled "R" GRADE in this catalog.)

NURSING (NURS)

5205. PROFESSIONAL NURSING-ISSUES AND INFLUENCES (2-0). Exploration and evaluation of contemporary issues and trends relevant to nursing. Prerequisite: senior status or graduate standing.

5234. ADVANCED PHARMACOLOGY FOR NURSING PRACTICE (2-0). Clinical pharmacological therapeutics for advanced nursing practice. Prerequisites: NURS 5301 and 5316 or concurrent enrollment or permission of instructor.

5301. RESEARCH IN NURSING (3-0). Critical examination of concepts and the research process with emphasis on statistical analysis, critique, and utilization. Prerequisites: Elementary statistics; NURS 5327 or concurrent enrollment. \$5 computer fee.

5302. CURRICULUM DEVELOPMENT IN NURSING (3-0). Explore the nature of nursing education. Focus on the curriculum process and its application to nursing education programs. Prerequisite: NURS 5301 or permission of instructor.

5308. NURSING INFORMATICS (2-3). Focus on the impact of computers on nursing. Gain knowledge and skills in wordprocessing, database management and use of spreadsheets. Prerequisite: graduate standing. \$10 computer fee. \$2 lab fee.

5310. NEGOTIATION AND CONFRONTATION (3-0). Focus on analysis and synthesis of knowledge from relevant theories and implementation of interpersonal skills and techniques of negotiation and confrontation. Prerequisite: graduate standing.

5311. NURSING ADMINISTRATION I: FOUNDATIONS OF ORGANIZATION AND ADMINISTRATION (3-0). Examines management, organizational, and leadership concepts and theories as applied to health care organizations and their environment. Prerequisite: NURS 5327 or concurrent enrollment.

5315. PATHOLOGICAL PROCESSES IN ADVANCED NURSING PRACTICE (3-0). Focuses on developing an advanced knowledge base of pathophysiology and psychopathology for nursing practice. Prerequisite: graduate standing.

5316. ADVANCED HEALTH ASSESSMENT IN NURSING PRACTICE (2-3). Apply theoretical foundations and clinical skills in comprehensive health assessment across the lifespan. Prerequisite: NURS 5301 and 5315 or concurrent enrollment or permission of instructor.

5320. CASE MANAGEMENT OF THE CHILD WITH SPECIAL HEALTH CARE NEEDS (2-3). Nursing assessment and case management of children with special health care needs 0-21 years and their families in ambulatory care settings. Prerequisite: NURS 5316 or permission of the instructor. \$2 lab fee.

5324. FAMILY DYNAMICS (3-0). Family theory and the dynamics influencing family life, role behavior, coping, change, and challenge. Emphasis on strategies to assess and promote primary family health to formulate a nursing practice framework. Prerequisite: graduate standing.

NURSING

- 5327. ANALYSIS OF THEORIES FOR NURSING (3-0).** Critical examination of philosophical and theoretical bases for nursing. Analysis of selected concepts and theories. Prerequisite: graduate standing.
- 5328. THEORY AND RESEARCH APPLICATION IN NURSING (3-0).** Integration of theoretical and empirical elements in the development of a research proposal. Prerequisites: NURS 5327 and 5301. \$5 computer fee.
- 5330. CLINICAL DECISION-MAKING IN ADVANCED NURSING PRACTICE (2-3).** Systematic clinical decision making and development of management plans in advanced nursing practice. Prerequisite: NURS 5417, 5421, or 5425 or concurrent enrollment. \$10 lab fee.
- 5339. NURSING ADMINISTRATION ROLE I: MANAGEMENT ROLES AND FUNCTIONS (1-6).** Examine and implement roles and functions of the administrative executives and managers in health care organizations. Prerequisites: NURS 5311 or MANA 5312; NURS 5328 or concurrent enrollment.
- 5340. NURSING ADMINISTRATION III: MANAGEMENT SEMINAR AND PRACTICE (1-6).** Analysis, application, and synthesis of management; organizational and leadership concepts and theories in selected health care settings. Prerequisite: NURS 5339. \$4 lab fee.
- 5341. NURSING ADMINISTRATION ROLE II: FINANCIAL MANAGEMENT IN NURSING (2-3).** Financial management concepts, financial planning and budgeting, reimbursement systems in health care, financial management skills in nursing. Prerequisite: Computer literacy with spreadsheets and graduate standing. \$5 computer fee. \$4 lab fee.
- 5342. NURSING ADMINISTRATION IV: MANAGEMENT OF NURSING OPERATIONS (2-3).** Strategies for organizational planning and performance. Prerequisite: NURS 5341. \$5 computer fee. \$4 lab fee.
- 5350. ROLE OF THE NURSE IN ADVANCED PRACTICE (2-3).** Theory and application of the multiple roles of the advanced practice nurse within the health care system. Prerequisite: NURS 5416, 5420, 5524, 5431, 5442, or 5445 or concurrent enrollment. \$5 computer fee. \$5 lab fee.
- 5381. PROGRAM EVALUATION IN NURSING (2-3).** Focus on the process and outcomes of strategic planning and program evaluation in academia and service. Prerequisite: NURS 5302 or permission of Graduate Advisor. \$2 lab fee.
- 5382. NURSING ADMINISTRATION II: NURSING AND HEALTH CARE POLICY (3-0).** Examines historical, current, and predicted health care policies formulated at the national, state, and local levels. Emphasizes collaboration of nursing in determining and implementing health policy. Prerequisite: graduate standing.
- 5383. CHILD AND ADOLESCENT PSYCHIATRIC NURSING (2-3).** The etiologies, theoretical base, empirical knowledge, and treatment approaches for the mental and emotional disorders of children and adolescents. The problems of special child and adolescent populations, including minority ethnic status, homelessness, physical illness and disability, and mental retardation will be analyzed and treated. Prerequisite: graduate standing. \$4 lab fee.
- 5385. NURSING CARE OF INDIVIDUALS/FAMILIES WITH ADDICTIVE BEHAVIORS (3-0).** Theoretical foundations for understanding the scope of the problem of addiction. Focuses on gaining expertise in the area of prevention and/or in the various modalities of therapy for the individual/family with an addictive problem. Prerequisite: graduate standing.
- 5393. ADVANCED CLINICAL NURSING PRACTICE I (1-6).** Development of advanced knowledge base of specialized clinical concepts and the application of this knowledge in selected clinical areas. Prerequisite: graduate standing. \$2 lab fee.
- 5394. ADVANCED CLINICAL NURSING PRACTICE II (1-6).** Expanded background in a selected clinical area with emphasis on analysis and synthesis of clinical data, clinical judgment and management of patients and families' care. Prerequisite: NURS 5393. \$2 lab fee.
- 5416. CRITICAL CARE NURSING I (2-6).** Focuses on developing advanced knowledge and skill in the provision of care to critically ill adults (with selected problems) and their families. Prerequisites: NURS 5301 and 5316 or concurrent enrollment. \$5 lab fee.
- 5417. CRITICAL CARE NURSING II (2-6).** Focuses on collaboration in the provision of care to critically ill adults (with complex problems) and their families. Prerequisite: NURS 5416. \$5 lab fee.
- 5420. ADULT NURSING I (2-6).** Analysis of theoretical foundations and clinical concepts necessary for advanced practice with adults at risk for or experiencing alterations in physiologic health. Prerequisite: NURS 5316 or concurrent enrollment. \$4 lab fee.

- 5421. ADULT NURSING II (2-6).** Analyze health problems in adults and the impact on the individuals, families, and communities. Implement care to assist clients and families to make effective health choices. Prerequisite: NURS 5420. \$4 lab fee.
- 5425. PSYCHIATRIC-MENTAL HEALTH NURSING II (2-6).** Focuses on advanced knowledge of psychiatric-mental health nursing with families, groups, and communities. Application of the nursing process to populations with complex mental illnesses. Prerequisite: NURS 5524. \$4 lab fee.
- 5429. ROLES AND FUNCTIONS OF THE NURSE EDUCATOR (2-6).** Investigate the roles and functions of the nurse educator with directed teaching experiences. Prerequisite: NURS 5302. \$5 lab fee.
- 5431. FAMILY NURSING I (2-6).** Theoretical study with applied clinical nursing judgment and management of families in health and illness. Prerequisites: NURS 5316; NURS 5234 or concurrent enrollment. \$25 lab fee.
- 5442. CHILD HEALTH NURSING I (2-6).** Theory and application of concepts in pediatric primary health care. Major focus: health promotion and the assessment and management of minor acute and chronic stable illness in infants and young children. Prerequisites: NURS 5316; NURS 5234 or concurrent enrollment. \$25 lab fee.
- 5445. GERONTOLOGICAL/ADULT NURSING I (2-6).** Theoretical study with applied clinical nursing judgment and management of adult and gerontological clients in health and illness. Prerequisites: NURS 5316; NURS 5234 or concurrent enrollment. \$25 lab fee.
- 5524. PSYCHIATRIC-MENTAL HEALTH NURSING I (3-6).** Focuses on advanced knowledge of psychiatric-mental health nursing with individuals across the lifespan. Application of the nursing process to populations at risk and to individuals with addictive disorders and selected mental illnesses. Prerequisites: NURS 5301; NURS 5316 or concurrent enrollment. \$4 lab fee.
- 5532. FAMILY NURSING II (3-6).** A continuation of NURS 5431 with progressive analysis and clinical nursing judgment and management of families in health and illness. Prerequisites: NURS 5431; NURS 5328 or concurrent enrollment. \$10 lab fee.
- 5543. CHILD HEALTH NURSING II (3-6).** Theory and clinical management of school age children and adolescents with acute minor illness, development disabilities and social/environmental problems. Prerequisites: NURS 5442; NURS 5328 or concurrent enrollment. \$10 lab fee.
- 5546. GERONTOLOGICAL/ADULT NURSING II (3-6).** Continuation of NURS 5445 with progressive analysis and clinical nursing management of adult and gerontological clients in health and illness. Prerequisite: NURS 5445; NURS 5328 or concurrent enrollment. \$10 lab fee.
- 5630. ADVANCED CLINICAL NURSING PRACTICUM (0-18).** Clinical preceptorship in selected practice sites with opportunities to apply knowledge and skills of advanced nursing practice. Prerequisite: NURS 5330.
- 5933. FAMILY NURSING III (0-27).** Clinical preceptorship in selected primary health practice sites with opportunities to apply knowledge and concepts in a guided, progressive context of family nursing practice. Prerequisite: NURS 5432. Graded P/F/R. \$2 lab fee.
- 5944. CHILD HEALTH NURSING III (0-27).** Field study in pediatric primary health care in selected clinical settings with guidance from preceptors and faculty. Major focus is integration of theoretical concepts applied to clinical practice. Prerequisites: NURS 5443. Graded P/F/R. \$2 lab fee.
- 5947. GERONTOLOGICAL/ADULT NURSING III (0-27).** Clinical preceptorship in selected primary health practice sites with opportunities to apply knowledge and concepts in a guided, progressive context of gerontological nursing practice. Prerequisites: NURS 5446. Graded P/F/R. nb\$2 lab fee.
- 5170, 5270, 5370. INDEPENDENT STUDY IN NURSING.** Detailed in-depth study in a specific topic area. Topic and mode of study are agreed upon by student(s) and instructor prior to registration. May be repeated for credit when topics vary. Graded P/F/R.
- 5190, 5290, 5390, 5490. TOPICS IN NURSING.** Selected topics in advanced nursing. May be repeated for credit as topics change.
- 5398, 5698. THESIS.** 5398 graded R/F only, 5698 graded P/F/R.
- 5696, 5996. INTERNSHIP IN NURSING ADMINISTRATION.** Exploration and participation in the role of a nurse administrator in planning, organizing, and analyzing nursing education or nursing service. Graded P/F/R. Prerequisite: approval of the Graduate Advisor.

Department of PHILOSOPHY AND HUMANITIES

Area of Study Humanities (See Interdepartmental and Intercampus Programs.) *Degrees* M.A., Ph.D.

Acting Chair: Dabney Townsend 305 Carlisle Hall 273-2774
Graduate Faculty:

Associate Professors Baker, Chiasson, Reeder, Townsend
Assistant Professors Bradshaw, Burgess-Jackson, Mahoney, Nussbaum

OBJECTIVE

The graduate course offerings in philosophy are provided to support other graduate programs, particularly those in Humanities and in the Social Sciences, and to meet the expressed needs of students. The courses are designed to provide the theoretical background necessary to the complete understanding and use of professional skills in these areas. No program leading to a graduate degree in philosophy exists at this time.

The grade of R (research in progress) is a permanent grade. An incomplete (the grade of X) cannot be given in a course which is graded R. To receive credit for an R-graded course the student must continue to enroll in the course until a passing grade is received. Three-hour thesis and three- and six-hour dissertation courses are graded R/F only. The grade of P (required for graduation) can be received in six- or nine-hour thesis courses and nine-hour dissertation courses only. In the course listings below, R-graded courses are designated either "Graded P/F/R" or "Graded R." (See also the section entitled "R" GRADE in this catalog.)

PHILOSOPHY (PHIL)

5391. CONFERENCE COURSE IN PHILOSOPHY. May be taken only with the permission of the instructor and the Graduate Advisor. Graded P/F/R.

5392. TOPICS IN THE HISTORY OF PHILOSOPHY (3-0). Consideration in depth of the work of a single philosopher or a related philosophical school against the background of the development of philosophy. May be repeated for credit as the topic changes.

5393. PHILOSOPHICAL PERSPECTIVES ON THE HUMANITIES (3-0). A philosophical inquiry into problems and issues of relevance in humanistic disciplines. May be repeated for credit as the topic changes.

Department of PHYSICS

<i>Areas of Study</i>	<i>Degrees</i>
Physics	M.S.
Physics and Applied Physics	Ph.D.
Radiological Physics (See Interdepartmental and Intercampus Programs.)	M.S.
Mathematical Sciences (See Interdepartmental and Intercampus Programs.)	Ph.D.

Master's Degree Plans: Thesis and Non-Thesis

<i>Chair:</i> R. N. West	108 Science Hall	794-5160
<i>Graduate Advisor(M.S. Programs):</i> J. L. Fry	108 Science Hall	273-2461
<i>Graduate Advisor(Ph.D. Programs):</i> A. Weiss	108 Science Hall	273-2459
<i>Graduate Faculty:</i>		

Professors Black, Diana, Fry, Ray, Rosen, Rubins, Sharma, Weiss, West, White
Associate Professor Kaiser

Assistant Professors De, Draper, Howard, Koymen, Lippel, Stephens

OBJECTIVE

The objective of graduate work in physics is to prepare the student for continued professional and scholarly development as a physicist. The Physics MS Degree Programs are designed to give the student advanced training in all fundamental areas of physics through formal courses and the options of some degree of specialization or participation in original research in one of a variety of projects directed by the faculty.

The Doctor of Philosophy in Physics and Applied Physics Program combines the traditional elements of a science doctoral program with courses in specifically applied topics and internship in a technological environment. It is designed to produce highly trained professionals with a broad perspective of the subject which may prepare them equally well for careers in academic or in government or industrial laboratories. Current research in the department is predominantly in the areas of condensed matter physics, materials science, and high-energy physics and includes a wide range of theoretical work in solid state physics and experimentation in laser physics, optics, positron physics, solid state and surface physics, and high-energy physics.

DEGREE REQUIREMENTS: MASTER OF SCIENCE

For admission to the Master of Science program in physics, the candidate must satisfy the general admission requirements of the Graduate School. In addition, the candidate must have satisfactorily completed at least 24 undergraduate hours of advanced physics and supporting courses.

A minimum of 30 hours is required for the Master of Science degree, of which 24 hours, including a six hour thesis (minimum registration), will be in physics, and six hours may be selected from physics, mathematics, chemistry, geology, biology, or engineering as approved by the Graduate Advisor.

PHYSICS

DEGREE REQUIREMENTS: DOCTOR OF PHILOSOPHY

To be admitted to the Doctor of Science program, an applicant must satisfy the general admission requirements of the Graduate School. Each candidate must complete the following program requirements:

1. Demonstration of competence in a minimum of 42 credit hours of core courses chosen under the guidance of the supervising committee from the following (or from courses approved in advance by the Graduate Studies Committee):

Traditional core courses:

- PHYS 5306 Classical Mechanics
- PHYS 5307, 5308 Quantum Mechanics I, II
- PHYS 5309, 5313 Electromagnetic Theory I, II
- PHYS 5310 Statistical Mechanics
- PHYS 5311, 5312 Mathematical Methods in Physics I, II
- PHYS 5315, 5316 Solid State I, II

Applied Physics core courses:

- PHYS 5314 Advanced Optics
- PHYS 5319 Mathematical Methods in Physics III
- PHYS 5349 Methods of Experimental Physics
- PHYS 6301, 6302, 6303 Methods of Applied Physics I, II, III
- MATH 5355 Statistical Theory for Research Workers
- MANA 5312 Management
- EE 5333 Advanced Electronics

Computer Science as required by the supervising committee.

2. Internship: PHYS 6304, 6604, 6904
3. Dissertation and additional research and elective courses chosen under the guidance of the supervising committee.

The grade of R (research in progress) is a permanent grade. An incomplete (the grade of X) cannot be given in a course which is graded R. To receive credit for an R-graded course the student must continue to enroll in the course until a passing grade is received. Three-hour thesis and three- and six-hour dissertation courses are graded R/F only. The grade of P (required for graduation) can be received in six- or nine-hour thesis courses and nine-hour dissertation courses only. In the course listings below, R-graded courses are designated either "Graded P/F/R" or "Graded R." (See also the section entitled "R" GRADE in this catalog.)

PHYSICS (PHYS)

5190. PHYSICS COLLOQUIUM (1-0). Lectures by students, faculty and invited speakers on current topics in physics. May be repeated for credit. Graded P/F/R only.

5301. PHYSICS OF MATERIALS (3-0). Crystal structure, lattice vibrations, and band theory of electrons as they relate to the understanding of the electrical, magnetic, and mechanical properties of materials. Also offered as MSE 5301. Prerequisite: PHYS 3313 or permission of instructor.

5306. CLASSICAL MECHANICS (3-0). General principles of analytical mechanics, the kinematics of rigid bodies, canonical transformation, Hamilton-Jacobi theory. Prerequisite: PHYS 4319 or permission of Graduate Advisor.

5307. QUANTUM MECHANICS I (3-0). Matrix formulation, theory of radiation, angular momentum, perturbation methods. Prerequisite: permission of Graduate Advisor.

5308. QUANTUM MECHANICS II (3-0). Approximate methods, symmetry and unitary groups, scattering theory. Prerequisite: PHYS 5307 or permission of Graduate Advisor.

5309. ELECTROMAGNETIC THEORY I (3-0). Boundary value problems in electrostatics and magnetostatics, Maxwell's equations. Prerequisite: permission of Graduate Advisor.

5310. STATISTICAL MECHANICS (3-0). Fundamental principles of statistical mechanics, Liouville theorem, entropy, Fermi-Dirac distribution, Bose-Einstein distribution, Einstein condensation, density matrix, quantum statistical mechanics, kinetic methods, and transport theory. Prerequisite: PHYS 4315 or permission of Graduate Advisor.

5311. MATHEMATICAL METHODS IN PHYSICS I (3-0). Algebraic and analytical methods used in modern physics. Algebra: matrices, groups, and tensors, with application to quantum mechanics, the solid state, and special relativity. Analysis: vector calculus, ordinary and partial differential equations, with applications to electromagnetic and seismic wave propagation. Prerequisite: permission of Graduate Advisor.

5312. MATHEMATICAL METHODS IN PHYSICS II (3-0). Continuation of PHYS 5311 with a selection from the following topics. Algebra: matrix representations of the symmetric and point groups of solid state physics, matrix representations of the continuous groups $O(3)$, $SU(2)$, $SU(3)$, $SL(2,C)$, general covariance. Analysis: further study of analytic functions, Cauchy's theorem, Green's function techniques, orthogonal functions, integral equations. Prerequisite: PHYS 5311 or permission of Graduate Advisor.

5313. ELECTROMAGNETIC THEORY II (3-0). Modern tensorial treatment of classical electrodynamics, force on and field of a moving charge, derivation and application of 4-vector potential, Maxwell's equations in tensor form, field momentum and radiation. Prerequisite: PHYS 5309 or PHYS 5311 or permission of Graduate Advisor.

5314. ADVANCED OPTICS (3-0). Electromagnetic wave equations, theory of diffraction, radiation scattering and dispersion, coherence and laser optics. Additional advanced topics of current interest. Prerequisite: permission of Graduate Advisor.

5315. SOLID STATE I (3-0). Crystal structure, lattice vibration, thermal properties, and band theory of solids. Prerequisite: permission of Graduate Advisor.

5316. SOLID STATE II (3-0). Electrical and magnetic properties of crystalline solids, magnetic resonance, and optical phenomena. Prerequisite: permission of Graduate Advisor.

5317. STATISTICAL MECHANICS II (3-0). Methods in applied statistical mechanics. Topics may include fluctuations and critical phenomena, the Ising model, the master equation, transport in solids, and chaos. Prerequisites: PHYS 5310 and PHYS 5307, or permission of instructor.

5319. MATHEMATICAL METHODS IN PHYSICS III (3-0). Numerical methods for applied physics; computer techniques, numerical differentiation, integration, interpolation, extrapolation; differential equations, integral equations, statistical analysis; scientific computer library; artificial intelligence programming. Prerequisite: permission of instructor. \$5 computer fee.

5320. QUANTUM MECHANICS II (3-0). Quantum theory of radiation; relativistic equations; elements of quantum field theory; symmetries and gauge theories. Applications in elementary particle physics and solid-state physics. Prerequisites: PHYS 5308 and PHYS 5312.

5325. INTRODUCTION TO ELEMENTARY PARTICLES I (3-0). An overview of particles and forces. Particle detectors and accelerators. Invariance principles and conservation laws. Standard model. Electromagnetic, weak, strong, and unified interactions. Prerequisite: basic quantum mechanics, special relativity.

5326. INTRODUCTION TO ELEMENTARY PARTICLE PHYSICS (3-0). Systematics of the quark model; the fundamental interactions of elementary particles; spin and relativistic kinematics; Dirac Equation; the standard electroweak model. Prerequisite: knowledge of quantum mechanics, special theory relativity.

5328. SURFACE PHYSICS (3-0). Experimental and theoretical methods for the study of solid surfaces. Geometric and electronic structure of metals and semiconductors. Surfaces as model systems of reduced dimensionality. Adsorption phenomena and film growth.

5391. SPECIAL TOPICS IN PHYSICS (3-0). Topics in physics, particularly from areas in which active research is being conducted, are assigned to individuals or small groups for intensive investigations. May be repeated for credit. Graded R. Prerequisite: permission of Graduate Advisor.

5193-5393. READINGS IN PHYSICS. Conference course. May be repeated for credit. Graded R. Prerequisite: permission of instructor.

5194, 5294, 5394, 5694. RESEARCH IN PHYSICS. Conference course with laboratory. May be repeated for credit. Graded P/F/R. Prerequisite: permission of instructor. \$5-10 computer fee.

5398, 5698. THESIS. 5398 graded R/F only; 5698 graded P/F/R. Prerequisite: permission of Graduate Advisor. \$5-10 computer fee.

6301. METHODS OF APPLIED PHYSICS I—ELECTRONICS (3-0). The analysis and design of electronic circuits for use in the laboratory. Transistors and integrated circuits in analog instrumentation. Digital logic. Information theory and signal processing.

POLITICAL SCIENCE

6302. METHODS OF APPLIED PHYSICS II—COMPUTERS IN PHYSICS (3-0). Applications of computers in physics. Acquisition and analysis of experimental data. Vector and parallel processing, image processing, simulation.

6303. METHODS OF APPLIED PHYSICS III—SPECTROSCOPY (3-0). The principles (interactions, cross-sections, elastic and inelastic scattering, diffraction, coherence), the methodologies (sources, detectors, visualization), and applications (structure, dynamics, composition, excitations) of neutral and charged particle spectroscopies to condensed matter physics and materials science.

6304, 6604, 6904. APPLIED PHYSICS INTERNSHIP. Applied physics and engineering research and training in industry or other science or engineering departments of UT Arlington or other institutions requiring applied physicists. Faculty supervision and submission of technical progress reports required. Graded P/F only. Prerequisite: permission of Graduate Advisor.

6391. SELECTED TOPICS IN APPLIED PHYSICS (3-0). Topics chosen from research areas in the Department of Physics or at one of the institutions or corporations participating in the traineeship program in applied physics; emphasis on industrial and engineering applications. May be repeated for credit. Prerequisite: permission of instructor.

6399, 6699, 6999. DISSERTATION. 6399 and 6699 graded R/F only; 6999 graded P/F/R. Prerequisite: admission to candidacy for the Degree of Doctor of Science in Applied Physics. \$5-15 computer fee.

DISSERTATION—See also Mathematical Sciences.

Department of POLITICAL SCIENCE

Areas of Study

Political Science
Public Administration (see Interdepartmental
and Intercampus Programs)
Humanities (see Interdepartmental and
Intercampus Programs)

Degrees

M.A.

M.P.A.

M.A., Ph.D.

Master's Degree Plans: Thesis and Non-Thesis

Acting Chair: Suzanne Katsikas

206 University Hall

273-2993

Graduate Advisor: Roslyn Simowitz

402 University Hall

273-3965

Graduate Faculty:

Professors Cole, Dawson, Hekman, Marshall, Stevens, Story

Associate Professors Cichock, Clark, Gutierrez, Katsikas, MacKenna, Simowitz

Assistant Professors Heard, Ignagni, Little, Moore

OBJECTIVE

The program leading to a Master of Arts degree in Political Science emphasizes preparation for service in many areas of our national life, both public and private. Students interested in careers in teaching and research or in leadership roles in the public or private sectors may pursue programs adapted to their individual objectives. The Department of Political Science endeavors to equip students with the research techniques and substantive background for coursework undertaken beyond the master's level. Particular attention is given newer methodologies and approaches employed by scholars in the field.

DEGREE REQUIREMENTS

The thesis degree plan requires 24 hours of coursework including three hours of methods in Political Science for those who have not had POLS 4329 or its equivalent (POLS 3310 does not satisfy this requirement). Of the remaining 21 hours, at least one course each must be taken from four of the following six areas:

Political Behavior and Processes—5305, 5310, 5315, 5316, 5350, 5391.

Comparative Politics—5336, 5337, 5353, 5391.

International Politics and Organization—5327, 5354, 5391.

Public Law and Jurisprudence—5320, 5355, 5391.

Public Administration and Policy Studies—5331, 5332, 5335, 5356, 5391.

Political Theory (Thought and Methodology)—5339, 5357, 5391.

Students should consult the Political Science Graduate Student Handbook for regulations on transfer courses, undergraduate courses, conferences, internships, and special courses.

The non-thesis degree plan requires a minimum of 36 hours, including three hours of methodology, and courses from four of the six areas.

All candidates for the degree of Master of Arts with a major in political science must pass a final comprehensive examination, written, oral, or both written and oral. The scope, content, and form of the examination will be determined by the student's supervising committee. In the event of failure of the final comprehensive examination, the student may petition the Committee on Graduate Studies to retake the examination on a date no sooner than 60 days after the first examination. Students will not be permitted more than one reexamination after failure of the initial examination.

International Studies Option

The International Studies option of the Master of Arts program in Political Science emphasizes comparative politics and international politics within the framework of Political Science. This option requires courses from three of six areas of Political Science and 12 hours in comparative politics and/or international politics. Students must have three hours of a methods course.

MASTER OF PUBLIC ADMINISTRATION

The Department of Political Science participates in the interdisciplinary Master of Public Administration along with the School of Urban and Public Affairs (see Interdepartmental and Intercampus Programs, Program in Public Administration).

DUAL DEGREE PROGRAM

Students in political science may participate in a dual degree program whereby they can earn a Master of Arts in political science and a Master of Arts in criminal justice. By participating in a dual degree program, students can apply a number of semester hours jointly to meet the requirements of both degrees, thus reducing the total number of hours which would be required to earn both degrees separately. The number of hours which may be jointly applied ranges from nine to 18 hours, subject to the approval of Graduate Advisors from both programs. To participate in the dual degree program, students must make separate application to each program and must submit a separate program of work for each degree. Those interested in a dual degree program should consult the appropriate Graduate Advisor(s) for further information on course requirements. See also the statement on "Dual Degree Programs" in the general information section of this catalog.

The grade of R (research in progress) is a permanent grade. An incomplete (the grade of X) cannot be given in a course which is graded R. To receive credit for an R-graded course the student must continue to enroll in the course until a passing grade is received. Three-hour thesis and three- and six-hour dissertation courses are graded R/F only. The grade of P (required for graduation) can be received in six- or nine-hour thesis courses and nine-hour dissertation courses only. In the course listings below, R-graded courses are designated either "Graded P/F/R" or "Graded R." (See also the section entitled "R" GRADE in this catalog.)

POLITICAL SCIENCE

POLITICAL SCIENCE (POLS)

5197. MASTER'S COMPREHENSIVE EXAMINATION. Required of all non-thesis Master of Arts students in the semester of their graduation. Graded P/F/R.

5305. STATE AND LOCAL POLITICS (3-0). Problems and policies relating to American politics at the state and local level. Field research with and for area governments emphasized where practical. Also offered as URBA 5301; credit will be granted only once.

5315. AMERICAN POLITICAL INSTITUTIONS (3-0). The politics, processes, and policies of American political institutions. Includes issues of the presidency, Congress, bureaucracy, and courts, and the primary theories concerning the activities and influence of these institutions.

5316. ELECTORAL BEHAVIOR (3-0). Role of elections as a means of expressing citizen preferences. Candidate strategies, the effect of electoral institutions, and alternative explanations of electoral behavior reviewed. Survey research may be used to explore specific topics in electoral research.

5320. CONTEMPORARY JUDICIAL POLITICS AND BEHAVIOR (3-0). Process and decision-making of the American judiciary with emphasis on contemporary constitutional issues.

5327. POLITICS OF INTERNATIONAL ECONOMIC RELATIONS (3-0). Political aspects and implications of the international economic system and the role of international organizations and institutions in international political economy. Focuses on the political impact of economic aid, trade, and investment, the influence of multinational corporations and international economic cartels.

5331. URBAN GOVERNMENT ADMINISTRATION (3-0). Problems of governmental administration at all levels—national, state, and local—in urban areas, with emphasis on metropolitan and regional approaches in political decision-making. Also offered as URBA 5321; credit will be granted only once.

5332. PUBLIC POLICY ANALYSIS (3-0). Contemporary public policy analysis, focusing upon policy system modeling, the policy process as a descriptive phenomenon, and upon the profession of policy analysis. Oriented toward equipping students with analytic skills essential to analysis of public policies.

5335. LABOR RELATIONS IN THE PUBLIC SECTOR (3-0). Rise and growth of labor unions in government, the nature of the collective bargaining process and the role of third parties in mediation, conciliation and arbitration.

5336. THE POLITICAL SYSTEMS OF RUSSIA AND THE SUCCESSOR STATES (3-0). Analysis of comparative theories in relation to the 15 former republics of the Soviet Union. Particular emphasis on the current political and economic structures of the various republics.

5337. COMPARATIVE POLITICAL SYSTEMS (3-0). Theories and concepts relating to the scope of comparative politics and methods of comparing various aspects of the political system.

5339. EMPIRICAL THEORY AND METHODOLOGY (3-0). Selected empirical theories and research methods. Systems theory, structural-functional theory, and other empirical theories and such methodological concerns as research design, data collection, and data analysis and interpretation. Also offered as URBA 5360; credit will be granted only once.

5350. TOPICS IN POLITICAL BEHAVIOR AND PROCESSES (3-0).

5353. TOPICS IN COMPARATIVE POLITICS (3-0).

5354. TOPICS IN INTERNATIONAL POLITICS AND ORGANIZATION (3-0).

5355. TOPICS IN PUBLIC LAWS AND JURISPRUDENCE (3-0).

5356. TOPICS IN PUBLIC ADMINISTRATION AND POLICY STUDIES (3-0).

5357. TOPICS IN POLITICAL THEORY (THOUGHTS AND METHODOLOGY) (3-0).

These topics courses may be repeated for credit as the topic changes.

5391. CONFERENCE COURSE IN POLITICAL SCIENCE. Research and reading in a specialized field under the direction of a member of the graduate faculty. Graded P/F/R.

5393. INTERNSHIP. Under faculty supervision, a non-thesis degree student may elect an internship program in the student's major area of interest; a substantial internship report applying research procedures expected. Graded P/F/R. Also offered as URBA 5350; credit will be granted only once.

5398, 5698. THESIS. Original research designed to augment existing studies of problems or topics related to one of the major fields of study. 5398 graded R/F only; 5698 graded P/F/R.

Department of PSYCHOLOGY

Areas of Study

General Experimental Psychology
Mathematical Sciences (See Interdepartmental and
Inter-campus Programs.)

Degrees
M.S., Ph.D.

Ph.D.

Master's Degree Plans: Thesis

Chair: Roger Mellgren

315A Life Science 273-2281

Graduate Advisor: William Ickes

510 Life Science 273-3229

Graduate Faculty:

Professors Amster, Bernstein, Bowen, Cox, Erickson, Ickes, Mellgren, Paulus
Associate Professors Jackson, Kopp, Mann
Assistant Professors Asuncion, Brown
Professor Emeritus McCain

OBJECTIVE

The objective of graduate work in psychology is to educate the student in the methods and basic content of the discipline and to provide an apprenticeship in the execution of creative research.

Graduate work in the doctoral and master's programs will be offered in general experimental psychology. Students' individual programs may be arranged to give emphasis to a particular aspect of the general program.

Animal Behavior Option: Study in the area of animal behavior is offered jointly by the biology and psychology graduate programs. Students specializing in animal behavior may initially enroll in the Master of Science program in either biology or psychology. There are a number of biology and psychology courses offered within this specialization. In addition to the courses specified in the catalog, advanced courses in Animal Behavior are often offered under enrollment in BIOL 5310 (Special Topics in Biology), PSYC 5389 (Contemporary Problems in Psychology), and PSYC 6300 (Seminar in Psychology). Recent courses offered under these titles include Animal Cognition, Behavioral Ecology, Behavioral Genetics, Developmental Psychobiology, Nociception, and Predator-Prey Interactions.

Deadline for Financial Aid Applications—Students who wish to be considered for assistantships must have their applications and departmental forms sent to The University of Texas at Arlington by March 1 for the Fall Semester and November 1 for the Spring Semester. Students who do not desire financial aid may apply at any time up to one month before the semester in which they plan to enroll.

DEGREE REQUIREMENTS

In addition to the requirements outlined elsewhere, the Department of Psychology will require undergraduate courses in statistics and in experimental methods. These courses may be taken as deficiency courses.

Degree requirements for the Department of Psychology are established by the Committee on Graduate Studies in Psychology and supplement those established by the University (see general requirements of the Graduate School as stated under the section entitled "Admission Requirements and Procedures").

Each entering graduate student will be furnished a copy of the departmental rules which will serve as guidelines for departmental actions and recommendations.

Each student must adhere to the code of ethics of the American Psychological Association.

PSYCHOLOGY

Master of Science Degree

Thirty hours, including six hours of thesis, are required for the Master of Science degree. The program is designed to form the basis for the doctoral program. It is, however, open to those seeking a terminal master's degree. PSYC 5405, 5406, and 12 hours among 5312, 5313, 5321, 5322, 5331, 5333, 5335, 5341, and 5345 are required, including at least three hours from each of area A, B, and C. (See below).

As soon as is feasible, a student should decide on an area for concentration and research. After discussion with and consent of the involved faculty members, the student selects a supervising professor and a thesis committee. No student may enroll in PSYC 5398 or 5698 until the thesis committee has approved a proposal for the thesis project.

Doctor of Philosophy

The degree of Doctor of Philosophy in experimental psychology requires distinguished attainments both in scholarship and original research, and the deep understanding of the strategic role of thoughtful experimentation in the development of an empirical science. Although the student must meet the minimum requirements of a planned course of study, the ultimate basis for conferring the degree must be the demonstrated ability to do independent and creative work and the exhibition of a profound grasp of the subject matter of the field.

Mathematics—Experimental psychology requires sophistication in mathematics. Prospective students are encouraged to recognize this trend and prepare themselves as well as possible. Mathematics from College Algebra through Calculus is desirable.

Foreign Language—The Department of Psychology does not require a foreign language. In lieu of a foreign language, the Department of Psychology requires knowledge of at least one computer language such as PASCAL, C, or FORTRAN. This may be accomplished by a passing grade in CSE 2303, 2304, or 2306 (Computer Programming and Applications) which may be taken on a pass-fail basis. The grade in this course will not be used to determine a student's grade point average. Students who have a prior background in computer programming may elect to take an equivalency examination.

Course requirements—Entering graduate students will be required to take the following courses during their first four semesters of enrollment. Exceptions may be made only with written permission of the Committee on Graduate Studies.

Current Topics in Experimental Psychology(5110)

Statistics I (5405)

Statistics II (5406)

Experimental Design(5407)

Four of the following courses, at least one from each area A, B, and C:

Area A: 5312 Animal Learning, 5333 Physiological Psychology, 5335 Animal Behavior

Area B: 5321 Personality, 5322 Social Psychology

Area C: 5313 Cognitive Processes, 5331 Perceptual Processes, 5341 Decision Making, 5345

Human Learning and Memory

Students with prior graduate work may be exempted from any of the above requirements by taking a departmental test which is the equivalent of the final examination in that course. Having fulfilled the above, the following are required:

1. An additional five courses (15 hours) from among those numbered PSYC 5310 through 5347.
2. Two six-hour research courses. These may be taken from PSYC 5698 or PSYC 5600. Students who plan to obtain the MS should elect PSYC 5698 as one of the research courses and students who do not plan to obtain the MS should select two sections of PSYC 5600. If the student does not elect to obtain the MS, one of the research courses must result in a formal thesis-equivalent paper, which will be evaluated by a committee and defended in an oral examination. The two research courses are a minimum requirement. Students are strongly encouraged to take PSYC 5391 before taking PSYC 5600 and 5698.
3. Nine hours of PSYC 6300.
4. Additional hours of coursework to be determined by the Graduate Advisor and dissertation committee. The student should plan to take approximately 90 hours including 6999. No student may enroll in a dissertation course until the dissertation committee has approved a proposal for the dissertation project.

A student has completed the course requirements when he or she has:

1. Maintained at least a B average in 5405, 5406, and 5407.
2. Maintained at least a B average in his or her area A, B, and C courses.
3. Received at least a B average in all other courses.

Diagnostic Evaluations—Doctoral students normally take diagnostic examinations in a major and minor area between the fourth and fifth semester of graduate work. Satisfactory completion of the area A, B, and C course requirements by the end of the first four semesters is necessary for achieving satisfactory progress in the graduate program. It is also a condition for taking the diagnostic exams. Exceptions will rarely be made, and then only with the written permission of the Committee on Graduate Studies.

The grade of R (research in progress) is a permanent grade. An incomplete (the grade of X) cannot be given in a course which is graded R. To receive credit for an R-graded course the student must continue to enroll in the course until a passing grade is received. Three-hour thesis and three- and six-hour dissertation courses are graded R/F only. The grade of P (required for graduation) can be received in six- or nine-hour thesis courses and nine-hour dissertation courses only. In the course listings below, R-graded courses are designated either "Graded P/F/R" or "Graded R." (See also the section entitled "R" GRADE in this catalog.)

PSYCHOLOGY (PSYC)

5310. CURRENT TOPICS IN EXPERIMENTAL PSYCHOLOGY (1-0). A survey of contemporary topics in experimental psychology. Prerequisite: admission to the graduate program in psychology or permission of the instructor.

5310. MATHEMATICAL MODELS IN PSYCHOLOGY (3-0). Elementary probability theory, matrix algebra, and theory of linear difference equations applied to theoretical problems in learning, signal detection, decision processes, and social interactions.

5312. ANIMAL LEARNING (3-0). Survey of contemporary topics in animal learning.

5313. COGNITIVE PROCESSES (3-0). Includes topics such as concept identification, problem solving, reasoning, and knowledge representation.

5315. OPERANT PSYCHOLOGY (3-0). Overview of operant theory with an emphasis upon contemporary problems. Basic concepts that are covered include: reinforcement and stimulus control, punishment, compound schedules, response topography, and chaining. Other topics include complex human operants, verbal behavior, behavior modification, and contingency management.

5316. HISTORY AND SYSTEMS (3-0). Consideration of the origins of psychology in the development of Western thought. Early conceptualization of problems and their modification with changes in evidence emphasized.

5320. BEHAVIORAL PHARMACOLOGY (3-0). Survey of the basis of behavioral pharmacology including mechanisms and theories of drug actions, techniques and strategies of pharmacological research, common psychoactive drugs, and the uses of drugs in clinical practice.

5321. PERSONALITY PSYCHOLOGY (3-0). A survey of contemporary topics in personality psychology, including personality assessment, strategies for studying personality, temporal stability and cross-situational consistency in behavior, and personality influence on social behavior.

5322. SOCIAL PSYCHOLOGY (3-0). A survey of contemporary topics in social psychology, including interpersonal attraction, altruism and aggression, attribution and social cognition, social influence, group dynamics, and social motivation.

5323. GROUP PROCESSES (3-0). Survey of the major topics in group dynamics. Among the issues covered will be performance, motivation, goal setting, decision making, creativity, social influence, memory, leadership, teamwork, and collective behavior.

5325. THEORIES OF MOTIVATION (3-0). Surveys the current literature and theory on emotion and the neural and physiological basis for motivation. Material to be covered will include both biological drives, such as hunger and thirst, and interpretations of drives less immediately related to the underlying biological processes.

5331. PERCEPTUAL PROCESSES (3-0). Survey of methods and findings dealing with perception; emphasis will be upon behavioral rather than physiological considerations; particular topics include signal detection theory, form and pattern recognition, and attentional mechanisms.

PSYCHOLOGY

5333. PHYSIOLOGICAL PSYCHOLOGY (3-0). A survey of biological and physical processes underlying behavior. Emphasis on neural, hormonal, and genetic determinants of behavior. Topics include regulatory behaviors, reward and nociceptive systems, differentiation and sociosexual behaviors, limbic and cortical functions.

5335. ANIMAL BEHAVIOR (3-0). Phylogenetic approach to some basic problems in behavior, with special emphasis on unlearned behavior. Also offered as BIOL 5335; credit will be granted for only one of these courses.

5341. DECISION MAKING (3-0). Study of variables that influence judgments and choices.

5345. HUMAN LEARNING AND MEMORY (3-0). Survey of current approaches to the study of human learning and memory.

5346. SOCIAL BEHAVIOR OF ANIMALS (3-0). Survey of research and theory related to nonhuman social behavior.

5347. ENVIRONMENTAL PSYCHOLOGY (3-0). Survey of the current literature on the impact of various features of the physical and social environment on human behavior. Designed to be of interest to graduate students in architecture, urban studies, engineering, geology, sociology, as well as those in psychology.

5151, 5251, 5351. READINGS IN PSYCHOLOGY. Independent readings under the supervision of an individual faculty member. Students wishing to conduct research should sign up for PSYC 5191, 5291, or 5391. May be repeated for credit with consent of the Graduate Advisor. Graded P/F/R. Prerequisite: consent of the instructor.

5353. PSYCHOLOGY EDUCATION I (3-0). Survey of the content of contemporary psychology.

5354. PSYCHOLOGY EDUCATION II (3-0). Survey of the methods of contemporary psychology.

5355. MULTIVARIATE ANALYSIS (3-0). Application of general linear model to special cases such as factor analysis, multiple regression, and discriminant analysis. PSYC 5444 recommended. \$15 computer fee.

5389. CONTEMPORARY PROBLEMS IN PSYCHOLOGY (3-0). Topics vary; may be repeated for credit with consent of Graduate Advisor.

5191, 5291, 5391. RESEARCH IN PSYCHOLOGY. Independent research under the supervision of an individual faculty member; may be repeated for credit with consent of Graduate Advisor. Graded P/F/R. Prerequisite: consent of instructor. \$15 computer fee.

5405. ADVANCED STATISTICS I (3-2). Review of essential mathematical ideas and techniques, a survey of the basic concepts of probability theory, mathematical expectation, special distributions; parametric estimation theory.

5406. ADVANCED STATISTICS II (3-2). Statistical hypothesis testing, Bayesian inference, decision theory, linear regression and correlation; analysis of variance; distribution-free techniques. \$15 computer fee.

5407. EXPERIMENTAL DESIGN (3-2). Statistical aspects of complex experimental designs used in psychological research. Prerequisite: PSYC 5406. \$15 computer fee.

5444. PSYCHOMETRIC THEORY (3-3). Introduction to test construction. Topics include reliability theory, test validation, and item analysis. \$15 computer fee.

5600. ADVANCED RESEARCH. Supervised research. May be repeated for credit. Graded P/F/R. Prerequisite: consent of instructor.

5398, 5698. THESIS. 5398 graded R/F only; 5698 graded P/F/R. Prerequisites: 12 hours of advanced psychology and an approved thesis proposal. \$15 lab fee.

6300. SEMINAR IN PSYCHOLOGY (3-0). Offered each semester. Topics vary. May be repeated for credit. Prerequisite: consent of instructor.

6399, 6699, 6999. DISSERTATION. 6399 and 6699 graded R/F only; 6999 graded P/F/R. Prerequisite: approved dissertation proposal. For students in the PhD program in Mathematical Sciences, see Mathematical Sciences entry. \$15 lab fee.

Program in RADIOLOGICAL PHYSICS

See Interdepartmental and Intercampus Programs.

School of SOCIAL WORK

Areas of Study
Social Work

Degrees
M.S.S.W., Ph.D.

Master's Degree Plans: Thesis and Non-Thesis

<i>Dean:</i> Dorcas D. Bowles	211 Social Work	273-3181
<i>M.S.S.W. Graduate Advisor:</i> Ted Watkins	211 Social Work	273-3181
<i>Ph.D. Graduate Advisor and Director:</i> Doreen Elliott	211 Social Work	273-3181

Graduate Faculty:

Professors Bowles, Callicutt, Dangel, Duehn, Elliott, Granvold, Hunter, Lecca,
Mayadas, Mindel, Schoech, Sundel, Watts

Associate Professors Barrett, Berry, Birmingham, Jordan, King, Shannon, Watkins

Assistant Professors Cobb, Farmer, Hoefler, Martin, Molitor, Quinn, Ramsdell,
Simon, Souflee, Stocks, Yu

Specialists Beaty, Benavides

ACCREDITATION

The master's program in social work is accredited by the Council on Social Work Education. The Council does not accredit doctoral programs.

MASTER OF SCIENCE IN SOCIAL WORK

OBJECTIVES

The Master of Science in Social Work degree program's principal objective is to prepare students for advanced social work practice. The program leading to the MSSW degree focuses on developing professional leaders in the areas of direct social work practice and administrative and community practice. The program of instruction includes an intensive academic component integrated with a field work component, allowing the student to learn and apply theory concurrently.

APPLICATION AND ADMISSION REQUIREMENTS

Students are admitted for the Fall Semester. Completed applications must be received no later than March 15. Advanced Standing students are also admitted for Summer and Fall Semesters. Please note that the School of Social Work's deadline for application is different from the published deadlines of the Graduate School.

Admission to the School requires: (1) a bachelor's degree with a liberal arts perspective including instruction in the behavioral and biological sciences (including human biology) from an accredited college or university; (2) a grade point average of 3.0 or above on the last 60 semester hours of undergraduate study; or (3) if less than a 3.0 grade point average on the last 60 semester hours of undergraduate study, a Graduate Record Examination score which evidences graduate study aptitude; and (4) personal qualifica-

SOCIAL WORK

tions considered essential to the successful practice of social work including leadership ability, personal maturity, and motivation for a human service profession. A personal interview may be required.

Applicants to the School whose native language is not English must take, in addition to the Test of English as a Foreign Language, the Test of Spoken English.

Neither probationary nor provisional admission will be granted to an applicant with less than a 3.0 GPA on the last 60 semester hours of undergraduate study when the required GRE score is lacking.

DEGREE REQUIREMENTS

The program leading to the degree of Master of Science in Social Work covers a minimum of four semesters for full-time students and requires the completion of 64 semester hours of graduate work including class and field instruction, as well as thesis or completion of the integrative seminar for non-thesis students.

ADVANCED STANDING

An applicant who has graduated from an accredited undergraduate program in social work may request admission to the graduate program with advanced standing. All regular admission requirements must be met and the bachelor's degree in social work must have been conferred no more than six years prior to the date of enrollment.

Advanced standing students may receive credit hour waivers for some undergraduate social work courses which are considered equivalent to the first and second semester courses, provided the students' grades in those courses are B or better. Policies do not specify a minimum nor maximum number of hours waived. Courses waived are determined by the Graduate Advisor's assessment of individual transcripts.

DUAL DEGREE PROGRAM

Students in social work may participate in one of four dual degree programs whereby they can earn a Master of Science in Social Work and 1) a Master of City and Regional Planning, 2) a Master of Public Administration, 3) a Master of Arts in Urban Affairs, or 4) a Master of Arts in Criminal Justice. By participating in a dual degree program, students can apply a number of semester hours jointly to meet the requirements of both degrees, thus reducing the total number of hours which would be required to earn both degrees separately. The number of hours which may be jointly applied ranges from nine to 18 hours, subject to the approval of Graduate Advisors from both programs.

To participate in the dual degree program, students must make separate application to each program and must submit a separate Program of Work for each degree. Those interested in a dual degree program should consult the appropriate Graduate Advisor(s) for further information on course requirements. See also the statement on Dual Degree Programs in the general information section of this catalog.

CONTINUATION

In addition to the requirements of the Graduate School listed elsewhere, each graduate student in the social work program must (1) maintain at least a B (3.0) overall GPA in all coursework; (2) demonstrate suitability for professional social work practice; and, (3) demonstrate knowledge of and adherence to the Code of Ethics of the National Association of Social Workers and the Code of Ethics as currently propounded by the Texas Council for Social Work Certification.

At such time as questions are raised by Social Work faculty or field instructors regarding any of the above, the student will be notified and will be provided the opportunity to respond to the Academic and Professional Standards Committee. The committee will review the student's performance and make a recommendation concerning the student's eligibility to continue in the program. Appeal of a decision or continuation may be made to the Dean of the School of Social Work.

PART-TIME STUDENTS

Admission and degree requirements for part-time students are the same as those for full-time students. Likewise, part-time students must maintain the performance level required of full-time students.

The Council on Social Work Education's accreditation standards require that part-time students enroll for a minimum of two courses each semester and take no longer than four years to complete the M.S.S.W. program.

DOCTOR OF PHILOSOPHY IN SOCIAL WORK

OBJECTIVES

The program leading to the Doctor of Philosophy in Social Work is designed primarily for those preparing for advanced leadership positions in teaching, research, administration and planning, policy analysis, and clinical practice in the social work field. More specifically, the objectives of the program are for students to acquire (1) a broad analytic understanding of major policy and practice trends and issues in the field of social work; (2) substantive knowledge of some field or area of practice (e.g., health, mental health, public social services, aging, settings serving families and children and minority groups) with emphasis on issues and questions in that field which require scientific or scholarly attention; and (3) a competence to conduct independent, empirical research that extends the knowledge base of clinical practice with individuals, families, and small groups and/or administration and planning practice in some area of social work. Graduates of the program are expected to make a significant contribution to the field and to the profession through their own continued research, teaching, writing, and practice. The areas of specialization are administration, planning and policy, and clinical practice.

ADMISSION REQUIREMENTS

To be admitted to the Doctor of Philosophy in Social Work program, an applicant must satisfy the general admission requirements of the Graduate School and his or her academic record must show preparation for advanced study in social work. The students accepted for admission are those whose academic achievements, previous experience, and aptitude for research and scholarship indicate the potential for achieving the objectives of the program. In addition, admission to the program requires: (1) a grade point average of 3.0 or above on the last 60 semester hours of undergraduate study, (2) a grade point average of 3.4 on all graduate level work, (3) a Graduate Record Examination score which evidences an ability to do satisfactory graduate work, (4) leadership ability, and (5) three satisfactory letters of recommendation. Applicants should have a master's degree in social work, or in a related field, and a background in social and behavioral science and research methods is desirable.

An application for admission, transcripts of previous academic work and Graduate Record Examination scores must be submitted to the Graduate School of the University. An additional separate application and supporting materials must be sent to the Graduate Advisor, PhD in Social Work Program.

DEGREE REQUIREMENTS

The program leading to the degree Doctor of Philosophy in Social Work covers six semesters (three years) of full-time study and requires the completion of 54 semester hours of graduate work including class, field instruction, and a dissertation. The student and his or her faculty supervisory committee together develop a plan of study geared to the student's interests. Included in this plan are a set of required and elective courses in which students pursue their specialized interests. Additionally, all students in the clinical practice specialization and some students in the administration, planning and policy specialization are required to spend time in an internship that will be monitored through the supervising committee.

Comprehensive Examinations are taken in two parts: part one after 15 hours of Required Core Courses at the end of the first year, and part two after 42 hours of coursework are completed. Successful completion of the comprehensive examinations in both core and specialty areas of study advances the student to candidacy at which time he or she devotes time to the completion of the dissertation. The last step before the degree is awarded is the final examination, which is focused on the defense of the dissertation.

The grade of R (research in progress) is a permanent grade. An incomplete (the grade of X) cannot be given in a course which is graded R. To receive credit for an R-graded course the student must continue to enroll in the course until a passing grade is received. Three-hour thesis and three- and six-hour dissertation courses are graded R/F only. The grade of P (required for graduation) can be received in six- or nine-hour thesis courses and nine-hour dissertation courses only. In the course listings below, R-graded courses are designated either "Graded P/F/R" or "Graded R." (See also the section entitled "R" GRADE in this catalog.)

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SOCIAL WORK (SOCW)

Curriculum: Master of Science in Social Work

The curriculum is organized around five content areas and field instruction. Required and elective courses are offered in each sequence area. Students must complete all foundation (first year) required courses before taking advanced (second year) courses. First year courses have 5000 numbers; second year courses have 6000 numbers. Master's level students are also allowed to take doctoral level courses with permission of the instructor. The five areas and the courses offered under each are listed below:

HUMAN BEHAVIOR AND THE SOCIAL ENVIRONMENT

Students are required to take SOCW 5301 (Human Behavior and the Social Environment) and SOCW 5317 (Race, Ethnicity, and Women). Additionally, students choose one other course from the Human Behavior and the Social Environment content area.

5301. HUMAN BEHAVIOR AND THE SOCIAL ENVIRONMENT I (3-0). Exploration of behavioral and social science knowledge of human behavior and development through the life course. Examines major systems in society: individual, group, family, and community; and the diversity of ethnicity, race, class, sexual orientation, and culture.

5317. RACE, ETHNICITY, AND WOMEN (3-0) Introduction to theoretical, practical, and policy issues related to race, ethnicity, and women. Historical, political, and socioeconomic forces are examined that maintain racist and sexist values, attitudes, and behaviors in society and all levels of organizational behavior.

6307. PRACTICE OF BEHAVIOR THERAPY (3-0) Introduction to the experimental bases and clinical applications of socio-behavioral approaches relevant to social work practice; attention given to different change methods and application made directly to the wide range of behaviors of concern to the social worker. (This course may substitute for a Direct Practice Course.)

6308. BRAIN AND BEHAVIOR (3-0). This course explores recent knowledge suggesting a strong biological basis to simple and complex patterns of human behavior. The neurobiology of physical health and behavioral disorders are surveyed, and a physiological/ecological model of social work practice presented.

6310. SEMINAR IN WOMEN, SOCIALIZATION AND WORK (3-0). Examines women's development within psychological and sociological contexts; applies theories to understanding roles women take within families and the workplace.

6320. PERSONAL RELATIONSHIPS (3-0). Explores theoretical and empirical material on linkup initiation, maintenance, and termination. Identifies areas for intervention.

6323. INDIVIDUAL AND COMMUNITY PERSPECTIVES IN MENTAL HEALTH (3-0). Examination and analysis of theories of mental health and disorders, perspectives on the etiology and epidemiology of mental disorder and the institutional response to problems in mental health (e.g. "asylums", community mental health programs).

6330. CHILD DEVELOPMENT (3-0). Reviews and analyzes a number of theoretical and empirical approaches to understanding the development of the child through adolescence; implications for practice and policy.

6331. THEORIES OF THE FAMILY AND SOCIALIZATION PRACTICES (3-0). Reviews a variety of theoretical approaches useful in understanding the family. Implications for practice at the policy, community, and interpersonal levels are discussed.

6332. ADULT DEVELOPMENT (3-0). Explores selected issues and themes associated with early and middle adulthood. Issues pertinent to practice, such as the development change process, are also examined.

6333. AGING IN AMERICAN SOCIETY (3-0). Explores the elderly population in American society. Includes discussion of social gerontology, a description of the aged in the United States and across cultures. Changes among the elderly such as health, finances and social roles are studied.

6337. PSYCHODYNAMICS (3-0). Major aspects of psychodynamics theory derived from Freud and the recent ego psychologists are used in an analysis of the life cycle. Implications for social work practice are drawn, particularly application of the theory for practice with special groups: minorities, women, and lower socioeconomic groups.

6361. STRESS, CRISIS, AND COPING (3-0). The impact of specific crises on individuals and families are examined. Typical crises include life-threatening illness, trauma, physical and mental disability, and death. Assessment and evaluation of an individual's coping ability and appropriate strategies for social work interventions are studied. (May also substitute for Direct Practice course.)

SOCIAL WELFARE POLICY AND SERVICES

Students are required to take SOCW 5303 (Foundations of Social Welfare Policy and Services) and one other course from this content area.

5303. FOUNDATIONS OF SOCIAL WELFARE POLICY AND SERVICES (3-0). Examines how social goals are met by social welfare institutions. Conceptual schemes are developed for analyzing the structure of social welfare institutions and evaluating social welfare sub-systems. The social work profession also is examined in the context of the evolution and function of the contemporary American social welfare system. Required of all first-year students.

6304. ISSUES IN CHILD WELFARE (3-0). Examination of current policies, programs, and practices. Attention given to new perspectives on the delivery system and staffing in child welfare. Through analysis and research, students are provided knowledge for more effective practice in the field of child welfare.

6319. ISSUES IN COMMUNITY MENTAL HEALTH (3-0). Examines significant policy issues in mental health through the application of an analytic model. Issues include problem definition, client identification and analysis, staffing, organization and delivery of services, and economic issues. Substantive knowledge developed through discussion and analysis of these interrelated issues.

6321. ISSUES IN ALCOHOL ABUSE AND ALCOHOLISM (3-0). Examines significant policy issues in area of alcohol abuse and alcoholism through the application of an analytic model. Issues include problem definition, client identification and analysis, humanpower, organization and delivery of services, and economic issues. Substantive knowledge developed through discussion and analysis of these interrelated issues.

6334. WOMEN AND FAMILY POLICY (3-0). Policies affecting women and the family; interaction of women with other social institutions (family, economy, policy); the unique impact of policies upon families and women of color; cross cultural comparisons and political strategies; the role of the social work profession in this policy field.

6338. SOCIAL SERVICES AND SOCIAL WELFARE POLICY (3-0). Broad acquaintance with, and analysis of, the social services and their role within social welfare policy. A variety of social services examined as well as modes and methods of providing these services, degree of effectiveness of various services in adequately serving clients, service gaps or duplication, and related areas.

6345. HEALTH POLICY (3-0). Historical, current, and projected national and local health policies and roles of providers and consumers of health care examined; service demands, economic, access, and regulatory issues analyzed; relationships between governmental, voluntary, and commercial sectors studied; analytic frameworks for the understanding and development of policies developed.

6349. SOCIAL WELFARE POLICY AND THE AGED (3-0). Social welfare policies and programs are examined in terms of the overall impact on the aged and society. Needs and gaps in services to the aged are evaluated, especially concerning minority and low-income aged. Current issues in aging policy are examined.

6354. DEVIANCE AND SOCIAL POLICY (3-0). Examines past and present policies relating to deviant groups such as the physically and mentally handicapped, drug users, homosexuals, and juvenile delinquents. Theoretical and ideological bases of social reaction to these "problematic" individuals considered. Attention given to the influence of class, ethnicity, and gender on society's tolerance of deviant behavior.

DIRECT PRACTICE

Students are required to take SOCW 5304 (Direct Social Work Practice I) and 5305 (Direct Social Work Practice II). Students who choose a direct practice concentration take two additional courses from those listed below.

5304. DIRECT SOCIAL WORK PRACTICE I (3-0). Introduces the basic skills and knowledge needed for direct social work practice including basic strategies and techniques involved with developing rapport, interviewing, assessing, and contracting with clients. History, ethics, and values of the social work profession are also emphasized. Required of all first-year students.

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5305. DIRECT SOCIAL WORK PRACTICE II (3-0). Further attention given to change theories, intervention strategies and therapeutic techniques employed at the individual, family, and group levels. Emphasis placed on developing criteria for selection among alternative approaches, intervention activities appropriate to the specific goal of intervention and the specific practice context. Prerequisite: SOCW 5304 or equivalent. Required of all first year students, and all advanced standing students.

6302. SOCIAL WORK PRACTICE IN INDUSTRIAL SETTINGS (3-0). Examines the social work and business bases implicit for providing social services to enhance the well-being and productivity of employees in the business/industrial setting.

6307. PRACTICE OF BEHAVIOR THERAPY (3-0). Introduction to the experimental bases and clinical applications of socio-behavioral approaches relevant to social work practice; attention given to different change methods and application made directly to the wide range of behaviors of concern to the social worker. (This course may substitute for a Human Behavior and the Social Environment course.)

6311. SEMINAR IN DIRECT METHODS IN MARITAL COUNSELING (3-0). Examination of various psychological, social and behavioral treatment approaches to the treatment of problems in marital adjustment. Emphasis placed on developing criteria for assessing the sources and patterns of imbalance and conflict, the selection and ordering of treatment strategies, and intervention techniques consistent with determined goals.

6312. GROUP DYNAMICS I AND SOCIAL WORK PRACTICE (3-0). Examines contemporary social-psychological concepts and small group research, with a view to testing their applicability to practice propositions and operational principles, in work with both task and personality satisfaction groups.

6313. GROUP METHODS IN COUNSELING II AND SOCIAL WORK PRACTICE (3-0). Critical investigation of the therapeutic processes which are directed toward behavior change in persons through the structured medium of group interaction, and planful management, by the therapist, of group processes which emerge through interactional patterns between group members. Prerequisite: SOCW 6312.

6316. RESIDENTIAL CARE AND TREATMENT OF CHILDREN (3-0). Presents major treatment models employed by residential treatment centers for children and adolescents. Issues faced by administrators including licensing, litigation, fund-raising, changing characteristics of youth in care, sexual abuse, and treatment alternatives are discussed.

6317. DIRECT PRACTICE IN HEALTH CARE (3-0). Explores central contribution of social work to comprehensive health care; social work interventions to assess and ameliorate the psychosocial effects of illness and disability are included along with emerging roles for social work in prevention and health maintenance.

6318. DIRECT PRACTICE WITH AGING (3-0). Course presents an overview of current issues in the care, treatment, and delivery of social services to the aging. Students learn practice procedures designed to equip them with the skills needed for effective social work practice and review major theories on aging.

6325. TREATMENT OF CHILD ABUSE. Reviews current empirical literature and treatment procedures for work with child abusers and abuse victims.

6343. TREATMENT OF FAMILY VIOLENCE AND ABUSE (3-0). Addresses two areas: Models for effective treatment of violence-prone families and creation of legal and social service systems for treatment. Students undertake field research and learn procedures for conducting their own anger abatement training programs.

6344. TREATMENT OF CHILDREN AND ADOLESCENTS (3-0). Overview of the literature which describes physical, psychological, and cultural characteristics unique to childhood and adolescence. Attention then turned to treatment principles, and the specification of procedures for the amelioration of problems common to children and adolescents.

6350. SEMINAR IN COGNITIVE-BEHAVIORAL INTERVENTION STRATEGIES (3-0). Explores various covert conditioning, cognitive restructuring, and self-instruction therapies. Recent theoretical formulations and relevant research will be investigated as they pertain to the efficacy of cognitive intervention strategies with various clinical problems.

6353. SEMINAR IN FAMILY THERAPY (3-0). Comparison of various approaches to working with the family as a total system; enhancement of cognitive understanding of similarities and differences in theory and goals of family treatment in many fields of practice; integration of strategies and techniques of each method into an individual style of therapy.

6358. SOCIAL WORK SUPERVISION (3-0). Introduction to roles, functions, and contextual dimensions of social work supervision. Administrative and clinical perspectives are examined within contextual framework of social work supervisor as manager, mentor, mediator, and leader in the human service organization.

6360. CHILD ABUSE AND NEGLECT (3-0). Examines knowledge/technique in child physical/emotional/sexual abuse, physical/emotional neglect, and exploitation interventions. Includes interviewing, identification, legal issues, assessment/evaluation, case management, intervention, follow-up.

6361. STRESS, CRISIS, AND COPING (3-0). The impact of specific crises on individuals and families will be examined. Typical crises will include life-threatening illness, trauma, physical and mental disability, and death. Assessment and evaluation of an individual's coping ability and appropriate strategies for social work interventions will be studied. (May also be substituted for a Human Behavior and the Social Environment course.)

6362. STRESS MANAGEMENT (3-0). Stress management is a specialized area of clinical social work practice found in health, mental health, and occupational settings. Course content includes theory, assessment, and intervention methods.

6368. SEXUAL ABUSE OF CHILDREN: IDENTIFICATION, ASSESSMENT, CASE MANAGEMENT AND TREATMENT (3-0). Seminar focused on examination of current knowledge and intervention strategies related to child sexual abuse. Topics addressed include techniques of obtaining information, sexual assault assessment procedures, validation, case management, application of change methods, case monitoring and relapse prevention.

6369. INTRODUCTION TO HUMAN SEXUALITY AND SOCIAL WORK PRACTICE (3-0). Overview of human sexuality as it relates to social work practice. Human sexuality considered from a bio-psychosocial perspective. Emphasis on viewing human sexuality as an interactive process of the total personality. Attention given to various psychological, social and behavioral educational/treatment approaches.

6370. TREATING PARENT-CHILD RELATIONSHIPS (3-0). Treatment strategies and evaluation methods and research findings relevant to the treatment of parent-child relationships; review of existing parent training literature and commercially available parenting programs.

6380. TREATMENT OF ADDICTIVE BEHAVIORS (3-0). Surveys major treatment alternatives, showing addictive behavior patterns such as alcohol/drug abuse or eating disorders. Student conducts field research of 12-step programs, practices interventions, and studies inpatient and outpatient treatment methods with emphasis on relapse prevention.

ADMINISTRATIVE AND COMMUNITY PRACTICE

Students are required to take SOCW 5306 (Introduction to Administrative and Community Practice) and 5307 (Administrative and Community Practice Skills). Students who choose a concentration in administrative practice are required to take 6314 (Advanced Administrative Practice) and one additional course from those listed below. Students who choose a concentration in community practice are required to take 6315 (Advanced Community Practice) and one additional course from those listed below. Students who choose a concentration in both administrative and community practice are required to take both 6314 and 6315.

5306. INTRODUCTION TO ADMINISTRATIVE AND COMMUNITY PRACTICE (3-0). Survey of human services administration and community practice with emphasis on theory and methods. Also focuses on the development of analytical approaches to understanding community and organizational phenomena. Required of all students.

5307. ADMINISTRATIVE AND COMMUNITY PRACTICE SKILLS (3-0). Builds skills to apply the theories and methods of human services administration and community practice gained in SOCW 5306. Emphasizes planning, program development, and the development of a personal framework for future practice. Prerequisite: SOCW 5306. Required of all students.

5318. SEMINAR IN ADMINISTRATION AND PLANNING FOR ADVANCED STANDING STUDENTS (3-0). Basic and intermediary theories and methodologies, as well as philosophy, purpose, and skills of social work administration and planning. Substitutes for 5306 and 5307.

6314. ADVANCED ADMINISTRATIVE PRACTICE (3-0). Focuses on selected topics, issues, and skills for effective social work administration. Content includes leadership, worker motivation, resource

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development, interagency relations and managing conflict and diversity in a climate of scarce resources. Prerequisites: SOCW 5306 and 5307.

6315. ADVANCED COMMUNITY PRACTICE (3-0). Focuses on topics, issues, and skills for mobilizing neighborhoods, communities, and client groups to solve collective human problems. Content includes the politics of empowerment, mobilizing coalitions, locating resources, and mediating conflict. Prerequisites: SOCW 5306 and 5307.

6326. ADVANCED ADMINISTRATION AND PLANNING (3-0). Develops skills in applying basic management and planning techniques to human service agencies, in keeping with social work values and principles. Administration and planning methods, interfaced with theoretical orientation to human service organizations, emphasizes analysis within system framework.

6339. PROGRAM EVALUATION (3-0). Presumes basic research competence on part of student. Focus on socio-political aspects of program evaluation as a specialized use of scientific methods and community practice skills. Relationships between program evaluation and program planning or administration stressed. \$5 computer fee.

6355. ADVANCED USE OF COMPUTERS IN HUMAN SERVICES (3-0). Provides the knowledge and skills to develop computer-based solutions to individual, group, family, administrative, and community problems. Covers information systems, decision support systems, advisory systems, multimedia, and automated performance support. Students critique a variety of human service software. Prerequisite: SOCW 5319. \$15 computer fee.

6358. SOCIAL WORK SUPERVISION (3-0). Introduction to roles, functions, and contextual dimensions of social work supervision. Administrative and clinical perspectives are examined within the contextual framework of the social work supervisor as manager, mentor, mediator, and leader in human service organizations.

6363. BUDGETING AND FINANCIAL MANAGEMENT (3-0). Basic overview of financial management applied specifically to human service agencies; emphasizes on basic concepts and skill building in budgeting, grant writing, and fund raising; accounting principles, financial statements, and computerized financial information systems also covered.

6364. SOCIAL WORK IN HEALTH CARE SETTINGS (3-0). An introductory course for those students interested in medical social work practice; health settings examined from organizational, administrative, and clinical perspectives to provide an understanding of intra/interdisciplinary practice in the health care system.

RESEARCH AND EVALUATION

Students are required to take SOCW 5322 and 6324 (Research and Evaluation Methods in Social Work I and II). Thesis students are required to take 6393 (Thesis Research) and 6398 (Thesis). Non-Thesis students must take 6305 (Integrative Seminar) and one additional elective. Students must be enrolled in Thesis or Integrative Seminar during their final semester.

5319. TECHNOLOGY USE IN SOCIAL WORK PRACTICE (3-0). Introduces basic computer concepts, spreadsheets, word processing, assessment and intervention software, graphics packages and statistical packages and their applications in social work. Required of all students. Graded P/F. \$15 computer fee.

5322. RESEARCH AND EVALUATION METHODS IN SOCIAL WORK I (3-0). Introduction to the methods of scientific inquiry and their relevance to social work. Topics include problem formulation, single subject and group research design, elementary statistics such as chi squares, correlations, analyses of variance, and report writing. Required of all students. \$5 computer fee.

6324. RESEARCH AND EVALUATION METHODS IN SOCIAL WORK II (3-0). Advanced course in the application of research principles and techniques. Topics include regression and statistical control, analysis of variance, questionnaire construction, evaluation research, and computerized tabulation and analysis of data. Mini-projects require the student to apply these techniques in the context of social work practice. Prerequisite: SOCW 5322. Required of all students. \$5 computer fee.

6393. THESIS RESEARCH. Initial research in the student's area of concentration, leading to thesis. Graded P/F/R. Prerequisite for 6398. \$5 computer fee.

6395. APPLIED RESEARCH. Individual or small group research project in the student's major area of concentration with emphasis on applying research principles and procedures. A substantial research report is due at the conclusion of the course. May be taken as an elective only. Graded P/F/R. \$10 computer fee.

6398. THESIS. Requires an individual research project in the individual's area of concentration, with a minimum of six semester hours total needed for the project. Satisfactory completion requires approval of the instructor in charge, a supervising committee appointed by the Dean of the Graduate School. Defense in a final oral examination is required. Graded P/F/R. Prerequisite: permission of Graduate Advisor and the instructor in charge. \$10 computer fee.

GENERAL

6305. INTEGRATIVE SEMINAR (3-0). Focuses on issues and aspects of practice of broad concern to the profession of social work. Faculty members serve as consultants and resource persons to seminar members. Required of all non-thesis students in their final semester of coursework. Grade of B or better must be earned in this seminar. Graded R.

6329. SOCIAL WORK, LAW, AND THE FAMILY CODE (3-0). Overview of legal principles and procedures as they apply to social workers and their interaction with clients. Particular attention given to the broad area of family law. Areas of mental health law, children's rights, consumerism, malpractice, courtroom testimony, criminal law, estates, and community legal services covered. This course is an elective only; does not meet the requirements for a second year policy course.

TUTORIALS

6190, 6290, 6390. TUTORIAL. Arrangements may be made for a directed and supervised tutorial in a select area of special interest to the student. Prerequisite: permission of the Graduate Advisor. May be repeated for credit.

SPECIAL SEMINARS

6292, 6392. SELECTED TOPICS IN SOCIAL WELFARE. Topics vary from semester to semester depending on the needs and interest of the students. Prerequisite: permission of Graduate Advisor. May be repeated for credit.

FIELD INSTRUCTION

Field instruction is an essential component of professional education for social work practice. Its purpose is to provide adequate opportunity and support for the application of social work knowledge and skills gained by the student in the classroom and to acquaint students with the realities of practice in organizational settings.

Students are assigned to affiliated agencies where they are administratively responsible to an agency supervisor, the field instructor. A campus professor acts as liaison and consultant to the agency field instructor and to the student in regard to the educational experience, to insure that classroom and field curricula are related and integrated.

Students are assigned to two different agency- or campus-based placements for field instruction and complete a total of 13 credit hours and 900 clock hours. First year students must complete 400 clock hours of generalist practice in one agency during one semester. Students should have completed at least 15 credit hours before enrolling for the first field placement. Direct Practice II and Administration and Planning II must be taken either prior to or during the first field placement.

Second year students normally complete field instruction in two consecutive semesters at the same agency for a total of 500 clock hours in their method of concentration (250 clock hours each semester) and receive a total of 8 credit hours. Before enrolling for second year field instruction, a student must have completed all first year coursework and be taking a second year methods course with each semester of field instruction. Students may do second year field instruction in one semester (called a block placement) if approved by the Director of Field Instruction.

Students are permitted to do one of their field placements in an agency where they have been employed provided that the agency is affiliated with the School of Social Work for the provision of field instruction, that the agency has a qualified field instructor who is not the employment supervisor, and that the proposed educational experience is approved by the Director of Field Instruction. A proposal must be submitted to the Director of Field Instruction for review and approval.

Out of Dallas/Fort Worth Metroplex Field Placements

The School affiliates with social service agencies in the Dallas/Fort Worth Metroplex for provision of both first and second year field instruction. Occasionally other field placements are arranged outside the metroplex dependent upon the resources of the School and at the discretion of the Director of Field Instruction. Placements that are arranged outside of the metroplex for the sole benefit and convenience of

SOCIAL WORK

students will require that actual expenses for site visits and liaison visits be reimbursed by the student in accordance with the official travel reimbursement guidelines of the State of Texas.

Requirement for Liability Insurance

All social work students enrolling in field instruction courses will be assessed a fee in order to include them in the School's group professional liability insurance policy. Coverage is for \$250,000 limit each claim and \$500,000 limit aggregate. Students who wish to provide their own liability insurance will be required to show written evidence of coverage as a prerequisite to enrollment. The effective date of the policy must be on or before the first regular class period of the field instruction course for which the student is enrolling.

The first field placement is generic. The second field placement must be taken in the student's method of concentration. The number of field placements is not unlimited. Courses may sometimes be repeated for credit. Graded P/F/R only.

5151, 5251, 5351, 5551. APPLIED SOCIAL WORK PRACTICE I. Graded P/F/R.

6151, 6251, 6351, 6451, 6551, 6651, 6751, 6851, 6951. APPLIED SOCIAL WORK PRACTICE II. Prerequisite: Applied Social Work Practice I. Graded P/F/R.

6152, 6252, 6352, 6452, 6552, 6652, 6752, 6852, 6952. APPLIED SOCIAL WORK PRACTICE III. Prerequisite: Applied Social Work Practice II. Graded P/F/R.

DOCTORAL PROGRAM

Doctoral students must demonstrate knowledge of and adherence to the Code of Ethics of the National Association of Social Workers and the Code of Ethics as currently compounded by the Texas Council for Social Work Certification.

Core Curriculum: Doctoral Program

The PhD core curriculum provides an overview of relevant social science theories and emphasizes research methods and statistical procedures necessary for conducting research in the student's area of specialization. Courses that constitute the core curriculum are described below.

6322. SEMINAR IN SOCIAL SYSTEMS (3-0). Concepts and models of general and social systems theory; examination of the origins, elements, and application of the systems approach to problem solving and the planning of change.

6340. ADVANCED RESEARCH METHODS IN HUMAN SERVICES (3-0). Acquaints students at an advanced level with research methodology as it applies to the human services. Includes techniques and tools of research, problem conceptualization, measurement, research and instrument design and data collection methods. Prerequisites: SOCW 5322 and 6324 or equivalent within the last five years.

6341. ADVANCED STATISTICAL METHODS IN HUMAN SERVICES (3-0). Advanced statistical applications in the human services. Emphasis on multivariate statistical approaches including multiple regression analysis, logistic regression, structural model analysis using LISREL or EQS. Prerequisites: SOCW 5322 and 6324 or equivalent within the last five years.

6373. SCIENCE AND ADVANCED SOCIAL WORK PRACTICE (3-0). Involves the study of the philosophy of science and an examination of the contributions and limitations of science in the shaping of social work practice; involves as well the identifications and considerations of other factors which have a systemic effect on the epistemology and technology of the profession.

There is an additional core course for Administration majors: SOCW 6336.

6336. SEMINAR IN LARGE SCALE ORGANIZATIONAL AND EVALUATION RESEARCH (3-0). Examination of the problems and issues in evaluating the effectiveness of service outcome in large social service delivery systems; variety of research designs and exemplars of evaluative research examined; attention devoted to accreditation and accountability of human service practice. Prerequisites: SOCW 5322 and 6324 or equivalents and permission of instructor.

There are additional core courses for Clinical majors: SOCW 6365 and SOCW 6374.

6365. EVALUATION METHODS FOR CLINICAL PRACTICE AND SUPERVISION (3-0). Thorough strategic and tactical exposition of behavioral research and evaluation methods appropriate for clinical practice and methodologies useful for clinical evaluation, observational data collection methods, and relative merits of various statistical and non-statistical methods for interpreting findings; emphasizes on-going use of evaluation procedures in practice and supervision.

Required Courses for Social Work Administration Track

6309. PROSEMINAR IN ADMINISTRATION, MANAGEMENT, AND POLICY (3-0). Provides an orientation to and overview of human services administration, management, and policy. Embracing a philosophical and historical perspective, it also focuses on some theoretical and conceptual approaches to human services administration. Selected research in the field is reviewed. The goal of the seminar is to provide a foundation for further study and research in this area. Required for all doctoral students concentrating in administration as well as all doctoral students who do not possess a master's degree in social work.

6328. SOCIAL POLICY RESEARCH AND ANALYSIS (3-0). Seminar on methods of analyzing social welfare policies and the programs through which they are implemented and policy objectives achieved. Inquiries and investigations regarding control or management of policy considered, as well as more formal research designed to add to professional knowledge concerning intervention in macro-systems. Prerequisites: SOCW 5322 and 6324 or equivalents and permission of the instructor. Required of all doctoral students concentrating in Human Services Administration.

6335. ADVANCED SEMINAR IN THE THEORY AND PRACTICE OF SOCIAL WORK ADMINISTRATION (3-0). Examines theories and concepts of administration; critically explores the utility of these theories to social work administrative practice; provides a forum for students to analyze the fit of administrative theories to the ethical and philosophical bases of social work.

6357. PRINCIPLES OF ADMINISTRATION: A DOCTORAL SEMINAR (3-0). Focuses on applications of administrative principles; attention is directed at examining effective administrative practices; explores the students' development of professional ethics and their application to administrative practice.

6359. THEORIES OF PLANNING (3-0). Examination of planning theory in physical, social, economic, and policy aspects; differences in theoretical perspectives, methods, and processes; examination and evaluation in each aspect of the state-of-the-art and future directions.

Ph.D. Elective Courses

6374. COMPARATIVE SEMINAR ON TREATMENT MODALITIES (3-0). In-depth review of the major empirically based treatment modalities; attention given to efficacy with various populations and problems as well as to theoretical underpinnings, analysis of empirical validation and relationship to alternate theories of human behavior.

6375. CLINICAL ASSESSMENT (3-0). A critical examination of selected assessment approaches in clinical social work. Included are social treatment models, psychometric methods, DSM III-R assessment and review of selected family models.

6376. PSYCHOBIOLOGY OF EMOTIONS AND COGNITIONS (3-0). Recent findings about psychobiology of emotions and thought processes are related to procedures used in cognitive and emotive types of therapy. Students will incorporate scientific advances in the understanding of human nature into clinical social work practice. Prerequisite: permission of instructor.

6377. INTERPERSONAL MANAGEMENT IN HELPING PROFESSIONS (3-0). Focuses on the examination and analysis of research and theories in the area of interpersonal communication. The rationale for the course is based on identifying key interactional factors in dyadic and group situations which enhance worker effectiveness in the interest of client outcomes.

6378. CLINICAL AND RESEARCH APPLICATIONS OF SELF-REGULATION METHODS (3-0). Focuses on biofeedback as a method of intervention. Content includes theoretical perspectives from human systems, and behavior change as well as evaluation methods, psychophysiology, and instrumentation. A wide range of clinical applications are examined.

6379. SEMINAR IN ADVANCED MARITAL/DIVORCE INTERVENTION (3-0). Addresses cognitive and behavioral assessment and treatment methodologies as applied to the maritally distressed (intact and separated) and divorced.

6382. SELF-REGULATION METHODS: RELAXATION, BIOFEEDBACK, AND HYPNOSIS (3-0). Examines the clinical application of relaxation, biofeedback, and hypnosis for self-regulation of both internal and external behavior for personal growth and clinical treatment. Students will learn how to use specific instruments and techniques of self-regulation. \$5 lab fee.

6383. COMPUTER-SUPPORTED PRACTICE (3-0). Examines the data/information/knowledge basis of social work and the computer-based tools and techniques to support micro and macro practice. Tools

SOCIOLOGY AND ANTHROPOLOGY

examined include databases, spreadsheets, multimedia, expert systems, performance support systems, neural networks, and electronic networks. Prerequisite: SOCW 5319, or equivalent, or instructor's permission. \$15 computer fee.

6396. SOCIAL WORK EDUCATION: PRINCIPLES AND SKILLS (3-0). Considers a range of ideas in educational thought relevant to the formulation of an analytical appraisal of social work education and training. Educational methods and skills relevant to social work are addressed and practice opportunities offered.

6397. ADVANCED FAMILY THERAPY (3-0). Advanced theory and practice methods are presented for family therapy. Students also practice and evaluate advanced assessment and intervention techniques.

6399, 6699, 6999. DISSERTATION. Preparation and submission of a doctoral dissertation in an area in social work. 6399 and 6699 graded R/F only; 6999 graded P/F/R. Prerequisite: admission to candidacy for the PhD in social work. \$10 computer fee.

RESEARCH PRACTICUM

6394, 6694, 6994. APPLIED RESEARCH PRACTICUM. Students engage in an active program of applied research under direct supervision of a faculty member. \$10 computer fee.

Department of SOCIOLOGY AND ANTHROPOLOGY

Areas of Study

Sociology

Anthropology

Humanities (See Interdepartmental and
Intercampus Programs.)

Degrees

M.A.

M.A.

M.A., Ph.D.

Master's Degree Plans: Thesis and Thesis Substitute (Anthropology only)

Chair: William A. Stacey

430 University Hall

273-2661

Graduate Advisors:

Sociology: Raymond A. Eve

442 University Hall

273-2661

Anthropology: Jeffrey R. Hansen

417 University Hall

273-3800

Graduate Faculty:

Professor Bastien

Associate Professors Almore, Anderson, Eve, Hanson, Harrold, Petruso, Rouse,
Stacey, Weed, Young

Assistant Professors Dunn, Smith, Van Rompaey, Waller

OBJECTIVES, M.A. IN SOCIOLOGY

Sociology is the scientific study of human groups and human social behavior that helps us to gain better understanding of the society in which we live. The department is committed to providing students with a grounding in the technologies and techniques of contemporary social data analysis. In addition, the department offers a variety of courses to prepare students for several career fields.

The Master's degree program in sociology is designed with two objectives in mind:

1. To prepare students for a wide range of professional careers as sociologists in business and industry, government, and social service agencies;

2. To prepare students for continued graduate education at the Ph.D. level leading to teaching and research positions in colleges and universities.

ADMISSION, SOCIOLOGY

The admission requirements of the graduate program in sociology conform with the general Graduate School requirements. A bachelor's degree in sociology is not required for admission; however, those students who lack adequate undergraduate preparation will be required to make up such deficiencies before work can be credited toward the graduate degree. Detailed information about program requirements may be obtained from the Graduate Advisor. General university requirements of the Graduate School can be found in the Graduate School section of this catalog.

DEGREE REQUIREMENTS, SOCIOLOGY

The degree plan requires satisfactory completion of a minimum of 24 hours of coursework including core courses in theory, methods, and statistics — plus the six-hour thesis.

OBJECTIVES, M.A. IN ANTHROPOLOGY

The Anthropology M.A. program offers students a well-integrated curriculum in cultural anthropology, archaeology, and biological anthropology. It is intended both (1) for students who wish to prepare for admission to an anthropology Ph.D. program at another university, and (2) for those who wish to learn anthropological skills and perspectives to enhance their careers (in education, the helping professions, or other fields) in an increasingly diverse society.

Students may choose between a thesis option (30 credit hours), recommended for those planning to go on to a Ph.D. program, and a non-thesis option (36 credit hours, ordinarily including a six-hour practicum).

ADMISSION AND DEGREE REQUIREMENTS, ANTHROPOLOGY

The admission requirements of the graduate program in anthropology conform with the general Graduate School requirements. A bachelor's degree in anthropology is not a prerequisite for admission. Interested students should contact the Graduate Advisor for details.

The grade of R (research in progress) is a permanent grade. An incomplete (the grade of X) cannot be given in a course which is graded R. To receive credit for an R-graded course the student must continue to enroll in the course until a passing grade is received. Three-hour thesis and three- and six-hour dissertation courses are graded R/F only. The grade of P (required for graduation) can be received in six- or nine-hour thesis courses and nine-hour dissertation courses only. In the course listings below, R-graded courses are designated either "Graded P/F/R" or "Graded R." (See also the section entitled "R" GRADE in this catalog.)

SOCIOLOGY (SOCI)

CORE COURSES

5301. SOCIOLOGICAL THEORY (3-0). A comprehensive review, analysis, and evaluation of the dominant conceptual perspectives, and their proponents, in sociological theory.

5303. RESEARCH DESIGN (2-2). Seminar on the design, plan, structure, and strategies currently used in sociological research. Examines the interrelations of theory, methods, and statistics. Includes the limitations of theory, problems of measurement, sampling techniques, scaling techniques, and the presentation of statistical data.

5304. SOCIAL STATISTICS (2-2). This course covers a variety of statistical methods commonly used by sociologists in data analysis. Methods will include analysis of variance and covariance, multivariate regression models, multiple and partial correlations, factor analysis, structural equation models, and other parametric and nonparametric approaches. The emphasis in this course will be the application of these methods to social science data. Prerequisite: SOCI 3352 or permission of the instructor.

SOCIOLOGY AND ANTHROPOLOGY

SEMINARS

5310. SEMINARS IN SOCIAL PSYCHOLOGY (3-0). (May be repeated for credit when topics vary.)

1. Perspectives in Social Psychology
2. Intercultural Communication
3. Socialization
4. Deviant Behavior
5. Special Seminars in Social Psychology

5319. SEMINARS IN SOCIAL INSTITUTIONS AND CHANGE (3-0). (May be repeated for credit when topics vary.)

1. Sociology of Family
2. Sociology of Education
3. Sociology of Work and Occupations
4. Formal Organizations
5. Social Movements
6. Social Change and Development
7. Science, Knowledge, and Technology
8. Special Seminars in Social Institutions and Change

5330. SEMINARS IN SOCIAL DIFFERENTIATION (3-0). (May be repeated for credit when topics vary.)

1. Stratification/Inequality
2. Gender and Society
3. Minorities
4. Population and Development
5. Population and Environment
6. Special Seminars in Social Differentiation

5341. SEMINARS IN THEORY AND RESEARCH METHODS (3-0). (May be repeated for credit when topics vary.)

1. Methods of Demographic Research
2. Evaluation Research
3. Qualitative Research Methods
4. Advanced Social Statistics
5. Theory Construction
6. Special Seminars in Theory and Research Methods

INDIVIDUAL STUDY

5389. TEACHING SOCIOLOGY (3-0). To learn strategies of coping with practical problems of teaching undergraduate sociology, students assist one or more professors to have experience in lecture preparation, grading procedures, and examination construction. Not to be counted toward the degree requirement. Graded P/F/R.

5392. CONFERENCE COURSE IN SOCIOLOGY. Graded P/F/R.

5398, 5698. THESIS. 5398 graded R/F only; 5698 graded P/F/R.

ANTHROPOLOGY (ANTH)

5310. HISTORY OF ANTHROPOLOGICAL THEORY (3-0). This course is a critical examination of major theoretical trends in ethnological theory, from mid-19th century to the present.

5330. ANTHROPOLOGICAL METHODS (3-0). Research methods and underlying theory in one of four fields: biological anthropology; archaeology; ethnography; and ethnohistory. May be repeated for credit when the topic varies.

5342. ADVANCED ETHNOLOGY (2-2). Seminar based on student reports and critiques of assigned readings. Major emphasis on the areas of ethnology and social anthropology.

5343. HUMAN ECOLOGY (3-0). A critical examination of the application of models, theories, and concepts of human ecology in cultural anthropology and human adaptation.

5344. CULTURES OF LATIN AMERICA (3-0). An ethnological comparison of societies and cultures in Central and South America. Emphasis on gender, ethnicity, and political economy.

5345. RELIGION AND CULTURE (3-0). An ethnological comparison of native religions to understand non-western belief systems. Emphasis on rituals, myths, totemic systems, taboos, and cosmology.

5349. TOPICS IN ANTHROPOLOGY (3-0). May be repeated for credit as the topic changes.

5351. EMERGENCE OF HUMANKIND (3-0). An intensive review of the evidence for, and main outlines of, human biological and cultural evolution up to agricultural origins.

5353. MEDICAL ANTHROPOLOGY (3-0). An examination of anthropological concepts for understanding curing practices and attitudes toward health programs in various cultures.

5356. BIOLOGICAL ANTHROPOLOGY (3-0). The study of humans as a biological species: primatology, human evolution, physiological anthropology, and human variation.

5369. FOLKLORE AND MYTHOLOGY (3-0). Function, forms, and interpretation of folklore and myth in traditional societies; examination of oral literature as an expression of continuity and change; emphasis on a structural analysis of myth.

5370. APPLIED ANTHROPOLOGY (3-0). Explores the principles of cultural dynamics and the sources of cultural change in innovation and diffusion. Focuses particularly on the anthropological theories, methods, and findings relevant to problems of directed culture change, especially as illustrated by non-literate and peasant groups in contact with western civilization.

Program in THEATRE ARTS

Chair: Dennis M. Maher

191 Fine Arts 273-2650

Graduate Faculty:

Faculty members of the Program of Theatre Arts serve as Graduate Instructors.

OBJECTIVE

The graduate course offerings in theatre arts are provided to support other graduate degree programs and to meet the express needs of students. No program leading to a graduate degree in theatre arts exists at this time.

The grade of R (research in progress) is a permanent grade. An incomplete (the grade of X) cannot be given in a course which is graded R. To receive credit for an R-graded course the student must continue to enroll in the course until a passing grade is received. Three-hour thesis and three- and six-hour dissertation courses are graded R/F only. The grade of P (required for graduation) can be received in six- or nine-hour thesis courses and nine-hour dissertation courses only. In the course listings below, R-graded courses are designated either Graded P/F/R or Graded R. (See also the section entitled R GRADE in this catalog.)

THEATRE (THEA)

5320. FILM AND TELEVISION AS DRAMA (3-0). A study of dramatic arts as presented in film and on television.

5393. TOPICS IN THEATRE ARTS (3-0). Special topics in theatre; offered periodically, with subject matter determined by instructor and student interest. Previous topics have included: Design Portfolio Workshop; Alternative Actor Training Workshop; Playwriting; Improvisation; and Styles in Acting.

School of URBAN AND PUBLIC AFFAIRS

<i>Areas of Study</i>	<i>Degrees</i>
Urban Affairs (see below)	M.A.
City and Regional Planning (see Interdepartmental and Intercampus Programs)	M.C.R.P.
Public Administration (see Interdepartmental and Intercampus Programs)	M.P.A.
Public and Urban Administration (see below)	Ph.D.

Master's Degree Plans: Thesis and Thesis Substitute

<i>Dean:</i> Richard L. Cole	512 University Hall	273-3071
<i>Graduate Advisor and Program Coordinator (M.A.):</i>		
Paul N. Geisel	551 University Hall	273-3071
<i>Graduate Advisor and Program Coordinator (Ph.D.):</i>		
Rodney V. Hissong	507 University Hall	273-3071

Graduate Faculty:

Professors Cole, Cornehl, Geisel, Goldsteen, Taebel
Associate Professors Anjomani, Tees, Wegner, Wyman
Assistant Professors Arvidson, Bright, Gordon, Hissong

MASTER OF ARTS IN URBAN AFFAIRS

The Master of Arts degree in urban affairs is organized around a subject matter area, city or urban phenomena, rather than one of the traditional disciplines. Emphasis is placed on issues, problems, and public policy questions related to life in urban communities. Urban problems are viewed as complex and requiring the understanding and skills of many disciplines. Therefore, the program is interdisciplinary in character, curriculum content, teaching staff, and enrollment of students.

Broad and intensive graduate education in urban affairs can introduce graduates to a variety of rewarding and profitable careers and positions. With the increased urbanization of Texas and the nation, new career opportunities, many of them recent in origin, are becoming available.

By educating young men and women for urban affairs careers, the program seeks to help provide society with the "brain power" needed to deal with increasingly complex and urgent city problems.

DEGREE REQUIREMENTS

The Master of Arts degree in Urban Affairs seeks to provide students with an understanding of cities in four general and interrelated areas of knowledge:

1. Urban Institutions (nine-12 hours)
2. Urban Issues (nine hours)
3. Professional Development (six-nine hours)
4. Research and Analysis (12 hours)

A total of 36 to 42 hours is required for completion of the program, depending on the prior academic degree of the student, prior professional experience, and the specialization within the Professional Development field.

In the Research and Analysis field, all students are required to take URPA 5340 and URPA 5343. Students then have the option of taking one or the other of these sequences:

- a. URPA 5341, Professional Report Writing, and URPA 5396, Project Report;
- b. URPA 5342, Strategies for Urban Research, and URPA 5397, Research Report.

A student may select URPA 5698, Thesis, in lieu of either URPA 5396, Project Report, or URPA 5397, Research Report.

PROFESSIONAL DEVELOPMENT FIELDS

Students can specialize in one of four professional development fields as described below. As an alternative, they can petition to substitute another professional field, such as criminal justice, social work, engineering or business administration.

Urban Management: The Urban Management field is designed for students interested in public service careers or other managerial or administrative staff positions, such as finance and personnel. Student selecting Urban Management must fulfill the requirements as specified above.

Urban and Social Planning: The Urban and Social Planning field is designed for students interested in planning careers in non-profit and public agencies. Students selecting Urban and Social Planning must fulfill the requirements specified above.

Urban Journalism: The Urban Journalism field is designed for students who are interested in careers in the media with a specialization in urban and community affairs. Students selecting Urban Journalism must complete the course requirements specified above. Courses in the professional field are taken in Journalism from the Department of Communication (see the department listing). In addition, students must take the Project Report sequence in the Research and Analysis field, but the course requirements are reduced from 12 to 9 hours because URPA 5341 is not required.

Environmental Policy and Planning: The Environmental Policy and Planning Field is designed for students interested in careers in the public and private sector which focus on environmental concerns. Students selecting Environmental Policy and Planning must complete the course requirements specified above. Courses in the professional field will be drawn from Civil Engineering, City and Regional Planning and other programs. (See appropriate departments for course listings.)

DUAL DEGREE PROGRAM

Students in Urban Affairs may participate in a dual degree program whereby they can earn a Master of Arts in Urban Affairs and a Master of Science in Social Work. By participating in a dual degree program, students can apply a number of semester hours jointly to meet the requirements of both degrees, thus reducing the total number of hours which would be required to earn both degrees separately. The number of hours which may be jointly applied ranges from nine to 18 hours, subject to the approval of Graduate Advisors from both programs. To participate in the dual degree program, students must make separate application to each program and must submit a separate Program of Work for each degree. Those interested in the dual degree program should consult the appropriate Graduate Advisor(s) for further information on course requirements. See also the statement on "Dual Degree Programs" in the general admission section of this catalog.

PH.D. IN URBAN AND PUBLIC ADMINISTRATION

The PhD Program in Urban and Public Administration is based on a unique interdisciplinary approach in preparing students for a variety of academic and senior public management positions.

Students in the program are required to take two core fields of study and two support fields of study. One of the core fields of study is public administration and the other is urban policy. The support fields of study from which students can choose are listed below.

ADMISSION

A Master's degree is required for admission. In addition, a student must have a GPA of 3.4 on all previous graduate work and a GRE score above 1000 in order to qualify for unconditional admission.

PROGRAM

Core fields: Students generally take 18 hours of course work in each of the two core fields of study. Appropriate courses in the public administration field are listed below under "Urban Management" and also in the Public Administration section of this catalog under the heading of "Administrative Theory, Practices and Processes." Appropriate courses in the urban policy field are listed below under "Urban Institutions" and under "Urban Issues." Courses from other programs, including social work, city and regional planning, criminal justice, and education may also be applied to the core fields, if appropriate.

URBAN AND PUBLIC AFFAIRS

Support Fields: Students generally take 12 hours of coursework in the two support fields. Research is one of the required support fields. Appropriate courses for this field are listed below under "Research and Analysis." A proficiency examination is also required in this field of study by all students.

Students can select the other support field from among the following:

Professional Fields: City and Regional Planning, Criminal Justice, Social Work, Education

Disciplinary Fields: Political Science, Sociology, Economics, History

Courses drawn from either the professional or disciplinary fields should be related to the overall objective of the program. To assist students in selecting courses, many courses in the urban and public affairs inventory have been cross-listed with the courses in the above fields. A student may also petition to have some other field of study substitute for one of those listed above.

EXAMINATIONS

Diagnostic Examination: A diagnostic examination will be taken by each student after completing 12 hours of coursework. The examination will evaluate the student's progress in the program, and, if the faculty recommends continuation, the tentative program of work will be established.

Research Proficiency Examination: All students are required to pass a proficiency examination in research.

Comprehensive Examinations: Students must successfully pass a comprehensive examination in each of the core fields during or after the semester in which they complete coursework in the field. The examination can be taken over a two-semester period.



DISSERTATION

Students who pass the proficiency and comprehensive examinations are elevated to candidacy for the PhD and may register for the dissertation. The dissertation is the culmination of the PhD program and represents a distinct contribution to the field of knowledge. A dissertation defense is required.

The grade of R (research in progress) is a permanent grade. An incomplete (the grade of X) cannot be given in a course which is graded R. To receive credit for an R-graded course the student must continue to enroll in the course until a passing grade is received. Three-hour thesis and three- and six-hour dissertation courses are graded R/F only. The grade of P (required for graduation) can be received in six- or nine-hour thesis courses and nine-hour dissertation courses only. In the course listings below, R-graded courses are designated either "Graded P/F/R" or "Graded R." (See also the section entitled "R" GRADE in this catalog.)

URBAN AND PUBLIC AFFAIRS (URPA)

URBAN INSTITUTIONS

5300. THE METROPLEX: SURVEY OF URBAN AFFAIRS, PLANNING, ADMINISTRATION: (3-0). The metroplex provides an ideal laboratory for study with more than 100 cities and other governmental units, thousands of neighborhoods and business enterprises, major concentration of minorities and dozens of ethnic groups. An in-depth orientation on urban dynamics utilizing senior faculty members, governmental and community leaders, and current research reports and studies.

5301. THE URBAN POLITICAL SYSTEM (3-0). Examination of the city as a political system, including the impact of urbanization and fragmentation on policies; input dimensions, including voting patterns and interest group development; decision-making structures, especially types of community power structures and the impact of the reform movement on structural processes. Also offered as POLS 5305; credit will be granted only once.

5302. THEORIES OF URBAN SOCIETY (3-0). Several theoretical perspectives of the community and community organization examined. Special emphasis given to theories from human ecology, organization and stratification, and social welfare.

5303. THE URBAN ECONOMY (3-0). Internal dynamics of the growth and development of the urban system and its relation to the national economy. National and urban economic policy, urban growth and land use, market imperfections, urban financial issues, and the environmental implications of urban growth studied through lecture, game simulation and policy debates.

5304. URBAN GEOGRAPHY (3-0). Emphasizes areal aspects associated with urban physical environments and social, behavioral and financial processes that shape these environments.

5305. URBAN HISTORY (3-0). Extensive reading primarily in the history of the urbanization and metropolitanization of the people of the United States. Historical methods as exemplified in the works of leading historians analyzed; examples of the scholarship of selected historians and treatises on selected cities, regions, and urban institutions studied. Also offered as HIST 5303; credit will be granted only once.

5390. TOPICS IN URBAN THEORY (3-0). Different topics explored on an intensive basis, especially recent theoretical approaches. May be repeated for credit as topic changes.

URBAN ISSUES

5310. URBAN POLICY AND INTERGOVERNMENTAL RELATIONS (3-0). Critical analysis of federal government and selected state and local government policies and programs designed to influence the course of change and the future development of cities and urban areas. The role of "private" governments in affecting policy explored. Also offered as POLS 5310; credit will be granted only once.

5311. SOCIAL POLICY FORMATION (3-0). Utilization of a sociological approach in the study of policy formation in such areas as aging, social planning, and community problem solving.

5312. ECONOMIC POLICY (3-0). Examines structure of the U.S. economic system and its impact on welfare of consumers, workers, and industry; public policy efforts to provide for management of critical economic variables are evaluated for effectiveness and equity as they impact different interest groups.

5313. COMMUNITY DEVELOPMENT (3-0). Focuses on problems of neighborhood development and revitalization. Decline of economic opportunity in central cities and deterioration of housing and neigh-

URBAN AND PUBLIC AFFAIRS

borhoods analyzed. Federal, state and local policies, with grass roots initiatives evaluated for effectiveness in promoting community stability.

5314. URBAN TRANSPORTATION (3-0). Analysis of development of transportation systems in cities, including mass transportation; review of governmental policy and fiscal strategies; impact on design of cities and other social problems. Also offered as CIRP 5315; credit will be granted only once.

5316. HUMAN SERVICES (3-0). Social welfare institutions—private and public; needs assessment, resource allocation, procedures, city/state/federal/private policy review; highlights of current system demands and changes.

5317. URBAN ENVIRONMENTAL MANAGEMENT AND POLICY (3-0). Focuses on the physical environmental dimensions of urbanization including such factors as pollution, waste disposal, and land use; stresses the role of economics, social, and political institutions as these affect environmental quality of the city. Management and policy alternatives for dealing with urban environmental problems.

5391. TOPICS IN URBAN POLICY (3-0). Different topics and approaches in analysis of urban problems. May be repeated for credit as topic changes.

PROFESSIONAL DEVELOPMENT

Urban Management

5320. ORGANIZATION THEORY AND DEVELOPMENT (3-0). Historical evolution of administrative theory including classical, sociological and social-psychological dimensions; decision-making theory; implications of public interest theory for public management; basic concepts of organization development and impact on public administration paradigms; new public administration; and future of public urban organization. Also offered as CRJU 5309 and POLS 5303; credit will be granted only once.

5321. URBAN MANAGEMENT (3-0). Focuses through lectures, readings, and exercises on major administrative process: personnel and policy development and analysis; management styles and key contemporary management problems explored through presentations by prominent local practitioners. Also offered as POLS 5331; credit will be granted only once.

5322. URBAN BUREAUCRACY AND THE POLICY PROCESS (3-0). Development of theory of bureaucracy; bureaucracy as social issue; ethics and morality in public bureaucracy; mobilization of special interest support; power differentials in urban agencies; policy process in bureaucracy; new bureaucratic structures and processes for urban policy making.

5323. PUBLIC ORGANIZATIONAL CHANGE (3-0). Current theories and concepts of public organizational change with particular emphasis on organization development and action research; theoretical roots of contemporary change literature traced through readings and discussion of classical organization theory, public administration including New Public Administration decision making, public interest, phenomenology, learning theory and general systems. Prerequisite: basic organization theory course or permission of instructor.

5324. URBAN PUBLIC FINANCE (3-0). Tax, revenue, and fiscal problems of cities and local governments in metropolitan areas; problems of matching costs and benefits in providing public services among different local governments; increasingly complex dimensions of intergovernmental fiscal relations and public budgeting systems.

5325. URBAN AND ADMINISTRATIVE LAW (3-0). Examines scope and role of administrative regulation of and by governmental agencies; explores constitutional principles which limit administrative power and administrative law which governs classical areas of conflict between administrative agencies and their constituencies; rule-making, judicial review and informed regulatory processes of importance to public officials.

5326. PUBLIC BUDGETING (3-0). Rationale of public budgeting including legal, political, social, and administrative perspectives; history of budgeting techniques and such approaches as Management by Objectives, and Program and Mission Budgeting.

5327. COMPARATIVE ADMINISTRATION AND DEVELOPMENT (3-0). Extensive, multidisciplinary exposure to concepts and models of administration in developed and modernizing countries; role of the military, bureaucracy and traditional elites in development; practices and concepts of strategies for effective change.

5328. SMALL CITY MANAGEMENT (3-0). This course will focus on problems peculiar to small cities, including administrative law; personnel, planning; public works, public safety; human services; budget and finance; public relations and parks and recreation.

5392. TOPICS IN URBAN MANAGEMENT (3-0). Selected topics on current management problems including small city management, community-neighborhood relations, citizen involvement programs and techniques, personal and professional effectiveness as a total person, intergovernmental strategies and styles, public-private sector collaboration and coplanning, privatization, and other alternatives to economic service delivery. May be repeated as topic changes.

PROFESSIONAL DEVELOPMENT

Urban and Social Planning

5330. COMMUNITY AND NEIGHBORHOOD ORGANIZATION (3-0). Structures and processes in the analysis and development of community and neighborhood organizations; special emphasis given to poverty and minority communities and neighborhoods.

5331. LAND USE PLANNING AND THE LAW (3-0). Examines the relationship between land use in urban areas and the legal system; covers traditional land use planning tools of zoning, subdivision regulation, and the special permit system; assessment of some of the more exotic, modern tools for managing urban growth for their legality and scope as interpreted by the judicial system. Also offered as CIRP 5316. Credit will be granted only once.

5393. TOPICS IN URBAN PLANNING (3-0). Focuses on selected areas in urban and social planning. May be repeated for credit as topic changes.

RESEARCH AND ANALYSIS

5340. METHODS OF SOCIAL RESEARCH AND ANALYSIS (3-0). An introduction to research methodology and statistical techniques useful in analysis of urban trends and problems; concepts and procedures for use of computers in social research studied. Special problems and methods of evaluative research related to programs and policies for coping with urban problems explored. Also offered as POLS 5339; credit will be granted only once. \$5 computer fee.

5341. PROFESSIONAL REPORT WRITING (3-0). Provides students entering public sector employment with writing, management information, data retrieval skills to communicate ideas and information within and outside an agency; basic writing skills reviewed, including organization of reports and grammatical construction; assignments based on actual internship position of students in public agencies.

5342. STRATEGIES FOR URBAN RESEARCH (3-0). Intermediate level examination of statistical and research techniques appropriate to urban and social analysis. Special attention paid to use of micro computers in social science research. Prerequisite: URPA 5360. \$10 computer fee.

5343. APPLIED URBAN ANALYSIS (3-0). Group and individual projects to develop research studies or strategies, data reports for local government, agency or citizen group; techniques appropriate to task utilized. P/F only. \$10 computer fee.

5344. RESEARCH AND FORECASTING METHODS (3-0). Context and role of data and analysis in planning and administration; use of descriptive and inferential statistical techniques; topics include Probability and Sampling theory, hypothesis testing, table analysis, analysis of variance, bivariate and multivariate regression analysis. Prerequisite: URPA 5362. Also offered as CIRP 5317. Credit will be granted only once. \$10 computer fee.

5345. EVALUATIONS RESEARCH (3-0). Methodological issues in evaluating public programs; identification of variables, indicators and analyses formats presented.

5346. ADVANCED DATA ANALYSIS (3-0). Issues addressed include problems presented by cross-section and time series data in regression analysis. Time Series Analysis methods and econometric regional models are also explored. \$10 computer fee.

5347. DEMOGRAPHIC METHODS (3-0). Examination of sources of data-census, vital statistics, special surveys, reports, special studies; techniques of analysis with particular emphasis on growth and projection models, interpretation of findings as a major policy area in urban analysis.

5348. COST BENEFIT ANALYSIS (3-0). Reviews theory of cost-benefit and cost-effective analyses; explores the research, measurement and methodological requirements for the assessments of costs and benefits. It is recommended that students have completed at least one graduate course in research and one graduate class in public finance.

5349. INTRODUCTION TO MICROCOMPUTERS IN PLANNING AND ADMINISTRATION (3-0). Computer techniques studied as a basis for advanced analysis and data manipulation. Topics include

URBAN AND PUBLIC AFFAIRS

spreadsheet (LOTUS 1-2-3), Data Base Management Systems, Word Processing, Computer Graphics and Mapping, etc. Also offered at CIRP 5320. Credit will be granted only once.

5394. SPECIAL TOPICS IN URBAN RESEARCH (3-0). Different topics each semester concentrate on a variety of methodological techniques and research strategies, such as demographic research and survey techniques. May be repeated for credit as topic changes. \$10 computer fee.

5395. CONFERENCE COURSE IN URBAN AFFAIRS (3-0). Reading and research in a specialized area of urban affairs under the direction of a member of the graduate faculty.

5396. PROJECT REPORT (3-0). Student prepares report focusing on specific policy or professional issue, utilizing appropriate research techniques; subject area and design of project report with consent of instructor. Graded P/F/R only. Prerequisite: URPA 5341.

5397. RESEARCH REPORT (3-0). Student prepares report comparable to a journal article focusing on research issue, utilizing appropriate theory and research techniques; subject area and design of research report with consent of instructor. Graded P/F/R only. Prerequisite: URPA 5342. \$10 computer fee.

5398, 5698. THESIS. A thesis conforming to University and departmental requirements may be prepared by graduate students in urban affairs. Graded P/F/R. \$10 computer fee.

PROFESSIONAL FIELD EXPERIENCE

5350. URBAN MANAGEMENT/PLANNING INTERNSHIP (3-0). Designed to integrate work experience and coursework through a series of brief work-related assignments; presentations by local planning and management practitioners and class discussions and exercises. Enrollment is open to both pre-entry and in-career students. Formal internship placements with agency mentors will be arranged. P/F only. Also offered as POLS 5393; credit will be granted only once.

ADMINISTRATION (PhD Level Courses)

6305. SEMINAR IN URBAN POLICY PROCESSES (3-0). Final course in urban policy field; may be used for the purpose of completing the comprehensive examination; focus on the political, economic, and sociological institutions in the policy process, including various theoretical approaches, and application of these multi-disciplinary perspectives in the analysis of specific policy issues.

6310. MONETARY AND FISCAL POLICY: THE FEDERAL ROLE (3-0). Examination of the role of the federal government in maintaining economic stability, ensuring full employment and controlling inflation; exploration of liberal interventionist, conservative and radical theories of state economic management to assess the various policy alternatives and the importance of interest groups.

6340. RESEARCH DESIGN (3-0). Advanced course especially for PhD students; covers logic of research design and problems of structure. Emphasis on empirical and quantitative studies.

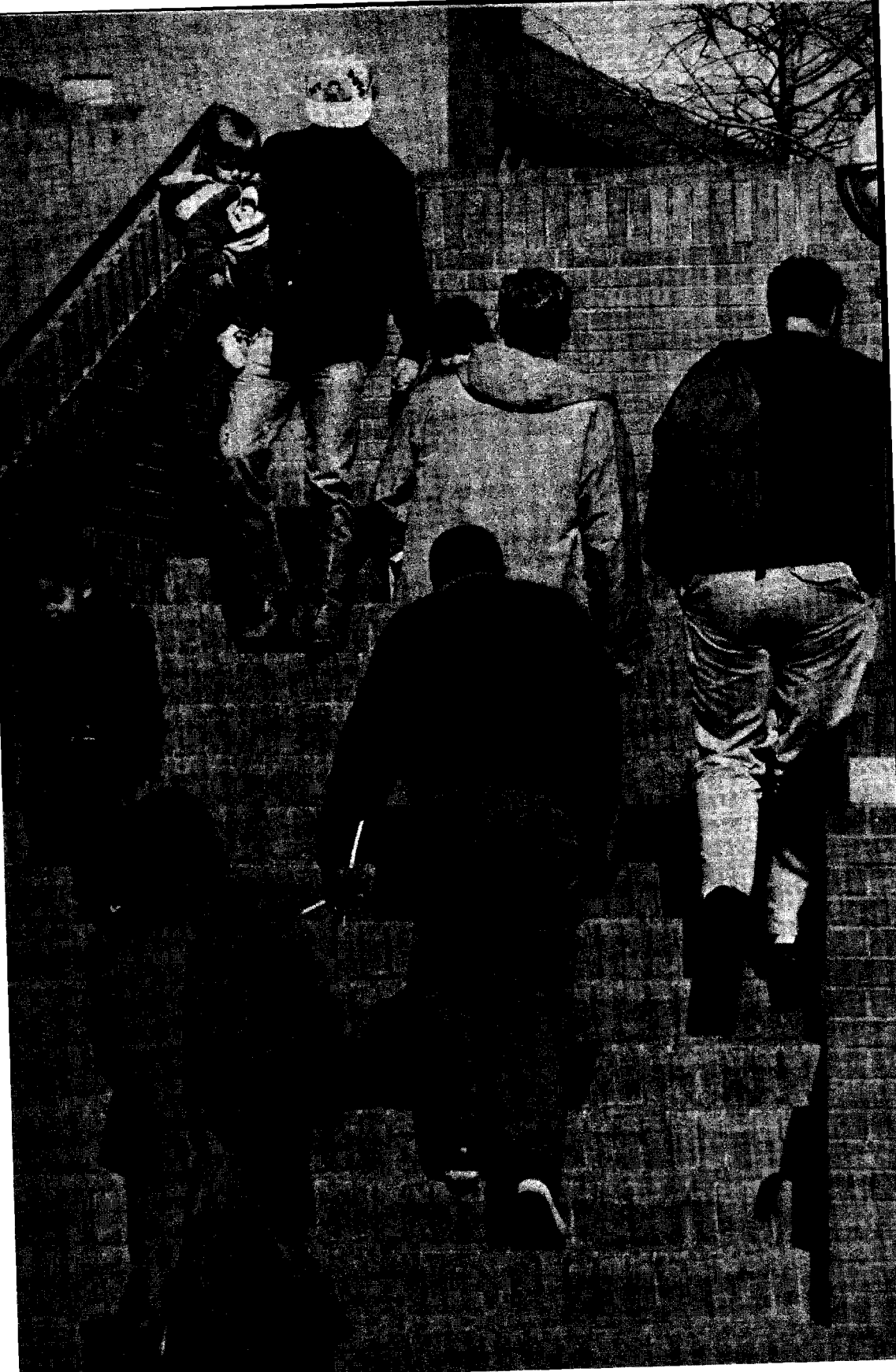
PUBLIC AND URBAN ADMINISTRATION (PUAD)

6399, 6699, 6999. DISSERTATION. 6399 and 6699 graded R/F only; 6999 graded P/F/R.

Interdepartmental and Intercampus Programs

This catalog is a general information publication only. It is not intended to nor does it constitute a contract, express or implied, between any applicant, student, or faculty member and The University of Texas at Arlington or The University of Texas System. The University reserves the right to withdraw courses at any time, change fees, rules, calendar, curriculum, degree programs, degree requirements, graduation procedures, and any other requirements affecting students. Changes will become effective whenever the proper authorities so determine and will apply to both prospective students and those already enrolled.

Students are held individually responsible for complying with all requirements of the rules and regulations of the University and the Board of Regents of The University of Texas System. Failure to read and comply with policies, regulations, and procedures will not exempt a student from whatever penalties he or she may incur.



Program in ADMINISTRATION

The doctoral program in Administration has been replaced by doctoral programs in Business Administration, Social Work, and Urban and Public Administration.* The doctoral program in Administration has been terminated, and no new students are being admitted to the program. Students who were enrolled in the program prior to August 1990 may complete the program providing they satisfactorily complete all of the requirements for the degree, including the dissertation and dissertation defense, by September 1996.

*For information on these doctoral programs, see listings for Business Administration (Interdepartmental and Intercampus Programs), the School of Social Work, and the School of Urban and Public Affairs.

The grade of R (research in progress) is a permanent grade. An incomplete (the grade of X) cannot be given in a course which is graded R. To receive credit for an R-graded course the student must continue to enroll in the course until a passing grade is received. Three-hour thesis and three- and six-hour dissertation courses are graded R/F only. The grade of P (required for graduation) can be received in six- or nine-hour thesis courses and nine-hour dissertation courses only. In the course listings below, R-graded courses are designated either "Graded P/F/R" or "Graded R." (See also the section entitled "R" GRADE in this catalog.)

6392. INDEPENDENT STUDY IN ADMINISTRATION (3-0). Graded P/F/R.

6399, 6699, 6999. DISSERTATION. 6399 and 6699 graded R/F only; 6999 graded P/F/R. \$10 computer fee.

Program in BIOMEDICAL ENGINEERING

Areas of Study

Biomedical Engineering

Clinical Engineering

Biomedical Engineering

Degrees

M.S., Ph.D.

Certificates

Internship

Internship

Master's Degree Plans: Thesis and Non-Thesis

Graduate Advisor:

Charles C.J. Chuong

220 Engineering Laboratory

273-2249

Graduate Faculty:

Professors Eberhart, von Maltzahn

Associate Professors Behbehani, Chuong

Adjunct Faculty (UT Southwestern and UT Arlington): Antich, Ashman, Baker, Bansal, Bertocci, Dechow, Hagler, Imrhan, Jackson, Kondraske, Kulkarni, McColl, Nomura, Ordway, Orr, Pape, Peterson, Petroll, Prager, Tanelian, Templeton, Throckmorton, Tong, Zhong

OBJECTIVES

The Biomedical Engineering Program is jointly offered by The University of Texas at Arlington and The University of Texas Southwestern Medical Center at Dallas (UT Southwestern). Research and teaching

BIOMEDICAL ENGINEERING

efforts of various departments in the biological, engineering, mathematical, physical, and medical sciences of both institutions are coordinated through the Committee on Graduate Studies in Biomedical Engineering. The goal of the program is to prepare students as biomedical engineers for productive research, development, and teaching careers in academic, industrial, hospital, or governmental positions.

The program includes coursework and research in artificial organs, hospital systems, biosensors, physiological control systems, medical image processing, biomedical instrumentation, rehabilitation, orthopedics, biomaterials, fluid and tissue biomechanics, and bioheat transfer. Research and training in recombinant DNA technology, cell and molecular biology, and neuro-sciences is available to selected students.

A one-semester internship in Dallas/Fort Worth industry prepares students for careers in the biomedical engineering industry.

A six-month internship in clinical engineering after completion of the master's degree, with certification, prepares a student for a professional career in clinical engineering.

The master's program is based upon graduate level work in one of the engineering disciplines, biomedical engineering, and life sciences.

The doctoral program is based upon graduate level work in one of the engineering disciplines and extensive graduate training in the life sciences and related physical sciences. The program is aimed at the development of professional biomedical engineers capable of independent research.

ADMISSION

Application for admission should be made at either UT Arlington or UT Southwestern. Normally, the institution through which the student applies and is admitted is the student's home institution. Admission in the other institution is initiated during the student's first semester.

In addition to admission requirements of the Graduate School, the bachelor's degree held by applicants to the program may be in engineering, biological, physical, or mathematical sciences. Students required to take the TOEFL must achieve a score of at least 575 and a score of at least 400 on the verbal part of the GRE. Applicants to the M.S. program should have an undergraduate grade point average of 3.0 and a combined verbal and quantitative score of at least 1000 on the Graduate Record Examination. Applicants to the doctoral program normally should have a grade-point average exceeding 3.4, and a combined verbal and quantitative score of at least 1175 on the GRE. Students with unusual backgrounds and experience will be considered individually.

CONTINUATION

The Biomedical Engineering Graduate Program has established certain policies to fulfill its responsibility to graduate highly qualified professional engineers. In addition to the requirements of the Graduate School listed elsewhere, each biomedical engineering graduate student who wants to continue in the program must:

1. Maintain at least a B (3.0) overall GPA in all coursework, and
2. Demonstrate suitability for professional engineering practice.

At such time as questions are raised by biomedical engineering graduate faculty regarding either of the above, the student will be notified and will be provided the opportunity to respond to the Committee on Graduate Studies in Biomedical Engineering. The Committee on Graduate Studies will review the student's performance and make a recommendation concerning the student's eligibility to continue in the program. Appeal of a decision on continuation may be made through normal procedures outlined in the section of this catalog entitled "Grievances Other than Grades."

DEGREE REQUIREMENTS

In degree plan descriptions, course numbers followed by a D are offered at UT Southwestern. Courses indicated by an asterisk (*) are to be taken only with the written consent of the Graduate Advisor.

Non-Thesis Master of Science Degree Plan

Students selecting this plan take a minimum of 37 credit hours including the courses listed below.

Life Sciences: Physiology (BME 5385); Anatomy (HCS4408D).

One Engineering Area: Four courses*.

General Biomedical Engineering: Bioinstrumentation I (BME 5344); Laboratory Principles (BME 5382); Research Project or Directed Research (BME 5390 or 5396); Seminar—one year, first year (BME 5101).

Choose Two*: Clinical Engineering (BME 5320); Biological Materials, Mechanics, and Processes (BME 5335); Finite Element Biomechanics (BME 5340); Bioinstrumentation II (BME 5345); Modeling and Control of Biomedical Systems (BME 5350); Digital Control of Biomedical Systems (BME 5351); Hospital Internship (BME 6390); Special Topics in Biomedical Engineering (BME 5300 or 5096D); Thermoregulation and Bio-heat Transfer (BME 5362D); Design and Application of Artificial Organs (BME 5360D); Biomaterials and Blood Compatibility (BME 5361D); Digital Processing of Medical Images (BME 5363D); Biomedical NMR Imaging (BME 5096D); Biomedical Industry Internship (BME 6095D).

Free Elective: One three hour course from Life Science, Engineering, or BME.

Final Comprehensive Examination: The non-thesis student will be examined in all areas related to coursework taken.

Thesis Master of Science Degree Plan

Requirements of the thesis option are the same as those for the non-thesis option with the following exceptions: 1) free elective (three hours) is deleted, 2) research project or directed research (BME 5390 or BME 5396D) is replaced by thesis (BME 5698 or 5098D), and 3) an oral defense of the thesis replaces the final comprehensive examination.

Clinical Engineering Internship Plan

Following the MS degree in BME, students entering this program are required to take Clinical Engineering (BME 5320), Hospital Internship for Biomedical Engineers (BME 6990), work full-time in the clinical engineering department of a major hospital for at least one semester, write weekly reports, and pass the written certification exam for clinical engineers (administered by the International Certification Commission). After successful completion, students will be issued a certificate by the Graduate School.

Doctor of Philosophy Degree Plan

The PhD degree program consists of a minimum of 58 credit hours beyond the bachelor's degree level and includes the courses listed below.

Life Sciences: Human Anatomy (HCS 4408D and 4209D), Physiology (Physiology 5680D or BME 5385D), Biochemistry (Biochemistry 5580D or HCS 3311D or CHEM 4311 and 4312). One additional life science course is required unless six hours are taken in Physiology or Biochemistry. See UT Southwestern graduate catalog and consult with adviser.

One Engineering Area: Six Courses*.

Mathematics, Statistics, Computer and Physical Sciences: Choose two courses*.

General Biomedical Engineering: Seminar—two years, first year (BME 5101 or 5193D); second year, journal club; Fundamentals of Bioinstrumentation (BME 5381D); Laboratory Principles (BME 5382); Dissertation—re-enroll, approximately 30 hours (BME 6399, 6699, 6999, or 5099D).

Choose Three*: from non-thesis MS degree listing of courses entitled "Choose Two."

Although qualified applicants may be accepted into the PhD program without earning the Master of Science in biomedical engineering, all students must satisfactorily pass the Diagnostic Examination (Exam I). This examination will cover all relevant coursework taken by the student. The examination may be written, oral, or both and consists of a timed, written analysis of a major problem in the student's general area of research interest, followed by an oral examination covering the same material. Elements of engineering, physical and biological science, mathematics, computer science and statistics may be included in this examination.

Proficiency in the computer sciences and experimental statistics is substituted for the foreign language requirement.

The Comprehensive Examination consists of satisfactory completion of a detailed prospectus of proposed dissertation research and an oral examination. (Exam II).

Sufficient copies of the approved thesis or dissertation must be provided to satisfy the requirements of both UT Arlington and UT Southwestern.

BIOMEDICAL ENGINEERING

For additional information, applicants and students should contact the Graduate Advisor for a copy of the "Information Brochure" for related and amplified information about the graduate program.

The grade of R (research in progress) is a permanent grade. An incomplete (the grade of X) cannot be given in a course which is graded R. To receive credit for an R-graded course the student must continue to enroll in the course until a passing grade is received. Three-hour thesis and three- and six-hour dissertation courses are graded R/F only. The grade of P (required for graduation) can be received in six- or nine-hour thesis courses and nine-hour dissertation courses only. In the course listings below, R-graded courses are designated either "Graded P/F/R" or "Graded R." (See also the section entitled "R" GRADE in this catalog.)

BIOMEDICAL ENGINEERING (BME)

5100, 5300. SELECTED TOPICS IN BIOMEDICAL ENGINEERING. Material may vary from semester to semester. May be repeated for credit if different topics are covered for each registration. Prerequisite: permission of the instructor. \$15 lab fee.

5101. SEMINAR IN BIOMEDICAL ENGINEERING (1-0). University and guest lecturers speak on topics of current interest in the field of biomedical engineering. Graded P/F only.

5191, 5291, 5391. DIRECTED RESEARCH IN BIOMEDICAL ENGINEERING. Student participates in a research project under the individual instruction of a faculty supervisor. Prerequisite: permission of the instructor. \$15 computer fee.

5193. MASTER'S COMPREHENSIVE EXAMINATION (1-0). Individual instruction, directed study, consultation, and comprehensive examination over coursework leading to the non-thesis Master of Science degree in biomedical engineering. Graded P/F/R only. Required of all non-thesis MS students in the semester when they plan to graduate.

5320. CLINICAL ENGINEERING (3-0). Electrical, mechanical, nuclear, radiological, and environmental hazards and safety programs in hospitals; hospital codes, standards, and regulations; setup and operation of clinical engineering programs in large, medium, and small sized hospitals; study of shared service programs. Prerequisite: BME 5344.

5335. BIOLOGICAL MATERIALS, MECHANICS AND PROCESSES (3-0). Typical functional behavior of various biological materials, flow properties of blood, bioviscoelastic fluids and solids, mass transfer in biological systems. Prerequisites: BME 5385D, ME 3313, or permission of the instructor.

5340. FINITE ELEMENT APPLICATIONS IN BIOMECHANICS (3-0). Variational and Galerkin finite element formulations, linear and Hermitian elements, accuracy and convergence, applications in field problems: elasticity (plane stress, plane strain, torsion), steady state heat transfer, seepage fluid flow, diffusion. Projects in biomechanical applications with the above engineering topics are emphasized. Prerequisites: AE 3311, ME 3342, CE 3311, working knowledge of FORTRAN.

5344. BIOINSTRUMENTATION I (3-0). Fundamental principles of bioinstrumentation, including operational amplifiers and instrumentation amplifiers; measurements of biopotentials; signals and noise in biological systems; mechanical transducers; resistive, inductive, capacitive transducers; measurement of temperature, blood pressure and flow; electrical safety.

5345. BIOINSTRUMENTATION II (3-0). Continuation of Bioinstrumentation I. Measurement of pulmonary function, light and spectrophotometry, chemical transducers, ventilators, anesthesia equipment, defibrillators, fundamentals of medical imaging, lasers, electro-surgical devices, cardiac pacemakers. Prerequisite: BME 5344.

5350. MODELING AND CONTROL OF BIOLOGICAL SYSTEMS (3-0). Introduction to fundamental methods of modeling, analysis and control of biological systems. Linear system modeling, state space modeling, stability analysis, basic control strategies and identification techniques. Examples from cardio-pulmonary, visual and motor control systems.

5351. DIGITAL CONTROL OF BIOMEDICAL SYSTEMS (3-0). Design of control strategies for microprocessor-based medical equipment. Discrete and sampled data systems, Z transform, digital control design methods, stability considerations and closed loop system response.

5382. LABORATORY PRINCIPLES (0-9). Introduction to the fundamental biomedical engineering laboratory procedures including human studies and animal surgery; includes clinical laboratory projects; data collection, analysis, and interpretation. Prerequisite: permission of the instructor. \$10 lab fee.

5390. RESEARCH PROJECT (0-9). Taken by students enrolled in the non-thesis option for the MS degree. Individual instruction in research and/or instrumentation development and evaluation conducted under supervision of the instructor. A final report required. Graded P/F/R. Prerequisite: permission of the instructor. \$10 computer fee. \$5 lab fee.

5398, 5698, 5998. THESIS. 5398 graded R/F only; 5698 and 5998 graded P/F/R. Prerequisite: graduate standing in biomedical engineering.

6194. DOCTORAL DIAGNOSTIC EXAMINATION (1-0). Individual instruction, directed study, consultation, and diagnostic examination. Graded P/F/R only. Required of all doctoral students in the semester when they take any portion of the diagnostic examination.(Exam I).

6195. DOCTORAL COMPREHENSIVE EXAMINATION (1-0). Individual instruction, directed study, consultation, and comprehensive examination. Graded P/F/R only. Required of all doctoral students in the semester when they take the comprehensive examination.(Exam II).

6197, 6297, 6397, 6697, 6997. RESEARCH IN BIOMEDICAL ENGINEERING. Individually approved research projects leading to a doctoral dissertation in the area of biomedical engineering. Graded P/F/R. \$15 computer fee.

6390, 6690, 6990. HOSPITAL INTERNSHIP FOR BIOMEDICAL ENGINEERS. Each student interns at local hospitals under the individual supervision of the course instructor and a hospital staff member. During the semester, the student rotates through areas such as cardiac, pulmonary, prosthetic, and neuro surgery, anesthesiology, radiology, catheterization, and emergency care. Graded P/F/R. Prerequisites: BME 5385D and permission of the instructor.

6399, 6699, 6999. DISSERTATION. Preparation and submission of a doctoral dissertation in an area of biomedical engineering. 6399 and 6699 graded R/F only; 6999 graded P/F/R. Prerequisite: admission to candidacy for the PhD in Biomedical Engineering. \$15 computer fee.

Courses offered at The University of Texas Southwestern Medical Center at Dallas (UT Southwestern):

- BME5580D. Graduate Biochemistry
- BME 5381D. Biomedical Instrumentation (5344 at UT Arlington)
- BME 5383D. Anatomy for Biomedical Engineers
- BME 5385D. Physiology for Biomedical Engineers
- BME 5193D. Biomedical Engineering Seminar
- BME 5094D. Research in Biomedical Engineering
- BME 5096D. Special Topics in Biomedical Engineering
- BME 5396D. Individual Laboratory Projects
- BME 5360D. Design and Application of Artificial Organs
- BME 5361D. Biomaterials and Blood Compatibility
- BME 5362D. Thermoregulation and Bio-Heat Transfer
- BME 5363D. Digital Processing of Medical Images
- BME 6095D. Industry Internship
- HCS 3311D. Biochemistry
- HCS 4209D. Human Anatomy Laboratory
- HCS 4408D. Human Anatomy Lectures
- PHY 5680D. Medical Physiology

See the UT Southwestern Graduate Catalog for course descriptions.

Program in BUSINESS ADMINISTRATION

Areas of Study

Business Administration

Degrees

M.B.A., Ph.D.

Master's Degree Plan: Thesis and Non-Thesis

<i>M.B.A. Graduate Advisor:</i> David A. Gray	434 Business	273-3004
<i>Ph.D. Graduate Advisor:</i> John M. Hassell	434 Business	273-3004
<i>Director of Graduate Advising:</i> James E. Walther	434 Business	273-3004

Graduate Faculty:

- Professors Amacher, Apilado, Baker, Carney, Courtney, Dess, Dickinson, Dunn, Furubotn, Gates, Gerloff, T. Hall, Hayashi, Holland, Hopkins, Martin, McDaniel, Meiners, Mullendore, Nelson, Panton, Quick, Raja, Ross, Schkade, L. Solomon, Swanson, Taylor, Wofford, Worrell, Ziegler
- Associate Professors Beehler, Diltz, Eakin, Gray, Guynes, B. Hall, Hassell, Himarios, Huq, Iyer, Jarboe, Lockwood, Mark, McCall, McConnell, Munch, Myktyyn, Pinney, Price, Rasheed, Rosenstein, Sircar, Slinkman, Swidler, Tsay, Walther, Wheeler
- Assistant Professors Baker, Bordoloi, Buttimer, Crowder, Dodson, Farnsworth, Flessig, Harrison, Hensler, Ho, Priem, Rutherford, Sarkis, Semple, Smythe

OBJECTIVE: MASTER OF BUSINESS ADMINISTRATION

The Master of Business Administration program is aimed at general competence in management. Often managers must change their roles as they reach higher positions of responsibility. The ability to reason and learn in new situations aids in the creation of general management capabilities. The professional manager's ability to contribute constructively to change in business and to make and successfully execute wise decisions is, to a great extent, derived from a sensitivity to immediate problems. Management competence requires a willingness to face the challenge of living in an environment of uncertainty where innovation occurs at an ever-increasing rate and personal and group relationships are complex.

ACCREDITATION

The Master of Business Administration program is accredited by the American Assembly of Collegiate Schools of Business.

DEGREE REQUIREMENTS

Admission to the Master of Business Administration program is based upon the completion of the general admission requirements of the Graduate School. For admission to the Business Administration program a satisfactory score on the Graduate Management Admission Test is required. There is no foreign language requirement for the MBA program.

Many people in business seek to enhance their career opportunities by broadening their knowledge and understanding of the overall management field. Since it is impossible for them to leave their responsibilities and return to academic work on a full-time basis, the College of Business Administration offers a complete program in the evening as a service to the community. Evening classes are taught by full-time faculty members and the same academic standards required of full-time students are maintained. It is expected that the student will progress through the program at a pace that is commensurate with the time available.

The program has been designed to accommodate students of widely divergent backgrounds. It is not necessary to have completed prior academic work in business administration. Foundation courses have been designed to prepare the student for advanced coursework. These graduate courses are an integral part of the MBA program.

Grade and Graduation Requirements

The MBA program follows the grade requirements for probation as specified under the general regulations of the Graduate School. In addition, to graduate, students must have at least a 3.0 grade point average in all coursework and area of concentration. Students will be dismissed from the MBA program if they accumulate grade deficiency points greater than allowed. Any grade of C is worth one deficiency point, any grade of D is worth two deficiency points and any grade of F is worth three deficiency points. Deficiency points may not be removed from a student's record by additional coursework.

The maximum allowable deficiency points will be computed by the advisor when the degree plan is prepared or adjusted using the following guidelines:

Program Length (UT Arlington coursework only)	Allowable Deficiency Points
12 courses	2
13-17 courses	3
18 courses or more	4

THESIS DEGREE PLAN

Requirements for the thesis degree plan are the same as the requirements listed below for the non-thesis degree plan with the following change. A six-hour thesis can be added to the MBA program. The six hours would be beyond the 36 advanced hours required for the MBA degree. All candidates for the degree shall defend the thesis at a final oral examination.

NON-THESIS DEGREE PLAN: Background Category I

Students who have had no prior academic work in business will enter the program of work listed for Semester I and continue sequentially through both the Foundation Program and the Advanced MBA Program. Students with a statistics and/or mathematics deficiency will be required to complete BUSA 5301 and/or MATH 1315 and/or 1316.

NON-THESIS DEGREE PLAN: Background Category II

Students with varying amounts of academic work in business may have the requirement waived for those equivalent Foundation Program courses completed with acceptable grades within the last 10 years.

Foundation Program

These courses should be taken upon entering the MBA program and prior to taking courses in the advanced MBA program. They may not be used as electives in the advanced program.

Accounting Analysis I (ACCT 5301)	Accounting Analysis II (ACCT 5302)
Economic Analysis I (ECON 5309)	Economic Analysis II (ECON 5311)
Quantitative Analysis for Business Administration (BUSA 5303)	Marketing (MARK 5311)
Introduction to Computers and Information Systems (INSY 5310)	Finance (FINA 5311)
Behavioral Science in Management (MANA 5311)	Management (MANA 5312)

With approval of the Graduate Advisor, a student may enroll in advanced courses when schedule conflicts prevent completion of all the foundation courses. A student may not apply to the MBA degree more than nine semester hours of advanced work completed prior to the completion of all foundation courses.

Advanced MBA Program

The Advanced MBA Program normally consists of 36 hours of coursework to be selected by the student and approved by the Graduate Advisor. However, the accounting concentration may require the student to complete up to 45 hours of advanced coursework, depending on background. In those cases where it is necessary for the student to take nine or all of the Foundation Program courses at the graduate level, the student will be allowed to waive one or two non-concentration electives respectively.

Required MBA Courses

The following advanced MBA courses are required of all students: BUSA 5325; 5333; either 5330 or 5337; and a research course approved by the Graduate Advisor. BUSA 5325 is required of all students except those students with six hours of statistics who must take an approved advanced quantitative course.

Concentration Areas

A concentration of 12 semester hours may be taken in one of the following curriculum areas: economics, finance, information systems (see Department of Information Systems and Management Sciences courses), management, management science (see Department of Information Systems and Management Sciences), marketing, and real estate (see Department of Finance and Real Estate courses). A student who wishes to take a program of courses in a wider range may choose not to take a concentration.

A concentration in accounting requires a minimum of 15 semester hours of advanced graduate accounting courses. The student selecting a concentration in accounting must have previously studied or include in his or her program courses covering the following areas of accounting: financial accounting and accounting theory, management information and computer systems, financial and operational auditing, and taxation.

Students who elect a concentration in information systems are advised to take six semester hours in accounting and may select up to six hours of graduate electives in computer science or management science, subject to the approval of the MBA Graduate Advisor.

International Option

The following advanced courses permit students to pursue a comprehensive program of study in international business administration within the MBA program. The complete course description and prerequisites may be found under the appropriate functional listing.

Students planning a career in the international field and taking extensive coursework in international business administration may consider international-related research topics for approved research courses, preferably conducting an area study (Latin American, Asian, European, etc.) of some type. Students should also recognize the importance of those graduate courses in political science, history, and foreign languages, which would embellish graduate study in international business administration.

ACCT 5330 INTERNATIONAL ACCOUNTING AND FINANCIAL REPORTING
BUSA 5331 LAW OF INTERNATIONAL BUSINESS
ECON 5321 INTERNATIONAL ECONOMICS
ECON 5327 INTERNATIONAL FINANCE
FINA 5331 MULTINATIONAL FINANCIAL MANAGEMENT
FINA 5332 SEMINAR IN INTERNATIONAL FINANCIAL MARKETS
MANA 5331 MANAGEMENT OF INTERNATIONAL OPERATIONS
MARK 5331 INTERNATIONAL MARKETING

Elective Areas Outside Concentration or Other Professional Fields

An MBA student may take elective courses in any of the curriculum areas of the MBA Program. He or she may take no more than six semester hours in advanced courses in an area other than the concentration field (see professional management electives for exceptions). Any course beyond the foundation courses may be completed for advanced elective credit.

Professional Management Electives

Students holding bachelor's or master's degrees in professional fields such as architecture, education, engineering, nursing, social work, and urban studies have the option of taking up to 12 hours of electives in their professional area as part of their MBA degree requirements. With these electives, professionals can develop advanced management skill in a functional area by declaring a 9-12 hour concentration, or pursue a more general management approach by declaring "no concentration". If an accounting concen-

tration is desired, the advanced program may require up to 45 semester hours to provide required accounting skills. A full 36-hour advanced program is required for all other concentrations.

Technology and Innovation Management Electives

Several course sets have been designed for students wishing to achieve a greater understanding of technology and how it is developed. The courses in these sets include coverage of the economic role of innovation and the management of the firm's technological base to shape and accomplish the organization's operational, strategic, and competitive objectives. Separate course sets attempt to focus on the following specific areas of interest: energy technology, environmental technology, financial innovations, health technology management, information systems management, manufacturing management, marketing and technology, and production and operations management.

These course sets are included in the course set listings available in the Graduate Studies office.

MBA Cooperative Education Program

A non-credit MBA Cooperative Education Program exists for the convenience of employers and students. In the Parallel Program, students study full-time and work part-time. The work load is similar to that undertaken by other working full-time students. In the Alternating Coop Program, students study full-time one semester and work full-time the next semester. After successfully completing a coop agreement with a particular employer and upon receipt of notification by the employer of a satisfactory Student/Employer evaluation, a Coop Certificate will be awarded by the College of Business Administration to the student.

Benefits of the Coop Program over ordinary employment are derived by the employer supplementing and complementing classroom education by providing valuable experience and training in the chosen area of expertise.

Additional information on program requirements is available in the Graduate Studies Office.

OBJECTIVE: PH.D. IN BUSINESS ADMINISTRATION

The doctoral program is designed to develop scholars with the ability to teach and conduct independent research in various areas of business administration. The program prepares students for careers as creative teachers and researchers by providing thorough preparation in the theory and practice of business administration. The curriculum emphasizes the rigorous analytical skills needed to make meaningful contributions in fields of business. Graduates will assume significant roles in the world's educational and research institutions through the dissemination of knowledge in the classroom and the publication of research in journals and books and add significantly to the body of knowledge in their chosen fields.

Coursework is offered in the following areas: accounting, banking and finance, business economics, business policy/strategic management, business statistics, personnel/human resource management, insurance and risk management, international business management, investments and securities, labor/industrial relations, management information systems, management sciences, marketing management and research, organizational behavior, organizational theory, production/operations management, real estate, small business management and ownership, and taxation. Coursework in these areas of study supports the following major fields: Accounting, Economics, Finance, Information Systems, Management, Management Sciences, and Marketing.

ADMISSION

Admission is competitive and the attainment of a specific set of minimum qualifications does not assure admission. Instead, admission is granted to the candidate deemed to be most qualified to achieve success. In general, all applicants must:

1. Meet the admission criteria established by the Graduate School.
2. Have completed at least 30 hours of master's level graduate work in an appropriate field with a grade point average of 3.4 or higher.
3. Have achieved a satisfactory score on the Graduate Management Admissions Test and satisfactory scores on both the verbal and quantitative portions of the examination.

In addition, students for whom English is a second language must submit satisfactory scores on the Test of Spoken English (TSE-A) and the Test of English as a Foreign Language (TOEFL).

BUSINESS ADMINISTRATION

DEGREE REQUIREMENTS

All students must complete work in three fields: a major (dissertation) field, a minor field, and a research field. A minor field may be external to the College of Business Administration. Examples are industrial engineering, mathematics, computer science, sociology, and psychology. The student must petition for approval of an external minor field.

The following minimum semester hours must be included in the student's Program of Study.

	Minimum Semester Hours
Business Foundation	*
Major Field	18**
Minor Field	12**
Research Field	15**
Doctoral Research Colloquium	4
Dissertation	18

*From 0-30 hours depending upon the student's background at the time of admission to the doctoral program.

**Previous equivalent advanced coursework may be accepted.

RESIDENCE REQUIREMENTS

Each student enrolled in the doctoral program must enroll for and successfully complete a minimum of 15 hours in one 12-month period prior to completion of the comprehensive examinations. Each student must enroll for at least 12 hours every year. All students enrolled in the program must successfully complete all coursework and comprehensive examinations within a maximum of 60 months from initial enrollment in the program. A minimum of 24 graduate hours in residence, excluding dissertation, are required for all candidates.

DIAGNOSTIC EVALUATION

A diagnostic evaluation is required in the student's first year of coursework. The diagnostic evaluation must be completed before registration for the third semester of coursework. The Supervisory Committee Chair will conduct the diagnostic evaluation in consultation with other committee members. Upon completion of the evaluation, the Supervisory Committee will recommend either continuation or discontinuation in the program. If the student is continued in the program, the Supervisory Committee will prescribe curricula to prepare the student for comprehensive examinations.

COMPREHENSIVE EXAMINATIONS

Students must demonstrate competence in their major, minor, and research fields by the successful completion of written examinations. Written comprehensive examinations in each field will be given in February and October of each year. A student is eligible for a written comprehensive examination when that student has completed (1) the Business Foundation with a GPA of at least 3.25 and (2) prescribed coursework in the field.

If a student fails a written comprehensive examination and continues in that field, the examination must be retaken within a period of not more than 13 months. If a student fails a second comprehensive examination in a major or research field, that student will not be permitted to continue in the program. If a student twice fails a written comprehensive examination in a minor field, that student will not be permitted to continue in that field.

A student must complete all written examinations within 25 months or retake any examinations which fall outside the 25-month period.

When a student successfully completes all the written examinations, that student is scheduled for a comprehensive oral examination which is administered by the student's Supervisory Committee. A student who fails the comprehensive oral examination will be given a second oral examination within 12 months of the date of the first examination. If a student fails the second comprehensive oral examination, that student will not be permitted to continue in the program.

Upon successful completion of written and oral comprehensive examinations, the student is admitted to candidacy.

DISSERTATION

The Dissertation Committee consists of a minimum of five members: two from the student's major field, one each from the minor and research fields, and one other member. The chair of the Dissertation Committee must be from the major field.

Following completion of the comprehensive examinations, student will be required to enroll for at least nine hours of dissertation each regular semester and at least six hours each summer until completion of the dissertation. Students must register for a minimum total of 18 semester hours of dissertation and must be enrolled for a minimum of nine hours of dissertation in the semester in which they defend the dissertation.

The dissertation must be completed within four years of the oral comprehensive examination.

The grade of R (research in progress) is a permanent grade. An incomplete (the grade of X) cannot be given in a course which is graded R. To receive credit for an R-graded course the student must continue to enroll in the course until a passing grade is received. Three-hour thesis and three- and six-hour dissertation courses are graded R/F only. The grade of P (required for graduation) can be received in six- or nine-hour thesis courses and nine-hour dissertation courses only. In the course listings below, R-graded courses are designated either "Graded P/F/R" or "Grade R." (See also this section entitled "R" GRADE in the catalog.)

BUSINESS ADMINISTRATION (BUSA)

5301. STATISTICS (3-0). Introduction to statistics, designed to prepare the student for quantitative analysis of business problems. Topics include probability, random variables, sampling distributions, confidence intervals, tests of hypotheses, multiple regression, analysis of variance, Bayesian inference, and nonparametric methods. May not be counted as an MBA foundation course or elective. Prerequisite: MATH 1315. \$15 computer fee.

5303. QUANTITATIVE ANALYSIS FOR BUSINESS ADMINISTRATION (3-0). Study of the methods of quantitative analysis used in business administration. Topics include matrix algebra, systems of linear equations, differential and integral calculus, linear programming, classical optimization, and a survey of management science models. Prerequisite: MATH 1315. \$15 computer fee.

5325. ADVANCED STATISTICAL METHODS IN BUSINESS ADMINISTRATION (3-0). Advanced topics in regression, correlation, experimental design, sampling methods, and other statistical methods with emphasis on their application to problems in the administration of operations. Prerequisite: BUSA 5301 or equivalent. \$30 computer fee.

5330. LEGAL ENVIRONMENT OF BUSINESS (3-0). Study, in a conceptual framework, of the ideas and social and political forces that have led to changes in the business legal environment and legal institutions including current and historical developments affecting the business corporation. Legal framework and ethical problems of managers in serving diverse interests studied in connection with modern social legislation affecting business.

5331. LAW OF INTERNATIONAL BUSINESS (3-0). General principles of law applicable to international business including case law, statutory law, treaties, administrative law, and international agreements.

5332. ENTREPRENEURSHIP AND ENTERPRISE DEVELOPMENT (3-0). Venture formation and development process. Student-chosen entrepreneurial activities are planned including the preparation of a business plan for a proposed enterprise and, to the extent possible, execution of the business plan. Additional course activities will include guest speakers, "live" cases, entrepreneurial simulation and testing and selective case presentations by student teams. Prerequisite: Permission of the instructor and Graduate Advisor.

5333. BUSINESS POLICY (3-0). Integration of the MBA curriculum into a cohesive whole. Treats the several elements of business administration by use of business policy cases and decision simulation methods. Satisfactory completion of this course fulfills the Comprehensive Examination requirement for MBA students. Prerequisite: must be taken in last semester or with permission of the Graduate Advisor.

5334. REAL PROPERTY LAW (3-0). Legal property theory underlying real estate transactions and relationships including estates and interests in land, conveyances, and mortgages.

5337. BUSINESS AND SOCIETY (3-0). Examination of the organizations of industry and commerce, government, labor, and other institutions within our society. Emphasis is on the total environment, and the social/political/legal/ethical implications of the interface.

BUSINESS ADMINISTRATION

5375. ADVANCED BUSINESS COMMUNICATION THEORY AND PRACTICE (3-0). Examines theory of effective oral and written communication. Discusses techniques for improved research, report writing, and presentation. Also stresses presentation media and computer graphics for reports and presentations. \$10 computer fee.

5389, 5689, 5989. INDEPENDENT STUDIES IN MILITARY ACQUISITION. This course is reserved for military officers in the Training with Industry or I-Grad programs at UT Arlington. Studies consist of an acquisition practicum with training at an assigned agency and a required seminar at UT Arlington.

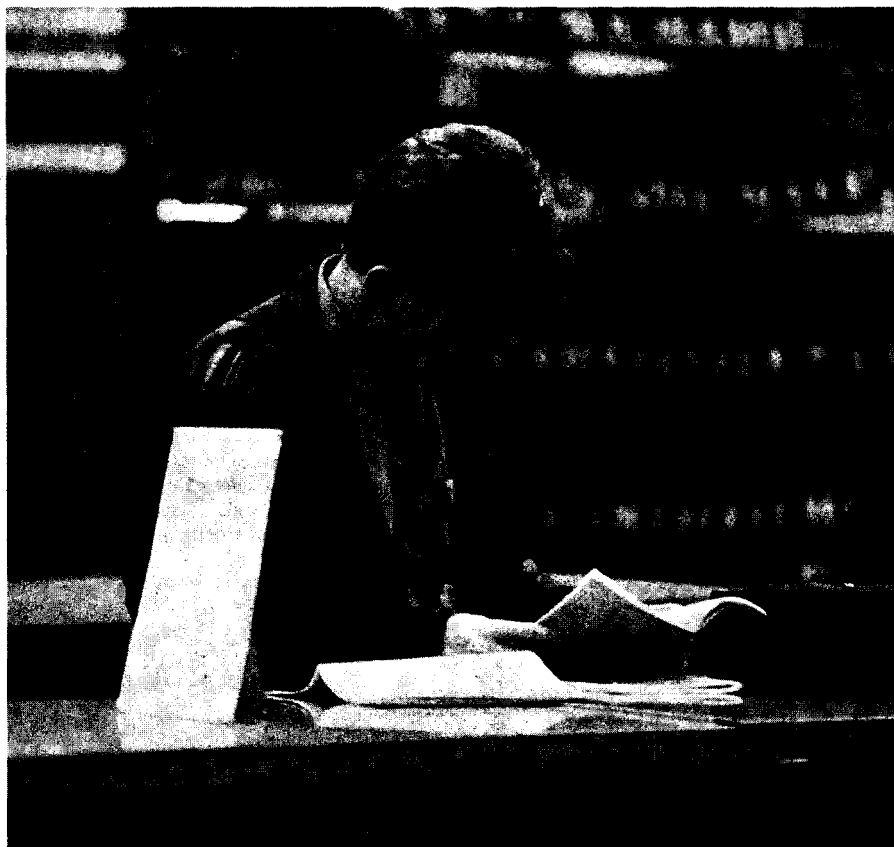
5398, 5698. THESIS. 5398 graded R/F only; 5698 graded P/F/R. Prerequisites: BUSA 5325, 5391 and approval of Graduate Advisor. \$20 computer fee.

DOCTORAL COURSES (BSAD)

6292. DOCTORAL RESEARCH COLLOQUIUM (2-0). Review of the research process and contemporary developments in the methodology and design of empirical research in the major fields of study represented in the doctoral program. May be repeated for credit.

6399, 6699, 6999. DISSERTATION. 6399, 6699 graded R/F; 6999 graded P/F/R.

For all other graduate courses, see course listings for the following departments: Accounting, Economics, Finance and Real Estate, Information Systems and Management Sciences, Management, and Marketing. If a course is not approved for the MBA program, a statement to that effect is included in its course description. 6000-level courses may not be taken without the permission of the Graduate Advisor and/or instructor.



Program in CITY AND REGIONAL PLANNING

Area of Study

City and Regional Planning

Degree

M.C.R.P.

Master's Degree Plans: Thesis and Thesis Substitute

Graduate Advisor and

Program Coordinator: Robert L. Wegner, Sr. 513 University Hall 273-2067

Program Graduate Faculty:

Professors Cornehl, Geisel, Goldsteen
Associate Professors Anjomani, Wegner
Assistant Professors Arvidson, Bright

Interdisciplinary Graduate Faculty:

Professors Cole, Taebel
Associate Professors Hissong, Tees, Wyman
And graduate faculty representatives from Architecture, Landscape Architecture,
Sociology, Civil Engineering, Geology, Economics, and Finance and Real
Estate.

OBJECTIVE

The Master of City and Regional Planning (MCRP) is a professional program accredited by the Planning Accreditation Board of the American Institute of Certified Planners and the Association of Collegiate Schools of Planning. The objective of the program is to educate and train competent professionals qualified for a role in guiding the development and growth of the city and region through public agencies or the private sector, including consulting, environmental, land development, and real estate firms. After graduation and work experience, The University of Texas at Arlington Planning Program graduates are qualified to become key members of public agencies and private firms.

In this structured degree program, graduate students study the scope, issues and interdisciplinary relationships in city and regional planning with an emphasis in one of the following three areas: 1) Environmental and Land Development Planning; 2) Policy Planning; 3) Urban Analysis, Regional, and Transportation Planning. Academically, the program equips the student with knowledge of problem-solving techniques, practical skills, and understanding of the dynamics of change, implementation methods, design controls, and the capability to evaluate implications of alternative solutions. Courses are structured to provide students with a planning education comprised of theory, method, skills, concepts, experience, practice and field orientation to the profession of planning in a number of specific planning fields and subject areas.

Since each student's interest and academic background will vary, guiding each student in developing a program respecting personal needs and goals is a foremost consideration. To achieve this purpose, curriculum for the area of emphasis permits variation in the general structure of each degree program. Specialization in planning is obtained through specific subject areas and faculty-guided course selection and directed coursework.

Practical application of theory and research are important aspects of the educational process, and are facilitated through formal and informal research activities at the School of Urban and Public Affairs. Research activities and centers with the School and University are equipped to investigate planning problems and planning opportunities with staff recruited from the faculty and student body. The centers are: Center for Criminal Justice Research and Training; Environmental Research and Design Center; Center for Social Research; Construction Research Center; Environmental Institute for Technology Transfer, and

CITY AND REGIONAL PLANNING

Center for Geoenvironmental and Geoarcheological Studies. These centers were established to permit the student a work and study atmosphere where professional responsibilities in group participation can be experienced.

DEGREE REQUIREMENTS

A 48-credit-hour program is composed of:

21 hours of planning core courses

15 hours of area of emphasis and subject area courses

12 hours of electives and the required hours for thesis or thesis substitute (professional report or final exam) which will include six hours for thesis or a maximum of three hours for professional report and practicum or work experience.

The practicum, as a working experience in an agency, center, research group or office, must be approved by the Graduate Advisor.

Emphasis of Program: Substantive knowledge in planning, combined with areas of emphasis, specialization, and technical and analytical focus, is the basis for providing a new professional capable of innovation in guiding dynamic environment. Analytical research methods, empirical research skills, and computer applications are emphases of our professional education in planning at The University of Texas at Arlington.

Methods and Analytical Orientation: It is our understanding that substantive planning coursework and experience, areas of emphasis, and specialization along with a methods and analytical emphasis will provide those skills necessary to guide and control the future city, region, and nation.

Unique Planning Emphasis and Specialization: The MCRP Program allows for students with specific interests in areas of academic emphasis to submit their intention to the Planning Faculty Committee. While the required program of courses are established, graduate students entering the program may further specialize. Formal application to the Planning Faculty Committee should be made for area of emphasis and subject interest specialization.

Planning Core Courses

These courses are required for all students:

CIRP 5301 Planning Theory

CIRP 5310 Urban Structure and Economic Methods, Models and Simulation

CIRP 5314 Advanced Studies in Planning Communication Skills

CIRP 5317 Research and Forecasting Methods in City and Regional Planning

CIRP 5318 Techniques of Planning Analysis

And two courses from CIRP 5330, CIRP 5331, CIRP 5332, and CIRP 5333 (the Project Planning courses)

The MCRP Program permits three major areas of emphasis: Environmental and Land Development Planning, Policy Planning, and Urban Analysis, Regional, and Transportation Planning. Each area of emphasis includes a number of subject areas which allow students to develop a study plan tailored to individual interests within the broader field and profession of City and Regional Planning. Other areas of emphasis are encouraged with approval of the Graduate Advisor. This includes a generalized plan of study with no emphasis.

The **Environmental and Land Development Planning** emphasis is focused on the planning and development of land and structures in urban areas of the United States. Specific subject areas within this emphasis are concerned with land-use planning, urban design, real estate and land development, growth management, and environmental management and planning.

In addition to the required planning core and the thesis or thesis substitute, two courses will be required in this area of emphasis: 5304 (Plan Implementation and Legal Controls); and 5305 (Land Use Management and Development). The student in consultation with the Graduate Advisor will select three additional courses from:

CIRP 5302 Housing Policies, Programs, and History

CIRP 5306 Urban Redevelopment

CIRP 5309 Transportation/Land Use Methods, Models, and Simulation

CIRP 5311 Elements of Urban Design

CIRP 5312 Strategic Planning and Management

CIRP 5313 Urban Growth Policies

CIRP 5315 Transportation Policies, Programs, and History

CIRP 5316 Planning Law and Regulatory Systems

CITY AND REGIONAL PLANNING

CIRP 5319 Agencies of Planning and Administration
CIRP 5340 Land Suitability Analysis and Site Planning
CIRP 5341 Environmental Regulations: Laws and Planning
CIRP 5342 Urban Environmental Management and Policy
CIRP 5345 Planning and Real Estate Development
CIRP 5350 Environmental Planning
CIRP 5351 Environmental Impact Assessment
CIRP 5352 Advanced Techniques of Planning Analysis
CIRP 5358 Natural Resources Planning
CIRP 5359 Water Resources Planning
CIRP 5361 Comprehensive Planning

The **Policy Planning** emphasis is devoted to the field of public agency planning in a number of policy areas. Subject areas include social policy, economic development, housing and community development, and transportation.

In addition to the required planning core and the thesis or thesis substitute, two courses will be required in this area of emphasis: 5316 (Planning Law and Regulatory Systems); and 5322 (Urban and Regional Economic Development). The student in consultation with the Graduate Advisor will select three additional courses from:

CIRP 5302 Housing Policies, Programs, and History
CIRP 5303 History of American City Planning
CIRP 5305 Land Use Management and Development
CIRP 5306 Urban Redevelopment
CIRP 5307 Planning for Developing Countries
CIRP 5312 Strategic Planning and Management
CIRP 5313 Urban Growth Policies
CIRP 5315 Transportation Policies, Programs, and History
CIRP 5319 Agencies of Planning and Administration
CIRP 5324 Community Development
CIRP 5340 Land Suitability Analysis and Site Planning
CIRP 5341 Environmental Regulations: Laws and Planning
CIRP 5344 Human Service Planning
CIRP 5345 Planning and Real Estate Development
CIRP 5347 Urban Problems
CIRP 5352 Advanced Techniques of Planning Analysis
CIRP 5354 Housing Finance and Planning
CIRP 5362 Urban Diversity

The **Urban Analysis, Regional Planning, and Transportation** emphasis is oriented toward information management and utilization of computers in all aspects of planning. This prepares interested students for data management, urban modeling, economic analysis, and other quantitative careers in planning. Subject areas include regional planning, regional science, transportation and land use modeling, computer application in planning, and international planning and regional development.

In addition to the required planning core and the thesis or thesis substitute, two courses will be required in this area of emphasis: 5320 (Introduction to Microcomputers for Planning and Policy Analysis); and 5352 (Advanced Techniques of Planning Analysis). The student in consultation with the Graduate Advisor will select three additional courses from:

CIRP 5302 Housing Policies, Programs, and History
CIRP 5307 Planning for Developing Countries
CIRP 5309 Transportation/Land Use Methods, Models, and Simulation
CIRP 5312 Strategic Planning and Management
CIRP 5315 Transportation Policies, Programs, and History
CIRP 5319 Agencies of Planning and Administration
CIRP 5321 Computer Graphics and Mapping for Urban Analysis
CIRP 5322 Urban and Regional Economic Development
CIRP 5340 Land Suitability Analysis and Site Planning
CIRP 5345 Planning and Real Estate Development
CIRP 5356 Geographic Information Systems

CITY AND REGIONAL PLANNING

A study plan (listed with subject area classification) must be submitted to the Graduate Advisor. The study plan will be the student's degree plan and will be placed in the student file.

JOINT M.C.R.P. AND M.ARCH. DEGREE PROGRAM

Students in the joint program may earn both the Master of City and Regional Planning and the Master of Architecture degrees. Applicants must meet the admission requirements of both the MCRP and the MArch programs. City and Regional Planning students wishing to earn the MArch degree will be required to take Path A in the architecture program unless they have earned an undergraduate degree in architecture which will allow CIRP applicants to take Path B. Programs of study will follow both master's programs, with all of the unspecified elective courses in the MArch program to be taken in the MCRP program. In addition to architectural core courses, the remainder of coursework will be in the City and Regional Planning program with a required thesis proposal to be jointly approved by the City and Regional Planning program and the Architecture Program. The thesis supervisor should be selected from CIRP or the School of Architecture, and committee members could be selected from both faculties.

Course selection and programs of study should be designed with the assistance of the Graduate Advisors in both areas. Only in special instances may students select the thesis substitute plan of the MCRP program. The successful candidate will be awarded both degrees rather than one joint degree.

DUAL DEGREE PROGRAM

Students in city and regional planning may participate in one of two dual degree programs whereby they can earn a Master of City and Regional Planning and 1) a Master of Science in Social Work, or 2) a Master of Public Administration. By participating in a dual degree program, students can apply a number of semester hours jointly to meet the requirements of both degrees, thus reducing the total number of hours which would be required to earn both degrees separately. The number of hours which may be jointly applied ranges from nine to 18 hours subject to the approval of Graduate Advisors from both programs. To participate in the dual degree program, students must make separate application to each program and must submit a separate Program of Work for each degree. Those interested in the dual degree program should consult the appropriate Graduate Advisor(s) for further information on course requirements. See also the statement on Dual Degree Programs in the general information section of the catalog.

The grade of R (research in progress) is a permanent grade. An incomplete (the grade of X) cannot be given in a course which is graded R. To receive credit for an R-graded course the student must continue to enroll in the course until a passing grade is received. Three-hour thesis and three- and six-hour dissertation courses are graded R/F only. The grade of P (required for graduation) can be received in six- or nine-hour thesis courses and nine-hour dissertation courses only. In the course listings below, R-graded courses are designated either "Graded P/R" or "Grade R." (See also the section entitled "R" GRADE in this catalog.)

CITY AND REGIONAL PLANNING (CIRP)

5300. INTRODUCTION TO URBAN PLANNING (3-0). Overview of contemporary city and regional planning activities. Reviews the broad range of theoretical and practical skills and knowledge required of the professional planning practitioner.

5301. PLANNING THEORY (3-0). Various theories of planning. Planning as: an individual phenomenon (individual rationality, decision theory), an organizational phenomenon (the planning process, organization theory, communications theory), a social phenomenon (utopias, ideologies and systems, social planning and social reform, general systems theory), local planning in the United States (politics and policies, professional planning).

5302. HOUSING POLICIES, PROGRAMS, AND HISTORY (3-0). Examines the development of housing policies and programs to implement those policies, as well as private sector activities that affect the provision of housing.

5303. HISTORY OF AMERICAN CITY PLANNING (3-0). Explores the history of city planning, examining the nature of planning practice, the development of the planning profession, and the changing urban environment in which planning has occurred.

- 5304. PLAN IMPLEMENTATION AND LEGAL CONTROLS** (Zoning, Subdivision Ordinances, Capital Budgets) (3-0). Development of skills in document preparation including proper methods in preparing the usual development controls of zoning ordinances, subdivision regulations, and capital budgets and other municipal codes and regulations.
- 5305. LAND USE, MANAGEMENT AND DEVELOPMENT** (3-0). Assesses land use, management and development and considers new directions. Relates comprehensive planning, environmental management, and land use.
- 5306. URBAN REDEVELOPMENT** (3-0). Study of the problems and achievements of the public and private sectors in urban redevelopment.
- 5307. PLANNING FOR DEVELOPING COUNTRIES** (3-0). History, theories, methods, and process of development planning introduced on a regional and national scale; comparative international planning is the focus and case studies are analyzed for their specific planning achievement.
- 5309. TRANSPORTATION/LAND USE METHODS, MODELS, AND SIMULATION** (3-0). Overview of transportation/land use with specific transportation models and simulation methods; topics include economic theory of travel demand, land use models, UTPS framework for travel demand estimation, disaggregated travel demand models and abstract mode models.
- 5310. URBAN STRUCTURE AND ECONOMIC METHODS, MODELS, AND SIMULATION** (3-0). Overview of urban economics along with pertinent economic models and simulation techniques. Regional science and economic research findings in relation to planning. Fiscal Impact Analysis and its application to development projects.
- 5311. ELEMENTS OF URBAN DESIGN** (3-0). A study of contemporary city and urban form will emphasize visual-spatial qualities, social need, and economic linkages. Environmental designed will be analyzed including street furniture, residential and commercial development, institutional development, and urban structure. Studies will include systematic processes, methods, and techniques appropriate to solving contemporary urban design problems.
- 5312. STRATEGIC PLANNING AND MANAGEMENT** (3-0). Readings and case studies of strategic planning and management in the public sector; application of principles to an actual situation, involving stakeholder identification, environmental scanning, and formulation of mission statements, goals, and strategies.
- 5313. URBAN GROWTH POLICIES** (3-0). Study of the political, societal and physical policies involved in urban growth.
- 5314. ADVANCED STUDIES IN PLANNING COMMUNICATION SKILLS** (3-0). Techniques of presentation, use of graphic tools, and recent developments of media advances.
- 5315. TRANSPORTATION POLICIES, PROGRAMS AND HISTORY** (3-0). Transportation and related programs and policies in relation to city development and housing patterns. Interdependencies of land use, building development, and social change are explained as transportation-related. Also offered as URBA 5314; credit will be granted only once.
- 5316. PLANNING LAW AND REGULATORY SYSTEMS** (3-0). Presentation of planning law in relation to the American political system. Examination of case briefs for their content, applicability, and background. Overview of legal and political aspects of planning. Also offered as URBA 5334; credit will be granted only once.
- 5317. RESEARCH AND FORECASTING METHODS IN CITY AND REGIONAL PLANNING** (3-0). Context and role of data and analysis in planning; use of computer in planning; use of descriptive and inferential statistical techniques in planning. Topics will include Probability and Sampling theory, hypothesis testing, table analysis, analysis of variance, bivariate and multivariate regression analysis. Emphasis on applying these techniques to real world planning problems. \$10 computer fee.
- 5318. TECHNIQUES OF PLANNING ANALYSIS** (3-0). Various methods form the bases for quantitative and non-quantitative exercises in Regional Planning. Includes population projection, project evaluation, land use and transportation models, economic base analysis, input-output, and shift and share. Prerequisite: consent of instructor. \$10 computer fee.
- 5319. AGENCIES OF PLANNING AND ADMINISTRATION** (3-0). Examines contemporary office practice and the functions involved in running public agencies (e.g., planning departments) or private firms (e.g., consulting organizations).

CITY AND REGIONAL PLANNING

- 5320. INTRODUCTION TO MICROCOMPUTERS FOR PLANNING AND POLICY ANALYSIS (3-0).** Computer techniques studied as basis for advanced analysis and data manipulation. Topics include spreadsheet (LOTUS 1-2-3), data base management systems, word processing, computer graphics and mapping. Also offered as URPA 5349; credit will be granted only once. \$10 computer fee.
- 5321. COMPUTER GRAPHICS AND MAPPING FOR URBAN ANALYSIS (3-0).** This laboratory course provides an introduction to the techniques and applications of computer graphics and mapping for presenting socio-economic information and graphic and spatial form. Included are bar and pie charts and methods of producing maps of social data through utilization of computer packages such as AUTOCAD, SASGRAPH, etc. \$10 computer fee.
- 5322. URBAN AND REGIONAL ECONOMIC DEVELOPMENT (3-0).** Seminar in subnational economic development programs in the U.S. These programs and their criticisms examined in depth with emphasis on a search for viable solutions via focus on national concerns and individual case studies.
- 5324. COMMUNITY DEVELOPMENT (3-0).** Focuses on problems of neighborhood development and revitalization. Decline of economic opportunity in central cities and deterioration of housing and neighborhoods analyzed. Federal, state, and local policies, with grass roots initiative evaluated for effectiveness in promoting community stability. Also offered as URBA 5313; credit will be granted only once.
- 5330. PROJECT PLANNING (0-9).** Skills, practical experience, problem-solving methods and techniques in mapping, design, planning, and research projects. Studio and seminar for field studies in the practical application of city and regional planning. May be repeated as topic changes. \$5 lab fee.
- 5331. PROJECT PLANNING (0-9).** Skills, practical experience, problem-solving methods and techniques in mapping, design, planning, and research projects. Studio and seminar for field studies in the practical application of city and regional planning. May be repeated as topic changes. \$5 lab fee.
- 5332. PROJECT PLANNING (0-9).** Skills, practical experience, problem-solving methods and techniques in mapping, design, planning, and research projects. Studio and seminar for field studies in the practical application of city and regional planning. May be repeated as topic changes. \$5 lab fee.
- 5333. PROJECT PLANNING (0-9).** Skills, practical experience, problem-solving methods and techniques in environmental planning, pollution and contamination studies, mapping, design, planning and research projects. Studio and seminar for field studies in the practical application of city and regional planning. Required for the Hazardous Materials Management Certificate Program in the Environmental Institute for Technology Transfer. May be repeated as topic changes. \$5 lab fee.
- 5340. LAND SUITABILITY ANALYSIS AND SITE PLANNING (3-0).** Acquaints students with the land suitability analysis and site planning processes. How to incorporate environmental and ecological factors into designs, including soils, slope, drainage, vegetation, computer models, and related factors. \$5 computer fee.
- 5341. ENVIRONMENTAL REGULATIONS: LAWS AND PLANNING (3-0).** Federal, state, and local environmental regulations which have effect on the practice of city and regional planning. Specific articles, laws, and directives contrasted and compared to local city design and development controls. Subjects include CERCLA, RCRA, SARA, TSCA, OSH Act, among others.
- 5342. URBAN ENVIRONMENTAL MANAGEMENT AND POLICY (3-0).** Focuses on the physical environmental dimensions of urbanization including such factors as pollution, waste disposal, and land use; stresses the role of economic, social, and political institutions as these affect environmental quality of the city. Also offered as URBA 5317; credit will be granted only once.
- 5344. HUMAN SERVICE PLANNING (3-0).** Needs assessment, funding, agency management, priority setting, service providers, long range planning, and federal, state, local, private, public, and volunteer roles. Also offered as URBA 5333; credit will be granted only once.
- 5345. PLANNING AND REAL ESTATE DEVELOPMENT (3-0).** The goals, strategies, methods, and achievements of major participants in the urban land and building markets are examined. Land owners, speculators, real estate brokers, developers, bankers, lawyers, non-profit builders, and government agencies are studied, and some selected business tools include: market and feasibility analysis, appraisal techniques, proforma analysis, and others.
- 5347. URBAN PROBLEMS (3-0).** Specific urban problems examined in depth, traced to their historical origins to see how they or similar problems have been dealt with in other times and places. Students will then propose possible solutions to the problems in their contemporary form.

- 5350. ENVIRONMENTAL PLANNING (3-0).** Environmental issues and problems. Topics include basic ecological principles; development of the chemical industry and its effects on the environment; and the issues of quantitative risk assessment and human health effects.
- 5351. ENVIRONMENTAL IMPACT ASSESSMENT (3-0).** Analysis of impact assessment documents from a variety of projects; study of federal laws and regulations which govern the assessment process.
- 5352. ADVANCED TECHNIQUES OF PLANNING ANALYSIS (3-0).** An introduction to selected advanced techniques of planning analysis. Subjects include land use and transportation models, advance regression analysis using simultaneous-equation models, multivariate logit analysis and projection techniques.
- 5354. HOUSING FINANCE AND PLANNING (3-0).** Evaluation of the effect of state, local, and federal housing policy on the urban arena. Topics will be selected from federal subsidy programs, tax subsidies, operations of financial intermediaries, and related areas.
- 5356. GEOGRAPHIC INFORMATION SYSTEMS (3-0).** Introduction to GIS and the application of computer graphics systems in the storage, processing, and retrieval of geographic urban and regional information; case examples and related projects and issues of system management. \$10 computer fee.
- 5358. NATURAL RESOURCES PLANNING (3-0).** Issues and problems in environmental planning are analyzed with an emphasis on pollution control, comparisons of management options related to equity, cost, and ease of administration. Studies include the preparation of environmental impact statements, general methodologies, and limitations.
- 5359. WATER RESOURCES PLANNING (3-0).** Water resources planning and management are examined. Federal and state water resources policies are emphasized and analytical skills are taught on how to identify environmental programs and resource distribution.
- 5361. COMPREHENSIVE PLANNING (3-0).** Examines steps involved in the preparation of comprehensive plans for community development and growth management; selected examples of different types of contemporary comprehensive plans; and criteria for preparing "achievable" comprehensive plans.
- 5362. URBAN DIVERSITY (3-0).** Examines the growing spatial and social diversity of cities; how physical as well as socio-economic urban structures have fostered race, class, and gender inequalities; how urban policies have dealt with these inequalities; and what can be done to address these problems and the needs of traditionally disempowered groups.
- 5381, 5681. PRACTICUM.** Students will serve as staff assistants, aides, or apprentices in area agency or private planning offices. Placement in such offices will be as approved and arranged; and performance will be monitored by the Graduate Advisor or instructor in charge. Graded P/F/R.
- 5191, 5291, 5391. CONFERENCE COURSE.** Special subjects and issues as arranged with individual students and faculty members. May be repeated for credit. Graded P/F/R.
- 5193. MASTER'S COMPREHENSIVE EXAMINATION (1-0).** Directed study, consultation and comprehensive examination over coursework leading to thesis substitute for MCRP degree. Required of all thesis substitute students not enrolled in other courses during semester in which they plan to graduate. Graded P/F/R only.
- 5195-5695. SPECIAL TOPICS IN PLANNING.** Selected topics in City and Regional Planning. May be repeated for credit.
- 5397. PROFESSIONAL REPORT.** Final report.
- 5398, 5698, 5998. PLANNING THESIS.** 5398 graded R/F only. 5698 and 5998 graded P/F/R.

Program in CRIMINAL JUSTICE

Area of Study Criminal Justice *Degree* M.A.

Master's Degree Plans: Thesis, Thesis Substitute and Non-Thesis

Program Director: Robert L. Bing, III 434 University Hall 273-3318

Graduate Advisor: Mary G. Almore 437 University Hall 273-2661

Graduate Faculty:

Professor (Political Science) Stevens
Associate Professors (Sociology) Almore, Bing; (Political Science) MacKenna
And others as appropriate from the graduate faculties of the Departments of
Sociology and Political Science, and from the Schools of Social Work and
Urban and Public Affairs

OBJECTIVES

The program leading to the MA degree in criminal justice is a multidisciplinary one which offers a comprehensive examination of the criminal justice system, an exploration of deviant behavior, a foundation in research and statistics, and an opportunity to explore other relevant topics of interest to the student.

It is designed for:

1. Pre-professional students who wish to pursue a career in some aspect of criminal justice, or in a related field, and to develop the perspectives and knowledges appropriate to doing so;
2. In-service professionals who wish to enhance and broaden their knowledge in this and related areas of study;
3. Students — pre-professional or in-service — who wish to pursue further relevant post-graduate studies, whether academic or professional.

To meet these objectives, and to develop a broadly-educated student, the program offers several options.

The coursework (non-thesis) option is generally recommended for students who do not intend to pursue doctoral-level studies. Pre-professional students may be expected to include the practicum in their course of study or, alternately, to select the thesis-substitute option. That option, too, requires an internship/practicum (professional or pre-professional work experience in an appropriate setting), but also requires a subsequent thesis-level internship report.

The thesis option is generally recommended for students wishing to pursue doctoral level studies. For those without professional experience in the field, however, the thesis-substitute may be a desirable alternative.

With the approval of the Graduate Advisor, students may also use their elective hours to concentrate on a particular field of study, such as sociology or political science, or on a multidisciplinary approach to a particular focus, such as administration or research.

ADMISSION AND DEGREE REQUIREMENTS

The MA degree in criminal justice requires a minimum of 36 semester hours, regardless of the option selected, and includes 24 semester hours of required core coursework.

1. Core: CRJU 5301, CRJU 5307, CRJU 5309, CRJU 5319, CRJU 5327, CRJU 5332, and CRJU 5380, plus any one of the following: SOCI 5303 or SOCI 5304 or SOCW 5322 or URBA 5360 or URBA 5362.
2. Electives: The number of semester hours available for electives ranges from a minimum of 6 to 12, depending on the option selected (thesis, thesis-substitute, coursework). Ordinarily, elective hours are taken in areas of particular interest to the individual student, with the advice and approval of the Graduate Advisor.

All candidates for the graduate degree must pass a final comprehensive examination, written, oral, or both written and oral. The scope, content, and form of this examination will be determined by the student's supervising committee.

The overall admission and degree requirements for the MA in criminal justice conform to those of the Graduate School as delineated elsewhere in this catalog and it is incumbent upon the applicant/student to be aware of, and to follow, the procedures and regulations in the Graduate Catalog. More specific information regarding the graduate program in criminal justice is available from the program's Graduate Advisor.

DUAL DEGREE PROGRAM

Students in criminal justice may participate in one of three dual degree programs whereby they can earn a Master of Arts in Criminal Justice and 1) a Master of Science in Social Work, 2) a Master of Arts in Political Science, or 3) a Master of Public Administration. By participating in a dual degree program, students can apply a number of semester hours jointly to meet the requirements of both degrees, thus reducing the total number of hours which would be required to earn both degrees separately. The number of hours which may be jointly applied ranges from nine to 18 hours, subject to the approval of Graduate Advisors from both programs.

To participate in the dual degree program, students must be admitted to each program and must submit a separate Program of Work for each degree. Those interested in a dual degree program should consult the appropriate Graduate Advisor(s) for further information on course requirements. See also the statement on Dual Degree Programs in the general information section of this catalog.

The grade of R (research in progress) is a permanent grade. An incomplete (the grade of X) cannot be given in a course which is graded R. To receive credit for an R-graded course the student must continue to enroll in the course until a passing grade is received. Three-hour thesis and three- and six-hour dissertation courses are graded R/F only. The grade of P (required for graduation) can be received in six- or nine-hour thesis courses and nine-hour dissertation courses only. In the course listings below, R-graded courses are designated either "Graded P/F/R" or "Graded R." (See also the section entitled "R" GRADE in this catalog.)

CRIMINAL JUSTICE (CRJU)

5301. THE ADMINISTRATION OF JUSTICE (3-0). Examination of administrative practices and procedures in criminal justice agencies/institutions. Emphasis on the administrative structure of various components of criminal justice system and on functioning and interrelationships of these units within the total criminal justice process. Students expected to select one area of administration for special study. Formerly CRJU 5315; credit will not be granted for both 5301 and 5315.

5307. DEVIANT BEHAVIOR (3-0). Examination of construct of deviance from historical and contemporary frames of reference. Attention is given both to diverse theoretical formulations and to applied aspects, particularly in dynamics of contemporary societal responses to deviancies including crime and delinquency.

5309. RESEARCH AND STATISTICS IN CRIMINAL JUSTICE (3-0). Examination of research methodology and statistical analysis. Special emphasis on methods and techniques for conducting research in criminal justice, including a review of problems encountered in sampling and survey research, field research, public policy implementation, and program evaluation.

5318. CRIMINAL JUSTICE PERSONNEL ADMINISTRATION (3-0). Personnel administration and management in criminal justice agencies and institutions; analyzes functions of recruitment, selection, hiring, placement, evaluation, dismissal, benefits systems, minority recruitment, training, education, promotion, career development, and retirement.

5319. ADVANCED LAW ENFORCEMENT PRINCIPLES AND PRACTICE (3-0). Analyzes the problems, practices, and philosophies of law enforcement in contemporary society. Students expected to give special attention to particular areas such as personnel selection, police-community relations, crisis intervention, patrol innovations.

5327. JUDICIAL AND CONSTITUTIONAL PROCESSES (3-0). Examination of the structure, functions, and operations of the courts, with special attention to contemporary constitutional issues and their impact on the criminal justice process.

CRIMINAL JUSTICE

5332. CORRECTIONAL THEORY AND PRACTICE (3-0). Examination of social, psychological, political, and historical bases of interventions in the control and disposition of offenders. Emphasis on contemporary policies, practices, and problems in institutional, semi-institutional, and community-based corrections.

5370. PRACTICUM (3-0). Professional or pre-professional experience in a criminal justice related agency or institution with the approval and direction of the student's supervising professor; intended for non-thesis option students who do not have professional experience related to criminal justice. Graded P/F/R.

5380. CRIMINAL JUSTICE SEMINAR (3-0). Synthesis course for advanced graduate students. Special emphasis on examination of constructs of crime/criminals, justice, and systems. Requires individual research in area of particular concern to student. Graded P/F.

5393. TOPICS IN CRIME AND CRIMINOLOGY (3-0). May be repeated for credit as the topic changes.

5394. TOPICS IN JUSTICE ISSUES (3-0). May be repeated for credit as the topic changes.

5396. CONFERENCE COURSE IN CRIMINAL JUSTICE (3-0). Reading and research in a specialized area of criminal justice under the direction of a member of the graduate faculty. Graded P/F/R.

5397, 5697. INTERNSHIP/INTERNSHIP REPORT. Professional or pre-professional experience in relevant agency or institution with placement and work experiences approved and directed by student's supervising professor; intended for thesis-substitute students without related professional experience. Course credit requires writing internship report meeting standards of scholarship expected of traditional research theses. 5397 graded R/F only; 5697 graded P/F/R.

5398, 5698. THESIS. 5398 graded R/F only; 5698 graded P/F/R.



Center for PROFESSIONAL TEACHER EDUCATION

Area of Study
Education

Degrees
M.E.T.

Master's Degree Plans: Non-Thesis

Director: Charles W. Funkhouser

500 Hammond

273-2591

Graduate Advisor: Judy Reinhartz

Graduate Faculty:

Professors Funkhouser, Reinhartz

Associate Professors Hadaway, Vardell

Assistant Professors Jacobson, Kelly, Stetson

Graduate Faculty of the Center for Professional Teacher Education

OBJECTIVE

The Master of Education in Teaching (MET) degree is a broad-based program which provides an opportunity for elementary and secondary inservice teachers to continue developing effective teaching and administrative skills that are congruent with an expanding theoretical knowledge base and to specialize in related professional careers in school administration, reading, and supervision. The graduate program is designed to assist inservice teachers or those working on certification to implement effective practices and become leaders within their school settings. The MET prepares the graduate to self-evaluate and to better understand the linkage between the theory and practice of teaching. Each student's program of study is planned individually and provides academic specialization within the context of teaching. To meet the objectives of the MET, it is essential that each student develop a tentative program of study during the second semester of graduate school.

The program leading to the Master of Education in Teaching (MET) focuses on developing effective elementary and secondary teachers and professional leaders in the schools. The program of instruction includes professional and academic components. A flexible curriculum is offered and provides courses that support the teaching and administrative assignments of teachers in the elementary or secondary schools.

Graduate faculty in the Center for Professional Teacher Education and those in departments in the Colleges of Liberal Arts, Science, and Business Administration work closely with students to formulate programs of work that meet the students' professional objectives and goals of professional growth.

The applicant for the Master of Education in Teaching degree must meet the general requirements of the Graduate School, have a bachelor's degree with teacher certification, and have a teaching certificate or be simultaneously working toward certification. With the assistance of the Graduate Advisor, students are required to complete a tentative program of work during the second semester following admission to Graduate School. This program of work is filed in the Graduate School and may be modified as needed. The MET is comprised of a minimum of 36 semester hours and is a non-thesis degree. Candidates for the MET are required to pass a comprehensive examination over the candidate's graduate coursework.

PROFESSIONAL LEVEL CERTIFICATION

The Center for Professional Teacher Education also offers the graduate level programs leading to the Professional School Administration Certificate, the Professional Supervisor Certificate, and Reading Specialist Certification. The English as a Second Language, Gifted and Talented, and Early Childhood Endorsements are also available.

PROFESSIONAL TEACHER EDUCATION

School Administration

Requirements for the School Administration Certificate include a valid Texas teacher certificate, three years of acceptable teaching experience, a master's degree, minimum nine hours above the master's, passing the ExCET in school administration, and coursework including:

Common core area	9 hours
Supervision area	9 hours
Administration area	24 hours
Elective area	3 hours

A review of the candidate's transcripts by the graduate advisor will identify specific courses required.

Professional Supervisor Certificate

Requirements for the Supervisor's Certificate include a bachelor's degree, a valid Texas teacher certificate, three years of acceptable teaching experience, at least 45 hours of graduate coursework in supervision, instruction, and academic content including:

- EDUC 5330 Leadership in the Instructional Setting
- EDUC 5342 Effective Teaching Practices
- EDUC 5343 Supervision Practicum
- 36 semester hours in the resource areas, a Master of Education in Teaching degree, and the Supervisor's ExCET.

Reading Specialist Certification

Reading Specialist Certification requires a master's degree, a valid Texas teacher certificate, three years of acceptable classroom teaching experience, and passing the Reading Specialist ExCET. Course requirements for the Master of Education in Teaching with Reading Specialist Certification include:

Reading	18 hours
Professional Education	9 hours
Resource	6 hours
Elective	3 hours
Minimum Total	36 semester hours

English as a Second Language Endorsement

For completion of an Endorsement Program an individual must have a baccalaureate degree and a valid Texas teacher certificate. The candidate must complete the following applicable coursework:

- LING 5300 Introduction of the Study of Language
- LING 5327 Introduction to Psycholinguistics
- LING 5353 Methodology of Teaching English as a Second or Foreign Language
- LING 5354 Methods and Materials to Teach English as a Second or Foreign Language
- Student Teaching in the ESL classroom or one year of successful teaching experience in an ESL or Bilingual Education Program approved by the Texas Education Agency.

Gifted and Talented Endorsement

The all-level Gifted and Talented Endorsement may be added to any valid teacher certificate. The Gifted and Talented ExCET, when developed, will be required. The endorsement requires 15 hours of coursework including the following:

- EDUC 5370 Introduction to Gifted and Talented Children
- EDUC 5371 Measurement and Assessment of Gifted and Talented Children
- EDUC 5372 Methods, Materials and Curriculum for the Gifted and Talented Student
- EDUC 5373 Creativity: Theories, Models and Application
- EDUC 5374 Practicum (or two years of successful classroom teaching experience in a program for gifted and talented students).

Early Childhood Endorsement

The Early Childhood Endorsement is a 12 hour program which includes the following courses:

- EDUC 5317 Theories of Development and Learning in Early Childhood Education
- EDUC 5318 Early Childhood Kindergarten Education: Philosophy and Curriculum
- EDUC 5319 Early Childhood and Kindergarten Methods and Materials
- EDUC 5390 Conference course.

The grade of R (research in progress) is a permanent grade. An incomplete (the grade of X) cannot be given in a course which is graded R. To receive credit for an R-graded course the student must continue to enroll in the course until a passing grade is received. Three-hour thesis and three- and six-hour dissertation courses are graded R/F only. The grade of P (required for graduation) can be received in six- or nine-hour thesis courses and nine-hour dissertation courses only. In the course listings below, R-graded courses are designated either Graded P/F/R or Graded R. (See also the section entitled "R" Grade in this catalog.)

EDUCATION (EDUC)

- 5303. MATH AND SCIENCE IN THE ELEMENTARY SCHOOL (2-3).** The examination of instructional approaches, materials, current research, and media pertinent to teaching math and science in the elementary school; the organization of math and science content and the selection and implementation of instructional techniques which are compatible with cultural and ethnic backgrounds, and the physical and intellectual characteristics of each child. Prerequisites: EDUC 3306 and 3316. \$2 lab fee.
- 5304. SOCIAL STUDIES IN THE ELEMENTARY SCHOOL (2-3).** An examination of content, methods, current research, and learning theory appropriate for elementary social studies education. Special attention to methods that promote analytical and evaluative abilities necessary for participatory democracy in a culturally diverse society. Prerequisites: EDUC 3306 and 3316. \$2 lab fee.
- 5305. CURRICULUM DESIGN, IMPLEMENTATION, AND EVALUATION (3-0).** An examination of theory and research in curriculum development, implementation, and evaluation. Emphasis on current trends in the content areas.
- 5309. ADVANCED INSTRUCTIONAL STRATEGIES (3-0).** A study of advanced models of teaching including concept attainment, inductive thinking, inquiry, cognitive growth, non-directive group investigation, laboratory training, simulation and the training model. Research in teacher effectiveness and demonstration of various models will be required. (Credit will not be granted for both EDUC 4309 and 5309.)
- 5314. EFFECTIVE CLASSROOM INSTRUCTION (3-0).** Designed to provide teachers with skills and competencies based on research findings on effective teaching and instruction related to promoting student academic achievement. Includes identifying, developing, and practicing instructional variables that affect teacher performance and student learning tasks.
- 5315. RESEARCH PRACTICUM.** Directed practicum in student's teaching areas. The student will be assigned to a public school classroom for an extended field-based experience. This longitudinal experience will help students apply theory and research to practice. The student will be responsible for planning, instruction, and evaluation. A research project is required. Can be repeated for credit with permission. \$4 lab fee.
- 5317. THEORIES OF DEVELOPMENT AND LEARNING IN EARLY CHILDHOOD EDUCATION (3-0).** Human growth and development, including developmental anomalies, from birth through early childhood with emphasis on cognitive, social, emotional, and physical growth. Attention is given to current research regarding establishment of learning environments that foster development of the child's self-concept, cognitive competencies, oral language and literacy development, and positive social behaviors including tolerance of diversity among individuals and groups.
- 5318. EARLY CHILDHOOD AND KINDERGARTEN EDUCATION: PHILOSOPHY AND CURRICULUM (3-0).** An overview of the historical and philosophical influences of pre-kindergarten and kindergarten education and the current research perspectives on fostering educational environments conducive to development of the whole child. Attention is given to organization and implementation of a developmentally appropriate curriculum and formulating programs which extend and integrate learning experiences of young children, including the home-school relationship.

PROFESSIONAL TEACHER EDUCATION

- 5319. EARLY CHILDHOOD AND KINDERGARTEN METHODS AND MATERIALS (3-0).** Examination of the content, pedagogy, and materials that are developmentally appropriate for use in a culturally diverse early childhood setting. Organization and management of the learning environment, management of student behavior, diagnosis and evaluation of the learner in the affective, cognitive, and motor areas, and effective use of a variety of teaching/learning strategies including the use of technology and an integrated curriculum (e.g., language and literacy, mathematics, natural and social sciences, fine arts, health and safety).
- 5321. EDUCATIONAL RESEARCH (3-0).** Examination of basic concepts and procedures necessary for empirical research investigations within classroom contexts, experimental design, data collection and interpretation, and statistical analysis.
- 5329. CLASSROOM MANAGEMENT AND DISCIPLINE (3-0).** Analysis of the variables that affect teacher and student behavior in the classroom. Survey of effective strategies of classroom management and discipline based on contemporary research. Particular attention to individual student differences in settings such as gifted and talented, handicapped, and learning disabled.
- 5330. LEADERSHIP IN THE INSTRUCTIONAL SETTING (3-0).** Examination of current research on effective instructional organizations and classroom instruction in today's schools, on characteristics of school leadership, and on the role and function of the teacher as instructional leader. Topics include the essential components of instruction, developing instructional-management systems, evaluating student and teacher performance, assisting colleagues to monitor and improve instructional skills, school climate and leadership styles as they impact on school improvement.
- 5333. EXCEPTIONAL LEARNERS (3-0).** Learning styles and effective teaching strategies for exceptional learners. Applications of research on identification, assessment, teaching, and technology for the full range of exceptions including handicapped and talented and gifted.
- 5335. THEORIES OF TEACHING AND LEARNING (3-0).** Examination of theories of teaching and learning and their applications to elementary and secondary school contexts.
- 5340. EDUCATIONAL EVALUATION (3-0).** Various means of evaluating school systems and their communities, school personnel, and students. Includes accreditation standards, personnel appraisal, mandated testing of students, and a review of the purpose, description, special utility, standardization, reliability, validity, and strengths and weaknesses of tests commonly used in public schools.
- 5342. EFFECTIVE TEACHING PRACTICES (3-0).** Focus on an examination of the correlates of effective instruction/effective schools research, the restructuring movement, and technology and its role in instruction. This course is designed to provide teachers and those in supervisory roles with skills and competencies in the following areas: teacher evaluation (TTAS), site-based management, and campus plans.
- 5343. PRACTICUM IN SUPERVISION (1-20).** Directed practicum in supervision. The student will be assigned to a public school for field-based supervisory experience. Activities involved may include grant writing, campus planning, site-based management activities, and restructuring efforts as they relate to planning, instruction, and evaluation.
- 5370. INTRODUCTION TO GIFTED AND TALENTED CHILDREN (3-0).** Psychological characteristics of gifted and talented children. Introduction to identification techniques, educational programs, instructional approaches, and special problems.
- 5371. MEASUREMENT AND ASSESSMENT OF GIFTED AND TALENTED CHILDREN (3-0).** Tests, formal and informal measures, and systems for identification and selection of the gifted and talented student. Basic test construction theory, test interpretation, and test uses.
- 5372. METHODS, MATERIALS, AND CURRICULUM FOR THE GIFTED AND TALENTED (3-0).** Curriculum theory and curriculum design for the gifted student. Methodology for implementing practical and theoretical objectives for gifted instruction.
- 5373. CREATIVITY: THEORIES, MODELS, AND APPLICATION (3-0).** The concept of and current research on creativity, the nature and assessment of creative thinking, as well as methods of fostering creativity.
- 5374. PRACTICUM (1-5).** Participation in a gifted and talented setting supervised by a university and/or school district representative. A wide range of practical experiences will be emphasized. Graded P/F/R.
- 5380. DIVERSITY IN EDUCATIONAL SETTINGS (3-0).** Effective leadership, instruction, and management strategies for work in diverse educational settings. Designed to provide increased self-aware-

ness and insight into issues of diversity such as culture, ethnicity, exceptionality, gender, language, and socioeconomic status. Demographic issues along with urban and suburban educational settings will also be addressed.

5381. POLITICAL AND LEGAL ASPECTS OF EDUCATION (3-0). Focus on the legal foundation of public education, political theory, and application of political skills in working with school personnel, students, parents, and community organizations. The role of the law, court rulings, and the politics of school governance at the federal, state, and local levels will be addressed.

5382. FOUNDATIONS OF EDUCATIONAL ADMINISTRATION (3-0). Will address the various aspects of instructional leadership roles and responsibilities of central office as well as building level administrators and supervisors. Topics included will be history of educational administration, educational philosophy, the global understanding of administrative roles in urban and rural settings, and professional organizations, as well as an overview of educational reforms, site-based management, governance, instructional management, evaluation, exchanging ideas, making changes, coaching beginning teachers, mentoring of teachers and peers, and a diverse community.

5383. THE PRINCIPALSHIP (3-0). Role of the principal in the organization and administration of schools, personnel and facility management, instructional leadership, forecasting and planning, shared decision-making, legal problems, interpersonal skills, time management, conflict resolution, program evaluation, and community relations.

5384. RESOURCE MANAGEMENT IN EDUCATION (3-0). School finance, as well as auxiliary areas of resource management, will be addressed. The emphasis will be on the use of technology, alternative models of financing and budgeting, and sources of revenue from the federal, state, and local levels as well as from private sources. The course is designed to assist administrators in developing an understanding of the functions, operation, and evaluation of auxiliary services which support the educational program.

5388. EDUCATIONAL POLICY ISSUES IN THE PUBLIC SCHOOLS (3-0). Examination of positions on policy issues of importance in public education.

5389. ADMINISTRATIVE INTERNSHIP (1-15). Designed to provide prospective educational administrators job-related experiences under supervision in an appropriate educational setting. An approved professional study is designed in relationship to the intern's interest and past experiences. Can be repeated for credit with approval of advisor.

5190, 5290, 5390. SELECTED TOPICS IN EDUCATION (3-0). An examination of different topics related to education. This seminar may be repeated for credit as the topic changes.

5191, 5291, 5391. INDEPENDENT RESEARCH. Research for thesis substitute or equivalent over topic agreed upon between student and instructor. Can be repeated for credit with permission. Graded R.

READING (READ)

5316. PRACTICUM AND SEMINAR IN LITERACY LEARNING (2-1). Directed practicum in literacy learning. Seminar will be held with emphasis on classroom application of recent issues in literacy learning. This course should be taken as the last reading course in the sequence of graduate reading courses.

5325. CURRENT TRENDS IN LANGUAGE ARTS (3-0). Relationships between theory and practice in the field of reading and language arts at the elementary and secondary level. Emphasis on current trends and issues.

5345. CONTENT AREA READING AND WRITING (3-0). Explores methods of teaching reading, writing, and study skills in content area subjects.

5346. TEACHING THE WRITING PROCESS (3-0). Current research and theory on the writing process, how children develop as writers, the teacher's role, the learning environment, and motivation, assessment, and evaluation in writing.

5350. LITERACY ASSESSMENT (3-0). Assessment and diagnosis, both formal and informal, of reading and language arts learning.

5353. LITERATURE FOR CHILDREN AND YOUNG ADULTS (3-0). Selection, evaluation, and use of current literature published for children and young adults.

5354. MULTICULTURAL LITERATURE FOR CHILDREN (3-0). Study of literature for children and young adults which reflects the culture and experiences of African-Americans, Asian-Americans, Mexican-Americans, and Native Americans, among others. Consideration of selection guidelines, evaluation of literary quality as well as cultural authenticity, and teaching applications.

ENGINEERING MECHANICS

5355. EMERGENT LITERACY (3-0). Examination of the natural process of early literacy development: an overview of current theory/research, designing literacy learning environments, philosophy, organization and assessment; relationship between home and school; community and parental involvement.

5357. COMPARATIVE LITERACY PROGRAMS (3-0). An overview of diverse paradigms and instructional approaches for literacy learning from a national and international perspective; impact of socio-cultural variables on literacy programs, and exploration of learning/teaching processes from a cross-cultural perspective.

5361. LANGUAGE LEARNING: EDUCATIONAL PERSPECTIVES (3-0). Deals with the relationship between language acquisition and literacy, dialect, linguistics, culture; nature and definition of language; overview of linguistic science and language with pedagogical applications.

5390. SELECTED TOPICS IN READING (3-0). An examination of different topics each semester, with a focus on subjects related to reading, writing, oral language, and literacy.

Program in ENGINEERING MECHANICS

Area of Study

Engineering Mechanics

Degrees

M.S.

Master's Degree Plans: Thesis and Non-Thesis

Graduate Advisor: J. H. Gaines

211 Engineering

273-2603

Graduate Faculty:

Professors Gaines, Huang, Lawrence, Yuan

Associate Professors Joshi, Stanovsky

The doctoral program in Engineering Mechanics has been terminated and no new students are being admitted to the program. Students who were enrolled in the Engineering Mechanics doctoral program prior to July 1989 may complete the program providing they satisfactorily complete all the requirements for the degree, including the dissertation and dissertation defense, by August 1995.

OBJECTIVE

The graduate program in engineering mechanics is designed to provide students with an understanding of the fundamentals of mechanics and to prepare them for careers in technical areas where a thorough knowledge of mechanics is essential. Students desiring to study mechanics should have a high level of interest and aptitude in mathematics and analysis.

Candidates for a Master of Science degree in engineering mechanics may elect programs emphasizing solid mechanics, fluid mechanics, or dynamics and vibrations. The program is interdisciplinary. In addition to the engineering mechanics courses, applicable courses may be found in the areas of aerospace engineering, biomedical engineering, civil engineering, electrical engineering, mechanical engineering, materials science, and computer science.

ADMISSION REQUIREMENTS

Applicants for the master's degree who hold a baccalaureate in engineering must meet the general requirements of the Graduate School as stated in the catalog section entitled "Admission Requirements and Procedures."

Applicants not meeting all criteria will be admitted on provisional or probationary basis only under exceptional circumstances.

For applicants with no prior training in engineering, the same minimum criteria will apply and, in addition, their records will be reviewed in relation to the intended program of study. Probationary status with specific remedial work required may be a basis for acceptance of such applicants.

The acceptance of applicants who have already received a master's degree in engineering will be based on the above-mentioned minimum criteria and results of graduate work, including the master's thesis.

CONTINUATION

The Engineering Mechanics Graduate Program, in fulfillment of its responsibility to graduate highly qualified professional engineers, has established certain policies and procedures. In addition to the requirements of the Graduate School listed elsewhere, to continue in the program each engineering mechanics graduate student must:

1. Maintain at least a B (3.0) overall GPA in all coursework, and
2. Demonstrate suitability for professional engineering practice.

At such time as questions are raised by engineering mechanics graduate faculty regarding either of the above, the student will be notified and will be provided the opportunity to respond to the Committee on Graduate Studies in Engineering Mechanics. The Committee on Graduate Studies will review the student's performance and make a recommendation concerning the student's eligibility to continue in the program. Appeal of a decision on continuation may be made through normal procedures outlined in the section of this catalog entitled "Grievances Other than Grades."

DEGREE REQUIREMENTS

The general degree requirements for the Master of Science degree have been presented in other sections.

Prior to admission as a degree candidate, the student must have, as a minimum, credit for statics, dynamics, mechanics of materials, advanced calculus, differential equations, basic fluid mechanics, and thermodynamics. In addition, each student must consult the Graduate Advisor to plan his or her program of coursework and research.

The following coursework is required of all M.S. candidates:

1. EM 5311 Theory of Elasticity or EM 5324 Energy Methods in Applied Mechanics
2. EM 5391 Advanced Dynamics or EM 5323 Advanced Mechanical Vibrations
3. EM 5391 Experimental Mechanics or EM 5317 Structural Statics
4. Two additional courses (six credit hours) in engineering mechanics
5. Two approved courses (six credit hours) in mathematics.

All degree candidates are expected to obtain an approved program of work in the second full semester or upon completion of 12 hours of coursework.

Master of Science in Engineering Mechanics

The Master of Science Degree is ordinarily a research oriented program consisting of a minimum of six credit hours of thesis and a minimum of 24 credit hours in engineering mechanics and related areas. In some cases, with prior approval of the Engineering Mechanics Committee on Graduate Studies, it is possible to complete a master's program without thesis. For details on a non-thesis degree plan, consult the engineering mechanics Graduate Advisor.

The grade of R (research in progress) is a permanent grade. An incomplete (the grade of X) cannot be given in a course which is graded R. To receive credit for an R-graded course the student must continue to enroll in the course until a passing grade is received. Three-hour thesis and three- and six-hour dissertation courses are graded R/F only. The grade of P (required for graduation) can be received in six- or nine-hour thesis courses and nine-hour dissertation courses only. In the course listings below, R-graded courses are designated either "Graded P/F/R" or "Graded R." (See also the section entitled "R" GRADE in this catalog.)

ENGINEERING MECHANICS (EM)

5311. THEORY OF ELASTICITY (3-0). Analysis of stress and strain in elastic bodies; equilibrium and compatibility conditions; analysis of two dimensional problems. Prerequisite: permission of instructor.

5317. STRUCTURAL STATICS (3-0). Finite element method in the study of the static response of complex structures and of continua. Applications to field problems. Analytical methods emphasized, and digital computer applications undertaken. Prerequisite: EM 5311 or consent of instructor. Also offered as ME 5310. \$5 computer fee.

5318. STRUCTURAL DYNAMICS (3-0). Natural frequencies; forced and random response of complex structural systems studied through the use of the finite element method. Computational aspects of these problems discussed, and digital computer applications undertaken. Prerequisite: EM 5323 or consent of instructor. Also offered as ME 5311. \$5 computer fee.

5319. STRUCTURAL OPTIMIZATION (3-0). Application of nonlinear programming techniques to obtain optimum solutions to structural design problems while satisfying stress, displacement and natural frequency constraints; mathematical basis of constrained minimization algorithms; formulation of structural optimization problems; techniques for obtaining the gradient of the eigenvalue problem; evaluation of currently available nonlinear programming codes. Prerequisites: EM 5317 and permission of instructor.

5320. THEORY OF THIN ELASTIC SHELLS (3-0). Elements of differential geometry, basic assumptions and fundamental elastic shell equations for shells of arbitrary shape. Specific equations and stress resultants derived from the general formulation of cylindrical shells and shells of revolution. Prerequisites: EM 5311 and consent of instructor. Also offered as CE 6354.

5322. THEORY OF ELASTIC STABILITY (3-0). Elastic stability of bars, buckling of plates and shells. Both classical and numerical solutions included. Prerequisite: permission of instructor.

5323. ADVANCED MECHANICAL VIBRATIONS (3-0). Application of generalized coordinates and Lagrange equations. Free and forced vibrations of elastic systems including damping effects. Prerequisite: ME 4314 or equivalent.

5324. ENERGY METHODS IN APPLIED MECHANICS (3-0). Virtual displacements, minimum potential energy, principle of complementary energy. Castigliano's Theorem, action integral, variational principles. Hamilton's principles and Lagrange's equations. Applications to solve problems in stress analysis, elastic stability, vibration and related topics. Prerequisite: permission of instructor. Also offered as CE 5301.

5332. CONTINUUM MECHANICS (3-0). Study of the underlying physical and mathematical principles relating to the behavior of continuous media; relationship between fluid and solid mechanics. Also offered as ME 5312.

5333. FUNDAMENTALS OF COMPOSITES (3-0). Methods of analyzing the mechanical behavior of composite materials. Failure criteria discussed. Also offered as AE 5315, ME 5348, and MSE 5348.

5336. ANALYSIS OF COMPOSITE STRUCTURES (3-0). Anisotropic elasticity and laminate theory with thermal and hygrothermal consideration. Plates and panels of composite materials; static and dynamic analysis. Joining of composite materials structures. Fabrication and curing processes for advanced composites. Advanced topics. Prerequisite: consent of instructor. Also offered as AE 5325.

5191, 5391. ADVANCED STUDIES IN ENGINEERING MECHANICS. Topics selected from various branches of engineering mechanics, particularly those in which active research is being conducted. 5191 graded P/F/R; 5391 may be graded P/F. Prerequisite: permission of instructor or Graduate Advisor.

5398, 5698, 5998. THESIS. 5398 graded R/F only; 5698 and 5998 grade P/F/R. Prerequisite: 12 hours of advanced engineering mechanics and approval of Graduate Advisor.

6399, 6699, 6999. DISSERTATION. Preparation of a doctoral dissertation in engineering mechanics. 6399 and 6699 graded R/F only; 6999 graded P/F/R. Prerequisite: admission to candidacy for the Doctor of Philosophy degree.

Program in ENVIRONMENTAL SCIENCE AND ENGINEERING

Area of study

Environmental Science and Engineering

M.S., PhD.

Master's Degree Plans

M.S. (Thesis), M.S. (Non-Thesis)

Program Director: John S. Wickham

107 Geoscience 273-2987

Interim Graduate Advisor: Clinton Parker

440 Nedderman Hall 273-2665

Graduate Faculty:

Graduate faculty from participating departments in the College of Engineering, College of Science and the School of Urban and Public Affairs are involved in teaching and supervising graduate students' research. Specific Faculty contacts within these areas and members of the Graduate Studies Committee include:

Biology: J.P. Grover, R.F. McMahon, N.J. Smatresk, A.W. Smits

Chemistry & Biochemistry: E. Bellion, P.R. Girardot, Z.A. Schelly, R.L. Smith

Civil Engineering: V.K. Argento, A.P. Kruzic, C.E. Parker, S.R. Quasim

Geology: W.L. Balsam, B. Ellwood, B.L. Otto-Bliesner, D.F. Reaser

Urban and Public Affairs: E.M. Bright, J.B. Goldsteen

OBJECTIVE

The program in Environmental Science and Engineering is designed to provide a graduate student an integrated, multidisciplinary education, nurtured through a carefully tailored degree program requiring a breadth of understanding and mastery of a spectrum of scientific and engineering principles. Among the goals is to provide students who have earned engineering or science undergraduate degrees a common ground for interdisciplinary communication, an understanding of the environment, and competence in a discipline that will enable him or her to evaluate and solve complex environmental problems.

ADMISSION

All admission requirements established by the graduate School at UT Arlington and published in the Graduate Catalog are general requirements for all admissions. In addition, students without prior interdisciplinary work may be required to take appropriate leveling courses by the Graduate Studies Committee. Specific admission requirements are listed below.

Master's Degree

Unconditional admission:

1. A B.S. degree in science, math, or engineering
2. An overall GPA in the final 60 hours of undergraduate coursework of at least 3.0 on a 4.0 scale.
3. A minimum total score of 1000 on the verbal and quantitative portions of the Graduate Record Examination
4. For applicants whose native language is not English, a minimum score of 575 on the Test of English as a Foreign Language, or a score of 230 on the Test of Spoken English.
5. Favorable letters of recommendation from faculty familiar with the applicant's work.

ENVIRONMENTAL SCIENCE AND ENGINEERING

Doctoral Degree

Unconditional admission:

1. A Master's degree or at least 30 hours of graduate work in Environmental Science and Engineering, or one of the sciences, engineering or mathematics.
2. A minimum of 3.5 GPA on a 4.0 scale in graduate coursework.
3. A minimum total score of 1200 on the verbal and quantitative portions of the Graduate Record Examination.
4. For applicants whose native language is not English, a minimum score of 575 on the Test of English as a Foreign Language, or a score of 230 on the Test of Spoken English.
5. Favorable letters of recommendation from faculty familiar with the applicant's work.

DEGREE REQUIREMENTS

Master's Degree

Master of Science in Environmental Science and Engineering: All students take a 21 semester hour core of courses as follows:

- CE 5318 Physical-Chemical Processes I
- CE 5319 Physical-Chemical Processes II
- CE 5325 Biological Processes
- EVSE 5301 Environmental Systems I
- EVSE 5302 Environmental Systems II
- CIRP 5341 Environmental Regulations: Laws & Planning, or
CIRP 5340 Land Suitability Analysis and Site Planning
- CIRP 5350 Environmental Planning, or
URBA 5317 Urban Environmental Management & Policy

In addition to the core courses, the minimum requirements for the Master's degree with thesis include:

- 9 hours of electives
- 2 hours of EVSE seminar
- 6 hours thesis

In addition to the core courses, the minimum requirements for the Master's degree without thesis include:

- 15 hours of electives
- 2 hours of EVSE seminar

Doctoral Degree

Core requirements for the Master's degree listed above (or equivalents) will be required for all doctoral students. In addition, six hours of Engineering and three hours of Policy and Planning courses are required. These courses must be approved by the student's supervising committee and the engineering courses are to be selected from the following list:

- CE 5320 Solid Waste Management
- CE 5326 Environmental Toxicology for Engineers
- CE 5328 Air Pollution Control - Particulates
- CE 6324 Dispersion Modeling

Additional coursework will normally be required by the graduate studies committee and the student's dissertation committee. The course program will be designed to meet the student's professional and research goals.

Other requirements include:

1. Successful completion of the Diagnostic Examination at the end of the first year of residence.
2. Successful completion of the Comprehensive Examination, an oral defense of a research proposal to be pursued for the dissertation, and a specialization examination over areas of the student's proposed research.
3. Demonstration of proficiency in one foreign language or a research tool such as advanced computer skills, statistics, or operations research.
4. Successful defense of the dissertation and acceptance of the dissertation by the supervising committee.

ENVIRONMENTAL SCIENCE AND ENGINEERING (EVSE)

5100, 5200, 5300. SELECTED TOPICS IN ENVIRONMENTAL SCIENCE AND ENGINEERING. May be repeated for credit when topic changes.

5301. ENVIRONMENTAL SYSTEMS I (3-0). Environmental Science and Engineering principles are introduced through an integrated interdisciplinary approach. Focus will be on the biological and biochemical principles of environmental systems and their engineering applications.

5302. ENVIRONMENTAL SYSTEMS II (3-0). Environmental Science and Engineering principles are introduced through an integrated interdisciplinary approach. Focus will be on the physical, chemical, and geological principles of environmental systems and their engineering applications.

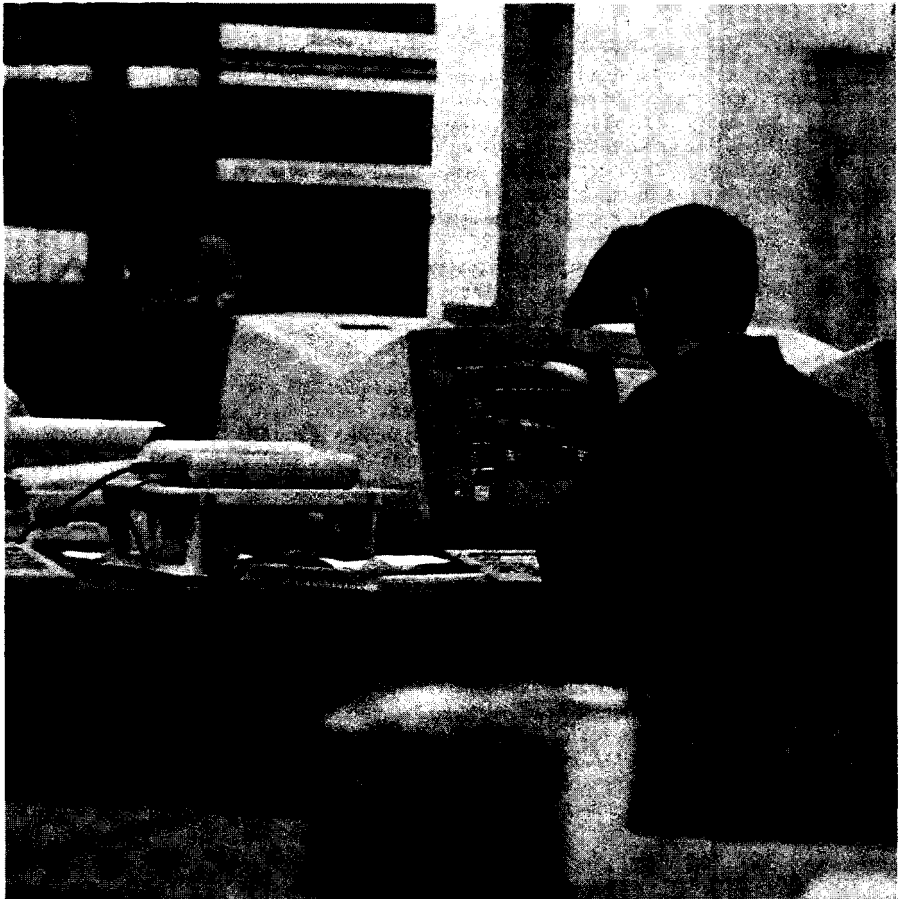
5398, 5698, 5998. THESIS. Graded R/F only.

5395, 5695. MASTER'S PROJECT. May be used as elective for students in non-thesis program. Graded P/F.

6100. SEMINAR IN ENVIRONMENTAL SCIENCE AND ENGINEERING. Topics presented by faculty, students, and invited lecturers. Graded P/F.

6197, 6297, 6397. RESEARCH IN ENVIRONMENTAL SCIENCE AND ENGINEERING. Individually approved research projects. May be repeated for credit. Graded P/F/R.

6399, 6699, 6999. DISSERTATION. Graded R/F only.



HUMANITIES

Program in HUMANITIES

Area of Study
Humanities

Degrees
M.A., M.A.T., Ph.D.

Master's Degree Plan: Non-Thesis

Associate Dean for Graduate Humanities:

Gary D. Stark 218 University Hall 273-2389

Graduate Advisor:

Harry P. Reeder 218 University Hall 273-2389

Graduate Faculty:

The Graduate Faculty of the College of Liberal Arts

OBJECTIVE

The Graduate Humanities Program offers a course of study designed to instill understandings across the spectrum of those fields traditionally identified as *the humanities*, that is, the study of humankind and of the cultures it has created. The program combines a strong foundation in the concepts and methods shared by the humanities with intensive study in an area of concentration that synthesizes or integrates two or more disciplines. It is not suited for those wishing to pursue a traditional disciplinary degree, because its views, subject matter and methods transcend those normally allowed in a single discipline. Its focus is centripetal and aimed at allowing integration and forging connections across disciplinary boundaries. Coursework, examinations and dissertation projects must reflect the methods and perspectives of the humanities.

The foundation of the program is a series of courses, taken at the outset of study, whose purpose is to teach heuristic and analytic methods and to enhance a student's ability to view complex issues from a variety of perspectives. Drawing on classical and contemporary approaches to grammar, rhetoric, and logic, the foundation courses present and illustrate the basic concepts and the theoretical frameworks of the humanities.

The Masters and Doctoral programs in Graduate Humanities, after the completion of foundation courses, apply the methods and perspectives of the humanities foundation in integrating the subject areas of concentration. Graduates of the program utilize these abilities in teaching, research, translation, the ministry, government service, and private non-profit organizations. Each student's course of study is planned individually and provides in-depth training in a specialization within the context of the humanities' traditional focus on human goals, needs, and values.

DEGREE REQUIREMENTS

The basic general admission and degree requirements are those of the Graduate School, as stated in this catalog. A Student Handbook is provided each student in the Graduate Humanities Program. Students are responsible for all information regarding rules, policies, and procedures as defined in the student handbook. In addition, all students (MA, MAT, PhD) must fulfill the following requirements:

1. **Foundation requirement**— All students must complete the Conceptual Basis of the Humanities and Foundations of Rhetoric courses (HUMA 5300 and 5301) within their first three semesters in the program. Students are also required to complete two additional of the four Foundation courses from among HUMA 5302, 5303, 5304, 5305.
2. **Foreign Language requirement**— Students must demonstrate the ability to use one foreign language as a research tool in the humanities by means of a translation or other written exercise.

3. **Scope requirement**— To insure a humanities perspective in the study of language, literature or cultural topics, 18 hours of coursework must be chosen from (A) or (B) below.

(A.) at least two of the areas of study currently represented in the College of Liberal Arts, such as:

American Literature
 Art Criticism and Art History
 British Literature
 Comparative Literature
 Criticism
 Cultural Anthropology
 English for Speakers of Other Languages
 French Language and Literature
 German Language and Literature
 Grammar Theory
 Historical Studies
 Music History and Theory
 Philosophical Studies
 Political Theory
 Rhetoric/Composition
 Social Theory
 Spanish Language and Literature
 Speech Communication
 Teaching Methodology, Instruction, and Curriculum
 Text Theory
 Women's Studies

No more than nine of these 18 semester hours may be taken from any one area of study.

(B.) an integrated program of multi-disciplinary study organized by theme, such as American Studies, Art and Society, etc.

MASTER OF ARTS IN THE HUMANITIES

The MA is a 36 semester-hour, non-thesis program. Twelve of these hours are devoted to the Foundation courses; 18 hours of study to the Scope requirement. A minimum of six further hours is required. In order to qualify for the final master's examination, the student must also submit one article-length paper for evaluation to his or her advisory committee. A positive assessment of the paper requires that the student demonstrate research competence and facility with appropriate humanities methodologies. The requirement of the article length paper must be satisfied before taking the final examination.

DOCTOR OF PHILOSOPHY IN THE HUMANITIES

The PhD program consists of a minimum of 45 semester hours beyond the MA followed by a minimum of nine hours of dissertation research (HUMA 6999). This 45 semester hours of coursework is divided into three parts: (a) 12 hours of Foundation courses; (b) 18 hours of Scope courses and (c) at least 15 hours of coursework chosen to provide support for the dissertation research. All Ph.D. students must also fulfill the following requirements:

1. Pass a diagnostic evaluation after completion of the first three semesters in the program. This evaluation is to insure that students can apply humanities methods and perspectives to areas of study before more specialized coursework can begin.
2. Demonstrate translation or comprehension proficiency in a second foreign language approved by the Advisory Committee as appropriate to the student's dissertation research. Alternatively, demonstrate proficiency with a research tool (e.g. use of statistics or the computer as a tool for humanities research) approved as a language substitute by the Advisory Committee, Graduate Studies Committee, and Graduate Advisor, on the student's Program of Work.
3. Consultation with the Advisory Committee and Graduate Advisor concerning the form (oral, written, or both) and scheduling of the Comprehensive Examination at the completion of coursework and satisfaction of the foreign language requirements.
4. Submission and defense of a dissertation project.

HUMANITIES

The grade of R (research in progress) is a permanent grade. An incomplete (the grade of X) cannot be given in a course which is graded R. To receive credit for an R-graded course the student must continue to enroll in the course until a passing grade is received. Three-hour thesis and three- and six-hour dissertation courses are graded R/F only. The grade of P (required for graduation) can be received in six- or nine-hour thesis courses and nine-hour dissertation courses only. In the course listings below, R-graded courses are designated either "Graded P/F/R" or "Graded R." (See also the section entitled "R" GRADE in this catalog.)

HUMANITIES (HUMA)

Foundation Courses

5300. CONCEPTUAL BASES OF THE HUMANITIES (3-0). Introduces students to fundamental concepts, methods, and issues central to the humanities. Particular attention will be given to a variety of epistemological approaches in humanistic inquiry, to theories of interpretation as applied to cultural constructs, and to recent issues and problems in the humanities. Required of all MA and PhD candidates in the humanities.

5301. FOUNDATIONS OF RHETORIC (3-0). Survey of classical and contemporary views of rhetoric. Discussion of such topics as the conflict between rhetoric and philosophy; the relationship between rhetoric and epistemology, ethics, and pluralism; and rhetoric as a propaedeutic, providing methodologies for the human sciences. Required of all MA and PhD candidates in the Humanities.

5302. THEORY OF DISCOURSE (3-0). Study of relationship of linguistic analysis to oral and written discourse; description and analysis of types of discourse; interdisciplinary perspectives — linguistic, sociological, psychological, philosophical, literary critical—on types of discourse. Fulfills Foundations requirement.

5303. TOPICS IN CULTURE AND SOCIETY (3-0). Relation between a culture's symbolic systems (e.g., religion, the arts, language, science) and the social organizations (e.g., family, tribe, or state) that bind individuals to a collective will and to hierarchical relations of power. Anthropological, sociological, historical, or political analyses of specific cultural systems in selected societies. Fulfills Foundations requirement.

5304. METHODS OF LOGICAL ANALYSIS (3-0). Foundations of modern logic and logical terminology in language-centered disciplines; applications of logical method to selected problems in the humanities illustrating a diversity of philosophical approaches, e.g., analytic philosophy, hermeneutics, phenomenology. Fulfills Foundations requirement.

5305. SEMIOTICS (3-0). Study of systems of symbols or "signs"; examination of structures underlying cultural activity from fundamental level of individual sign-creation to more complex systems. Fulfills Foundations requirement.

Other Courses

5391. CONFERENCE COURSE IN THE HUMANITIES. Prerequisite: permission of the instructor and Graduate Advisor. Graded P/F/R.

5392. TOPICS IN THE HUMANITIES (3-0). Selected topics of interdisciplinary interest. May be repeated for credit when subject matter changes.

6330. SEMINAR IN THE HUMANITIES (3-0). Interdisciplinary study of genres and themes. May be repeated for credit when subject matter changes.

6391. READINGS IN THE HUMANITIES (3-0). Supervised individual study for students preparing for the comprehensive examination. Prerequisite: permission of the instructor and Graduate Advisor. Graded P/F/R.

6399, 6699, 6999. DISSERTATION. Prerequisite: admission to candidacy for the PhD in Humanities. Graded P/F/R.

Program in INTERDISCIPLINARY STUDIES

Area of Study
Interdisciplinary Studies

Degrees
M.A., M.S.

Master's Degree Plans: Thesis, Thesis Substitute, Non-Thesis

Program Coordinator: Gloria W. Eyres 333 Davis

273-2681

Graduate Faculty:

The Graduate Faculty of The University of Texas at Arlington

OBJECTIVE

The purpose of the degree program is to allow individuals to pursue studies in multiple disciplines, to upgrade their formal education in their fields of specialization, and to develop professional skills. The program is intended for persons having professional experience beyond the baccalaureate degree and clear, well-developed academic and professional goals.

ADMISSION

An applicant to this program must satisfy the requirement for admission to the Graduate School and ordinarily will have professional experience in areas related to the graduate coursework proposed. The applicant should submit a tentative program of work and an academic goals statement to the program coordinator as part of the application for admission process. Applicants will ordinarily not be admitted to interdisciplinary studies until a tentative program of work has been reviewed and approved by the Committee on Graduate Studies.

DEGREE REQUIREMENTS

Programs of Work in interdisciplinary studies involve courses in several departments and should be designed in consultation with the appropriate graduate faculty members of those departments. Students entering the interdisciplinary studies program must consult with the program coordinator prior to registration for the first semester and each succeeding semester in which the student plans to enroll. The Committee on Graduate Studies is not responsible for selection of courses taken prior to program of work approval and cannot guarantee that such courses will apply to degree credit.

Interdisciplinary studies allows the student maximum flexibility in designing an academic program to meet specific professional and educational objectives. The student must complete work in at least two departments and may take courses in more than one of the schools or colleges of the University. The primary emphasis is on the individual needs and aspirations of the student. A supervising committee composed of members of the graduate faculty will be appointed to supervise the completion of an individual program of work and the final examination. General oversight will be provided by the Committee on Graduate Studies and the Dean of the Graduate School.

No more than 50 percent of the credit hours in a student's program may be taken in an area in which the University does not offer an advanced degree, or in the College of Business Administration. A maximum of nine hours of advanced (junior/senior) undergraduate courses may be applied to an interdisciplinary studies program; for the purpose of this policy, graduate foundation courses in the College of Business Administration are considered equivalent to advanced undergraduate courses and apply toward the nine hour maximum. In addition, the Committee on Graduate Studies has adopted other policies which govern the general design and content of programs of work in interdisciplinary studies. Information about these policies should be requested from the program coordinator.

INTERDISCIPLINARY STUDIES

The grade of R (research in progress) is a permanent grade. An incomplete (the grade of X) cannot be given in a course which is graded R. To receive credit for an R-graded course the student must continue to enroll in the course until a passing grade is received. Three-hour thesis and three- and six-hour dissertation courses are graded R/F only. The grade of P (required for graduation) can be received in six- or nine-hour thesis courses and nine-hour dissertation courses only. In the course listings below, R-graded courses are designated either "Graded P/F/R" or "Graded R." (See also the section entitled "R" GRADE in this catalog.)

INTERDISCIPLINARY STUDIES (INDS)

5193. MASTER'S COMPREHENSIVE EXAMINATION (1-0). Directed study, consultation, and comprehensive examination over coursework, leading to the Master's degree in Interdisciplinary Studies. Graded P/F/R.

5398, 5698. THESIS. Research and preparation pertaining to the master's thesis. 5398 graded R/F only; 5698 graded P/F/R.



Program in MATERIALS SCIENCE AND ENGINEERING

<i>Area of Study</i>		<i>Degrees</i>
Materials Science and Engineering		M.S., M.Engr., Ph.D.

Master's Degree Plans: Thesis (M.S.), Thesis Substitute (M.Engr.), and Non-Thesis (M.Engr.)

<i>Chair:</i> Ronald L. Elsenbaumer	325 Engineering	273-2398
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<i>Graduate Advisor:</i> Ronald L. Elsenbaumer	325 Engineering	273-2398
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Materials Science and Engineering Graduate Faculty:

Professors Elsenbaumer, Johnson
Associate Professors Chan, Goolsby
Assistant Professor Aswath
Professor Emeritus Wiseman

Graduate faculty from participating departments and programs in the College of Engineering and the College of Science are involved in teaching and supervising materials science and engineering graduate students' research. Specific faculty contacts within these areas include:

Aerospace Engineering		
Associate Professor Joshi	215 Engineering	794-3746
Biomedical Engineering		
Professor Eberhart	220 Engineering Lab	273-2053
Chemistry		
Professor Elsenbaumer	219 Science	273-3171
Civil Engineering		
Professor Yuan	408 Nedderman Hall	273-2550
Electrical Engineering		
Associate Professor Alavi	540 Nedderman Hall	794-5633
Mechanical Engineering		
Associate Professor Chan	325G Engineering	794-5638
Physics		
Professor Weiss	107D Science	273-2459

MATERIALS SCIENCE AND ENGINEERING

Participating faculty of the Colleges of Engineering and Science:

Aerospace Engineering-Joshi
Biomedical Engineering-Eberhart
Chemistry-Dias, Marynick, McDowell, Pomerantz, Rajeshwar,
Schelly, Timmons
Civil Engineering-Yuan
Electrical Engineering-Alavi, Carter, Davis, Klemer, Magnusson,
Maldonado, Shieh
Mechanical Engineering-Chan, Haji-Sheikh, Lou, Nomura, Wang
Physics-Black, Fry, Howard, Koymen, Lippel, Ray, Rubins, Sharma,
Weiss, West

OBJECTIVE

The graduate program in materials science and engineering is designed to provide students with a fundamental understanding of phenomena occurring in materials and their associated chemical, electrical, mechanical, and physical properties. The master's program prepares students for professional careers in materials science and engineering or for additional studies at the doctoral level.

Candidates for a master's or doctoral degree may elect programs emphasizing metals, polymers, ceramics, composite materials, or electronic materials, as well as a number of other areas. Although the program is administered through the College of Engineering, it is broadly interdisciplinary, actively involving faculty in both the College of Science and the College of Engineering. In addition to materials science and engineering courses, applicable courses are in the disciplines of aerospace engineering, biomedical engineering, chemistry, civil engineering, computer science engineering, electrical engineering, mathematics, mechanical engineering, and physics.

ADMISSION

Master's Degree

Applicants for the master's degree who hold a baccalaureate in engineering or science must meet the general requirements of the Graduate School as stated in the section of this catalog entitled "Admission Requirements and Procedures." Applicants not meeting all criteria may be admitted on a provisional or probationary basis.

For applicants with no prior training in engineering or with insufficient undergraduate materials coursework, the same minimum criteria will apply. Additionally, their records will be reviewed in relation to their materials backgrounds, and probationary status with specific remedial work required may be a basis for acceptance of such applicants.

The acceptance of applicants who hold a master's degree in engineering will be based on the above-mentioned minimum criteria and results of graduate work, including the master's thesis.

Doctoral Degree

Applicants for the doctoral degree must have either a baccalaureate or master's degree in engineering or science and meet all requirements stated above in both graduate and undergraduate work. Students without a master's degree will enter the program as master's candidates and must complete a minimum of 30 graduate semester hours (at least 24 hours of which must be coursework) with distinction prior to advancement to doctoral candidacy. Doctoral candidates shall also demonstrate through previous academic preparation the potential to carry out independent research in materials science and engineering.

CONTINUATION

The Materials Science and Engineering Graduate Program, in fulfillment of its responsibility to graduate highly qualified professional engineers and scientists, has established certain policies and

procedures. In addition to the requirements of the Graduate School listed elsewhere in this catalog, to continue in the program each materials science and engineering graduate student must:

1. Maintain at least a B (3.0) overall GPA in all coursework, and
2. Demonstrate suitability for professional practice.

At such time as questions are raised by materials science and engineering graduate faculty regarding either of the above, the student will be notified and will be given the opportunity to respond to the Committee on Graduate Studies for Materials Science and Engineering. The Committee on Graduate Studies will review the student's performance and make a recommendation concerning the student's eligibility to continue in the program. Appeal of a decision on continuation may be made through normal procedures outlined in the section of this catalog entitled "Grievances Other Than Grades."

DEGREE REQUIREMENTS

Master's Degrees

Master of Science in Materials Science and Engineering: The Master of Science degree is a research-oriented degree in which completion of a thesis is mandatory. The program consists of a minimum of 24 credit hours of coursework and an acceptable thesis (minimum of six credit hours).

Master of Engineering in Materials Science and Engineering: The Master of Engineering degree is an engineering practice-oriented program requiring a minimum of 36 credit hours. A maximum of six hours may be a special project. A final program examination is required of all master's degree candidates. Non-thesis degree candidates will fulfill the program examination requirement upon the successful completion of MSE 5192, Master's Comprehensive Examination. Candidates must enroll in MSE 5192 in the semester they intend to graduate.

Doctor of Philosophy

The PhD degree program involves an interdisciplinary and multidisciplinary approach which requires students to complete a set of Materials Science and Engineering core courses augmented by elective offerings in aerospace engineering, biomedical engineering, chemistry, civil engineering, electrical engineering, materials science, mathematics, mechanical engineering, and physics. The degree is a research degree which requires the candidate successfully to carry out independent research in an area acceptable to the Committee on Graduate Studies for Materials Science and Engineering. A student's research is directed by a faculty member from any of the departments or programs participating in the Materials Science and Engineering Program.

The PhD degree program requires successful completion of the following curriculum components:

1. A minimum of 24 semester hours of graduate coursework is expected for students entering with an appropriate master's degree or, for highly qualified students, a minimum of 42 semester hours of graduate coursework is expected for student's entering with a bachelor's degree, as approved by the Committee on Graduate Studies for Materials Science and Engineering. Additional coursework may be required by the student's doctoral dissertation committee.
2. Six core courses or their equivalent are required for all doctoral students:
 - MSE 5301 Physics of Engineering Materials (PHYS 5301)
 - MSE 5302 Fundamentals of Materials Science and Engineering I
 - MSE 5303 Fundamentals of Materials Science and Engineering II
 - MSE 5304 Analysis of Materials
 - MSE 5312 Mechanical Behavior of Materials
 - MSE 5320 Thermodynamics of Materials (CHEM 5333)
3. Three of the following supplemental courses must be taken by all doctoral students, as approved by the Committee on Graduate Studies for Materials Science and Engineering.
 - MSE 5310 Dislocation Theory
 - MSE 5314 Fracture Mechanics
 - MSE 5315 Fatigue of Engineering Materials
 - MSE 5316 Creep and Oxidation of Materials
 - MSE 5321 Phase Transformations of Materials
 - MSE 5345 Ceramic Materials
 - MSE 5347 Polymer Materials Science
 - MSE 5348 Fundamentals of Composites
 - MSE 5349 Applied Composites

MATERIALS SCIENCE AND ENGINEERING

BME 5335 Biological Materials, Mechanics and Processes
BME 5361D Biomaterials and Blood Compatibility
CHEM 5309 Organic Chemistry I
CHEM 5350 Advanced Polymer Chemistry
CHEM 5461 Analytical Instrumentation
CHEM 6305 Special Topics in Applied Chemistry
EE 5340 Semiconductor Device Theory I
EE 5343 Integrated Circuit Techniques
EE 5349 Topics in Integrated Circuit Technology
EE 6342 Advanced Quantum Devices
EM 5311 Theory of Elasticity
ME 5312 Continuum Mechanics
ME 5314 Fracture Mechanics in Structural Design
ME 5339 Structural Aspects of Design
PHYS 5316 Solid State II
PHYS 6302 Methods of Applied Physics II

4. Elective courses will be taken by all doctoral students which will allow specialization within a particular academic discipline. Graduate courses in chemistry, mathematics, physics, and engineering will be selected for this purpose in consultation with the student's research advisor, subject to approval by the Committee on Graduate Studies for Materials Science and Engineering.

After completion of the first year's coursework (i.e., core courses), students must satisfactorily complete diagnostic examinations which may be written or oral or written and oral with a supplemental interview with faculty members, as determined by the Committee on Graduate Studies in Materials Science and Engineering.

Upon completion of all or nearly all of the coursework requirements and after having demonstrated research ability through partial completion of dissertation research, a student must satisfactorily complete a comprehensive examination.

The dissertation research will be formulated in conjunction with the student's faculty research advisor who may be associated with any of the following academic disciplines participating in the Materials Science and Engineering Program: aerospace engineering, biomedical engineering, chemistry, civil engineering, electrical engineering, materials science, mechanical engineering, and physics. The dissertation research represents the culmination of the student's academic efforts and is expected to demonstrate original and independent research activity and be a significant contribution to knowledge in the field.

The grade of R (research in progress) is a permanent grade. An incomplete (the grade of X) cannot be given in a course which is graded R. To receive credit for an R-graded course the student must continue to enroll in the course until a passing grade is received. Three-hour thesis and three- and six-hour dissertation courses are graded R/F only. The grade of P (required for graduation) can be received in six- or nine-hour thesis courses and nine-hour dissertation courses only. In the course listings below, R-graded courses are designated either "Graded P/F/R" or "Graded R." (See also the section entitled "R" GRADE in this catalog.)

MATERIALS SCIENCE AND ENGINEERING (MSE)

5301. PHYSICS OF ENGINEERING MATERIALS (3-0). Crystal structure, lattice vibrations, and band theory of electrons as they relate to the understanding of the electrical, magnetic, and mechanical properties of materials. Also offered as PHYS 5301. Prerequisite: permission of instructor.

5302. FUNDAMENTALS OF MATERIALS SCIENCE AND ENGINEERING I (3-0). Interatomic and intermolecular forces, crystal structures, x-ray diffraction, electron theories of metals, defects and imperfections, dislocation and slip phenomena, solid solutions, diffusion, phase diagrams, precipitation. Prerequisite: ME 2321 or permission of instructor.

5303. FUNDAMENTALS OF MATERIALS SCIENCE AND ENGINEERING II (3-0). Ferrous metals systems, solidification, ceramic materials and processing, polymeric materials and processing, electrical conduction, semiconductors, magnetic properties, martensitic reactions, composite materials. Prerequisite: MSE 5302 or permission of instructor.

5304. ANALYSIS OF MATERIALS (3-0). Theoretical foundations and the practical applications of materials' analysis techniques are discussed. Topics and equipment covered include x-ray and electron

diffraction and spectroscopy, optical and electron microscopy, magnetic resonance, thermal and surface analysis. Prerequisite: permission of instructor.

5310. DISLOCATION THEORY (3-0). Theory of dislocations and their reactions and interactions in crystalline materials developed and extended into a basic understanding of mechanical properties of crystalline materials. Prerequisite: permission of instructor.

5312. MECHANICAL BEHAVIOR OF MATERIALS (3-0). Concepts of stress and strain, theory of plasticity. Elementary dislocation theory. Deformation of single crystals. Strengthening mechanisms like solid solution strengthening, precipitation hardening, etc. Elementary concepts in fracture mechanics. Microscopic aspects of fracture, fatigue, and creep of materials. Prerequisite: ME 3321 or permission of instructor.

5314. FRACTURE MECHANICS (3-0). Theory and applications of linear elastic fracture mechanics. Topics include stress analysis of cracks, crack-tip plasticity, fatigue and stress corrosion. Applicability to materials selection, failure analysis and structural reliability reviewed. Prerequisite: permission of instructor.

5315. FATIGUE OF ENGINEERING MATERIALS (3-0). Cyclic deformation, fatigue crack initiation and growth in ductile solids. Application of fracture mechanics to fatigue. Mechanisms of crack closure. Variable and multiaxial fatigue and corrosion fatigue. Fatigue of brittle solids. Prerequisite: permission of instructor.

5316. CREEP AND OXIDATION OF MATERIALS (3-0). Mechanisms and phenomenology of creep of metallic, intermetallic, and ceramic materials. Parabolic, logarithmic, and steady state creep. Nabarro-Herring creep, Harper-Dorn creep, Coble creep, and power law creep. Design of creep-resistant materials. Fracture at high temperature. Mechanisms of oxidation. Prerequisite: permission of instructor.

5320. THERMODYNAMICS OF MATERIALS (3-0). Applications of thermodynamics to the study of materials, thermodynamic properties of liquid and solid solutions and their relationships to surfaces and crystalline defects. Also offered as CHEM 5333. Prerequisite: permission of instructor.

5321. PHASE TRANSFORMATIONS OF MATERIALS (3-0). The theory of homogeneous and heterogeneous transformations, nucleation and growth, martensitic transformations, heat treatment and control of microstructure. Prerequisite: MSE 5320, CHEM 5333, or permission of instructor.

5330. CORROSION (3-0). Quantitative application of electrochemical principles to corrosion reactions. Effects of metallurgical factors and environmental conditions on oxidation, erosion, and cracking discussed along with materials selection. Prerequisite: permission of instructor.

5341. TRANSMISSION ELECTRON MICROSCOPY IN MATERIALS SCIENCE (2-1). Crystallography, stereographic projections, and reciprocal lattice. Specimen preparation in transmission electron microscopy. Dynamical and kinematical theories of electron diffraction. Interpretation of diffraction patterns and transmission electron micrographs. Use of the transmission electron microscope. Prerequisites: MSE 5302, MSE 5304 or permission of instructor.

5342. X-RAY DIFFRACTION OF MATERIALS (2-3). Theory and techniques of x-rays as applied to the study of crystalline solids. Production of x-rays, their scattering, absorption and diffraction. Special topics, such as stress analysis, crystal perfection, precision lattice constant determination, and phase diagrams. Prerequisite: permission of instructor. \$15 lab fee.

5345. CERAMIC MATERIALS (3-0). Crystal structure of ceramic materials. Phase equilibria in ceramic materials. The processing of ceramics and ceramic matrix composites. Strengthening mechanisms and mechanical properties of ceramics and ceramic matrix composites including flexure, tensile, fracture toughness, fatigue, and creep. Prerequisites: MSE 5302 and 5303 or permission of instructor.

5346. CONTEMPORARY POLYMER CHEMISTRY (3-0). Polymer synthesis and reactions. Principles of polymerization including thermodynamics and kinetic considerations. Physical characterizations including determinations of absolute and relative molecular weights, morphology, and glass transitions. Relationships between macromolecular structure, properties, and uses of polymeric materials. Also offered as CHEM 5350. Prerequisites: CHEM 2321 and CHEM 2322 or permission of instructor.

5347. POLYMER MATERIALS SCIENCE (3-0). Intermolecular forces of attraction in high polymers, polymer synthesis, morphology and order in crystalline polymers, mechanics of amorphous polymers, time-dependent mechanical behavior, transitional phenomena, mechanical behavior of semicrystalline polymers. Prerequisite: permission of instructor.

MATERIALS SCIENCE AND ENGINEERING

- 5348. FUNDAMENTALS OF COMPOSITES (3-0).** Fundamental mechanics concepts of fiber-reinforced composites; relationships between the properties of the constituents and those of the unit composite ply; lamina and laminate anisotropic behavior; structural characteristics of A, B, and D matrices; lamination theory; strength criteria; hygrothermal analysis; interlaminar stress analysis. Also offered as ME 5348 and EM 5333. Prerequisite: permission of instructor.
- 5349. APPLIED COMPOSITES (3-0).** Review of current state-of-the-art applications of composites; structural properties including section property; laminate sizing in preliminary design; notched sensitivity; delamination; fatigue characteristics; composite material testing; characteristics of composite joints. Also offered as ME 5349. Prerequisite: MSE 5348, ME 5348, or EM 5333.
- 5350. EXPERIMENTAL CHARACTERIZATION OF COMPOSITES (2-3).** Laminate processing, NDI, and physical characterization procedures; thermal analysis methods for composites; composite materials tensile, compressive, shear, flexure, thermoelastic, and interlaminar fracture characterizations. Prerequisite: MSE 5348, ME 5348, or EM 5333 or concurrent enrollment or permission of instructor.
- 5190, 5290, 5390. SPECIAL TOPICS IN MATERIALS SCIENCE AND ENGINEERING.** May be repeated for credit when topic changes. Prerequisite: Consent of instructor.
- 5191, 5291, 5391. ADVANCED STUDIES IN MATERIALS SCIENCE AND ENGINEERING.** Topics selected from various areas of materials science and engineering. Work performed as a thesis substitute normally will be accomplished under the course number 5391, with prior approval of the Committee on Graduate Studies. Graded R.
- 5192. MASTER'S COMPREHENSIVE EXAMINATION.** Directed study, consultation, and comprehensive examination over coursework leading to the Master of Engineering degree in Materials Science and Engineering. Required of all Master of Engineering students in the semester they plan to graduate. Graded P/F/R.
- 5193. SEMINAR IN MATERIALS SCIENCE AND ENGINEERING (1-0).** Selected topics in materials science and engineering presented by faculty, students, and invited lecturers. Graded P/F.
- 5398, 5698, 5998. THESIS.** 5398 graded R/F only; 5698 and 5998 graded P/F/R. Prerequisite: approval of Graduate Advisor.
- 6301. ADVANCED PHYSICAL METALLURGY (3-0).** Theory of phase stability in crystalline solids with special topics such as Long Period Superlattice formation and superplasticity. Prerequisites: MSE 5303 or permission of instructor.
- 6302. ADVANCED DISLOCATION THEORY (3-0).** Development of the theories of work hardening, fatigue, and creep of crystalline materials based on the generation, movement, and interactions of dislocations with themselves and other crystalline defects. Prerequisites: MSE 5310 and permission of instructor.
- 6390. ADVANCED TOPICS IN MATERIALS SCIENCE AND ENGINEERING (3-0).** Topics of special interest in the field of materials science and engineering. The subject title listed in class schedule and in student record. May be repeated for credit when topic changes. Prerequisite: permission of instructor.
- 6197, 6397. ADVANCED STUDIES IN MATERIALS SCIENCE AND ENGINEERING.** May be repeated for credit. Prerequisite: approval of Graduate Advisor. Graded R.
- 6198-6998. RESEARCH IN MATERIALS SCIENCE AND ENGINEERING.** Individually approved research projects in materials science and engineering. May be repeated for credit. Graded P/F/R.
- 6399, 6699, 6999. DISSERTATION.** 6399 and 6699 graded R/F only; 6999 graded P/F/R.

Program in MATHEMATICAL SCIENCES

Area of Study Mathematical Sciences *Degree* Ph.D.

Graduate Advisors:

Biology			
John Bacon	237 Life Science		273-2400
Chemistry			
Z. A. Schelly	238 Science Hall		273-3803
Computer Science			
Roger S. Walker	236 Nedderman Hall		273-3640
Geology			
Merlynd K. Nestell	211 Geosciences Bldg.		273-2983
Information Systems and Management Sciences			
R. C. Baker	132 Business		273-3547
Mathematics			
Alan Gillespie	440 Nursing Bldg.		794-6585
Physics			
Alexander Weiss	107D Science Hall		273-2459
Psychology			
James R. Erickson	303 Life Science		273-3228

Graduate Faculty:

Appropriate Graduate Faculty of various branches of mathematical sciences which include Biology, Chemistry, Computer Science, Geology, Information Systems, Mathematics, Physics, and Psychology

OBJECTIVES

A program leading to the Doctor of Philosophy degree in the mathematical sciences will aim at both real and demonstrated competency on the part of the student over material from various branches of mathematical sciences. The nature of the dissertation will range from research in mathematics to the discovery and testing of mathematical models for analyzing given problems in sciences and in locating and developing mathematical and computational techniques for deducing the properties of these models so as to solve these problems both effectively and efficiently. Such dissertations will be concerned with research problems from such areas as pure mathematics, applied mathematics, probability, statistics, computer science, biology, biometry, chemistry, engineering, geology, information systems, physics, management sciences, and operational sciences.

DEGREE REQUIREMENTS

Upon entering Graduate School, the student has the responsibility to consult with the Graduate Advisor in the appropriate department on a continuing basis.

The student must satisfactorily complete all deficiency courses.

In addition to the Graduate School requirements for the Doctor of Philosophy degree, students must satisfactorily demonstrate competence in 30 graduate hours of core areas as specified by the Committee on Graduate Studies for Mathematical Sciences (CGSMS). Furthermore, the student must complete

MATHEMATICAL SCIENCES

additional graduate coursework beyond these core areas as approved by the Committee on Graduate Studies for Mathematical Sciences.

Of the 30 hours of core courses, each student is expected to complete a minimum of 15 graduate hours in the Mathematics Department. However, the 30 hours of core courses will vary depending on the student's area of interest and background and will be determined on an individual basis by the student's supervisory committee subject to approval by the Committee on Graduate Studies for Mathematical Sciences.

Normally each candidate is required to be in residence as a full-time student for one year or three consecutive semesters including summer term. Exceptions to this requirement may be approved if the student has demonstrated continuous degree progress while working as a part-time student.

In addition to meeting the specific requirements listed above, each student's program of work must be approved by the Dean of the Graduate School.

Ordinarily, after 40 semester hours of graduate work and with the approval of the Committee on Graduate Studies for Mathematical Sciences, a comprehensive examination (usually oral) will be administered. To pass, the student must exhibit outstanding intellectual capacity and sufficient knowledge to continue doctoral studies and a program of research. A student who has failed the comprehensive examination may be allowed a single re-examination by the Committee on Graduate Studies for Mathematical Sciences on the recommendation of the examining committee. The student must be enrolled in the Graduate School at the time of the comprehensive examination.

The PhD program in the mathematical sciences, although demanding a strong mathematical orientation, does not fall within the traditional boundaries of a single department, and furthermore, the scope of this program is quite broad. Consequently, every course in a student's program of work will be evaluated as to not only course content but also the way in which each course complements other courses in the program of work as well as the ways in which each course broadens and furnishes depth to the program. Courses from a variety of departments (e.g., biology, business administration, chemistry, computer science, engineering sciences, geology, management sciences, statistics) will be counted toward the PhD degree if taken with the prior approval of the appropriate Graduate Advisor. One should refer to the list of departmental courses elsewhere in this catalog for specific descriptions.

The grade of R (research in progress) is a permanent grade. An incomplete (the grade of X) cannot be given in a course which is graded R. To receive credit for an R-graded course the student must continue to enroll in the course until a passing grade is received. Three-hour thesis and three- and six-hour dissertation courses are graded R/F only. The grade of P (required for graduation) can be received in six- or nine-hour thesis courses and nine-hour dissertation courses only. In the course listings below, R-graded courses are designed either "Graded P/R/R" or "Graded R." (See also the section entitled "R" GRADE in this catalog.)

MATHEMATICAL SCIENCES (MSCI)

6399, 6699, 6999. DISSERTATION. 6399 and 6699 graded R/F only; 6999 graded P/F/R. Prerequisite: admission to candidacy for the Doctor of Philosophy degree in mathematical science.

Program in PUBLIC ADMINISTRATION

Areas of Study

Public Administration

Degrees

M.P.A.

Master's Degree Plan: Non-Thesis

Graduate Advisor: Sherman Wyman

509 University Hall

273-3071

Graduate Faculty:

Professors Cole, Dawson, Geisel, Story, Taebel
Associate Professors Anjomani, Clark, Wyman

GENERAL

Public Administration is concerned with the formulation, analysis and implementation of public policy. With an interdisciplinary focus, this program gives special emphasis to the urban community and the special problems of public managers who serve the urban arena. The curriculum is designed to develop leadership skills while providing a thorough understanding of the political, social, and economic environment in which public managers operate. The MPA serves the educational needs of current public service professionals



PUBLIC ADMINISTRATION

interested in upgrading their skills and those who are preparing for management careers in government, especially local government. The program is of value to general managers as well as the departmental managers. The Masters of Public Administration is a joint program of the School of Urban and Public Affairs and the Department of Political Science.

In addition, the program utilizes the resources of several distinguished professionals in the field of public administration who serve as special lecturers and adjunct professors, including Mr. Charles Anderson, Director, Central and Eastern European Programs, International City/County Association, Washington, D.C.; Mr. William Pitstick, former executive director of the North Central Texas Council of Government; Mr. Levi Davis, Assistant City Manager, Dallas; George Campbell, City Manager of Arlington; Mr. James Kunde, Executive Director, Coalition for the Improvement of State and Local Government Management, Indianapolis, Indiana; Robert Weaver, Executive Director of the Concho Valley Council of Governments.

OBJECTIVES

The program includes three essential educational objectives. The first is to teach the skills needed for effective public leadership and management, including planning and decision making, managing people, resources and programs; and representing the public interest in the highest ethical traditions.

The second objective is to provide students with an intensive understanding of the urban community in its social, economic and political context. Since the urban environment impacts on public programs, a thorough understanding is an essential key for effective public administration.

The third objective is to equip students with a functional specialization. This component is intended to update and upgrade the functional skills of in-service managers and to guide pre-service students in the development of those skills essential for careers in public management.

DEGREE REQUIREMENT AND COURSES

The total numbers of semester credit hours will range from a minimum of 42 to a maximum of 45 as follows: (See departmental listings for course descriptions in other sections of the catalog as follows: URPA: Urban and Public Affairs; POLS: Political Science; CRJU: Criminal Justice; SOCI: Sociology; ECON: Economics; HIST: History; ACCT: Accounting.)

1. Political, Legal, Economic and Social Institutions and Processes (9 hours).

URPA 5300 The Metroplex: A Survey of Urban Affairs Planning and Administration

URPA 5301 The Urban Political System or

POLS 5305 State and Local Politics

URPA 5310 Urban Policy and Intergovernmental Relations or

POLS 5310 Federalism and Intergovernmental Relations

URPA 5325 Urban and Administrative Law

URPA 5302 Theories of Urban Society

URPA 5303 The Urban Economy

URPA 5305 Urban History

URPA 5390 Topics in Urban Theory

2. Administrative Theory, Practices and Processes (15 hours).

URPA 5320 Organization Theory and Development

URPA 5321 Urban Management or

POLS 5331 Urban Government Administration

URPA 5322 Urban Bureaucracy and the Political Process

URPA 5323 Public Organizational Change

URPA 5392 Special Topics in Urban Management

POLS 5335 Labor Relations in the Public Sector

POLS 5356 Seminar in Public Administration and Policy Studies

CRJU 5318 Criminal Justice Personnel Administration

URPA 5324 Urban Public Finance or

ECON 5304 Advanced Public Finance

URPA 5326 Public Budgeting

URPA 5327 Comparative Administration and Development

URPA 5328 Small City Management

ACCT 5320 Governmental and Nonprofit Accounting

3. Techniques of Analysis (9 hours).
 - URPA 5340 Methods of Social Research and Analysis or
 - POLS 5339 Empirical Theory and Methodology
 - URPA 5342 Strategies for Urban Research or
 - SOCI 5304 Social Statistics
 - URPA 5348 Cost Benefit Analysis
 - URPA 5345 Evaluation Research
 - URPA 5349 Introduction to Microcomputers for Planning and Administration
 - URPA 5341 Professional Report Writing
 - URPA 5343 Applied Urban Analysis
 - URPA 5395 Conference Course in Urban Affairs
 - POLS 5332 Public Policy Analysis
 - ECON 5309 Economic Analysis
4. Supporting Fields: (9 hours of coursework in the following specialized areas).
 - (a) Information Systems
 - (b) Social Services
 - (c) Water Resources
 - (d) Public Works
 - (e) Recreation
 - (f) Human Resources
 - (g) Financial Management
 - (h) Community Development and Planning
 - (i) Public Safety
 - (j) Health Care and Delivery
 - (k) Others as approved
5. Internship (URPA 5350 or POLS 5393) for students with less than one year of appropriate work experience.

DUAL DEGREE PROGRAMS

Students in public administration may participate in one of four dual degree programs whereby they can earn a Master of Public Administration and 1) a Master of City and Regional Planning, 2) a Master of Science in Social Work, 3) a Master of Science in Nursing, or 4) a Master of Arts in Criminal Justice. By participating in a dual degree program, students can apply a number of semester hours jointly to meet the requirements of both degrees, thus reducing the total number of hours which would be required to earn both degrees separately. The number of hours which may be jointly applied ranges from nine to 18 hours, subject to the approval of Graduate Advisors from both programs. To participate in the dual degree program, students must make separate application to each program and must submit a separate Program of Work for each degree. Those interested in the dual degree program should consult the appropriate Graduate Advisor(s) for further information on course requirements. See also the statement of Dual Degree Programs in the general information section of this catalog.

Program in RADIOLOGICAL PHYSICS

Area of Study
Radiological Physics

Degree
M.S.

Master's Degree Plan: Thesis only

Graduate Advisor: J. L. Fry

108 Science Hall 273-2461

Graduate Faculty:

The Graduate Faculty of the Department of Physics and the Graduate Faculty of the Department of Radiology of The University of Texas Southwestern Medical Center at Dallas.

OBJECTIVE

The master's program in Radiological Physics is a joint program of the Department of Physics of The University of Texas at Arlington and the Department of Radiology of The University of Texas Southwestern Medical Center at Dallas. The program is designed to prepare students for careers as radiological physicists in medical centers and for independent research in physics related to the life sciences and clinical procedures.

Radiological Physics is the study of radiation, both ionizing and nonionizing, and the medical application of the interaction of radiation with matter. The subject matter may be divided on the basis of the type of radiation and medical application into the physics of (1) radiation therapy, (2) diagnostic radiology, (3) nuclear medicine, and (4) radiation safety.

Physical principles and their application in medicine are emphasized. Research activities are conducted to improve current medical applications and to use new physical concepts and instrumentation in expanding the role of physics in medical procedures.

ADMISSION

Applicants must meet the entrance requirements of the Graduate Schools at both UT Arlington and UT Southwestern. Applicants will be expected to have or to establish a background in electronic circuits, statistical analysis, biology, and computer techniques. The background undergraduate courses are available at UT Arlington.

DEGREE REQUIREMENTS

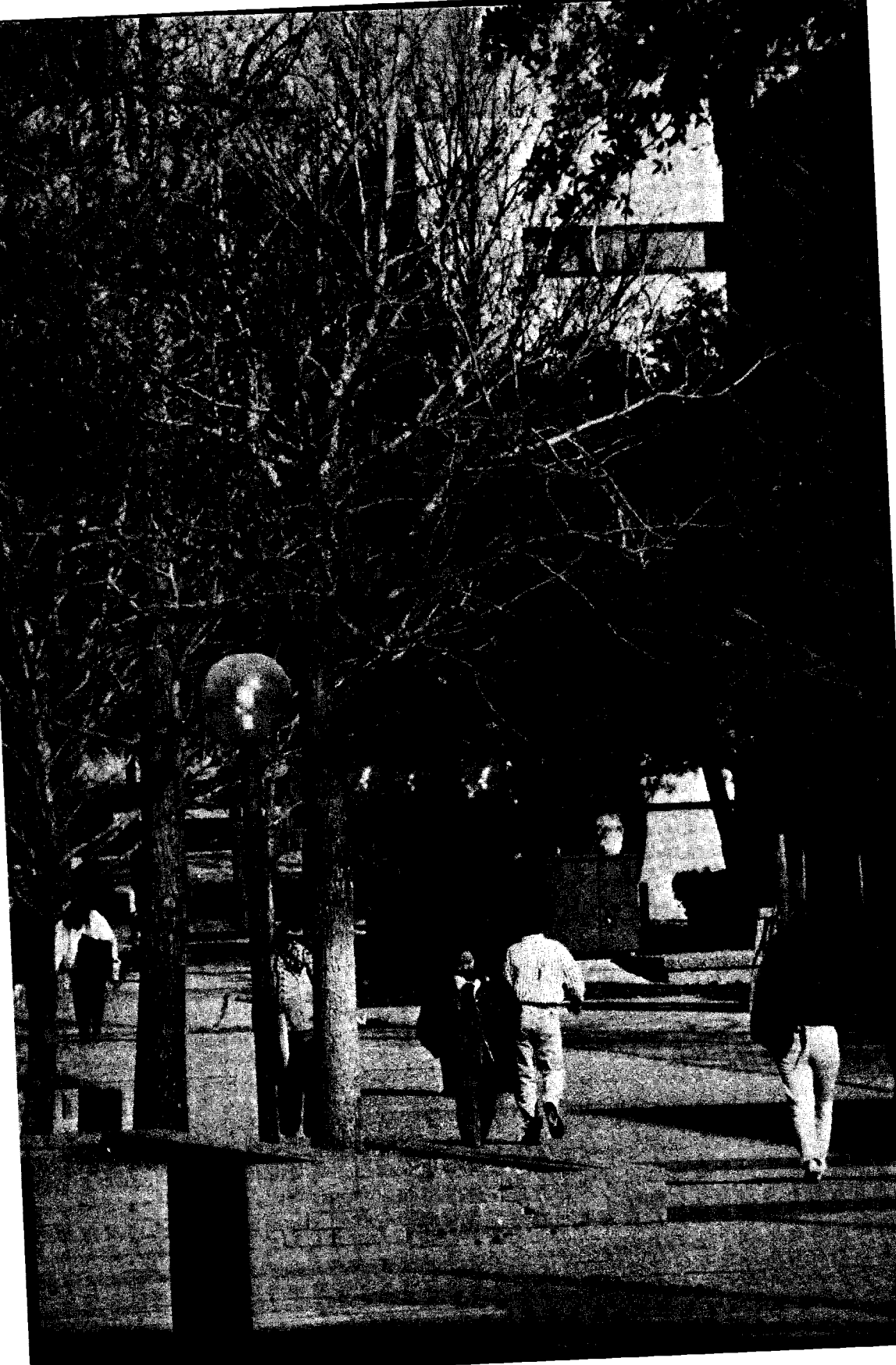
Consult the Advanced Degrees and Requirements section of this catalog for general master's degree requirements. The course requirements for radiological physics students vary depending upon the student's previous college level preparation or experience. Individual programs will be designed in consultation with the Graduate Advisor.

In addition to the courses listed under the Department of Physics in this catalog the following courses offered at UT Southwestern are applicable to this program:

5181. RADIOLOGICAL PHYSICS
5382. APPLIED RADIOLOGICAL PHYSICS
5094. RESEARCH IN RADIOLOGICAL PHYSICS
5286. ADVANCED RADIOLOGICAL PHYSICS
5193. SEMINAR
5383. DIAGNOSTIC RADIOLOGICAL PHYSICS

5384. PHYSICS OF RADIOTHERAPY
5385. NUCLEAR PHYSICS AND PHYSICS
OF NUCLEAR MEDICINE
5096. TOPICS IN RADIOLOGICAL PHYSICS
5391. READINGS IN RADIOLOGICAL PHYSICS
5098. THESIS

**ADMINISTRATION
AND
GRADUATE FACULTY**



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Gloria W. Eyres, M.A., *Assistant Dean*

GRADUATE FACULTY

(Year in parentheses indicates year of initial employment to the faculty of The University of Texas at Arlington.)

- ALAVI, KAMBIZ, *Associate Professor in Electrical Engineering Department* (1988). B.S., *Massachusetts Institute of Technology*, 1972; M.S., 1977; Ph.D., 1981.
- ALMORE, MARY G., *Associate Professor of Criminology and Criminal Justice* (1972). B.S., *Florida State University*, 1955; M.A., 1956; M.S., 1958; Ph.D., *Texas Christian University*, 1971.
- AMACHER, RYAN C., *Professor of Economics and President of the University* (1992). A.B., *Ripon College*, 1967; Ph.D., *University of Virginia*, 1971.
- AMSTER, HARRIETT, *Professor of Psychology* (1973). A.B., *Bryn Mawr College*, 1950; M.A., *Clark University*, 1954; Ph.D., 1957.
- ANDERS, EVAN M., *Associate Professor of History* (1982). B.A., *University of Texas at Austin*, 1968; M.A., 1970; Ph.D., 1978.
- ANDERSON, DALE A., *Professor of Aerospace Engineering* (1984). B.S., *St. Louis University*, 1957; M.S., *Iowa State University*, 1959; Ph.D., 1964. *Professional Engineer*.
- ANDERSON, R. BRUCE W., *Associate Professor of Sociology* (1973). A.B., *Stanford University*, 1961; M.A., *Northwestern University*, 1965; Ph.D., *Duke University*, 1970.
- ANDERSON, RONALD J., *Adjunct Assistant Professor of Linguistics* (1991). B.S., *University of California*, 1972; M.A., 1980; Ph.D., *Stanford University*, 1990.
- ANDRESEN, EARL, *Professor and Chair of the Communication Department* (1991). A.B., *Columbia College*, 1969; A.M., *University of Illinois*, 1972; Ph.D., *Texas A&M University*, 1988.
- ANJOMANI, ARDESHIR, *Associate Professor of City and Regional Planning* (1979). M.Arch., *University of Tehran, Iran*, 1968; M. Planning, *University of Southern California*, 1976; Ph.D., 1979.
- ANTONIADES, ANTHONY C., *Professor of Architecture* (1973). B.S., *National Technical University, Athens, Greece*, 1965; M.S., *Columbia University*, 1966; M.S., 1968; M.Ph., *University of London*, 1972. *Registered Architect*.
- APILADO, VINCENT P., *Professor of Finance and Real Estate* (1980). B.S., *University of Portland*, 1959; M.B.A., *University of Oregon*, 1966; Ph.D., *University of Michigan*, 1970.
- ARDEKANI, SIAMAK A., *Associate Professor of Civil Engineering* (1989). B.S., *University of Texas at Austin*, 1980; M.S., 1981; Ph.D., 1984. *Professional Engineer*.
- ARGENTO, VITTORIO K., *Associate Professor of Civil Engineering* (1977). B.S., *San Diego State College*, 1964; M.S., *University of Texas at Dallas*, 1976; Ph.D., 1989. *Professional Engineer*.
- ARMSTRONG, MYRNA L., *Associate Professor of Nursing* (1985). B.S.N., *De Paul University*, 1969; M.S., 1972; Ed.D., *East Texas State University*, 1986. *Registered Nurse*.
- ARNOTT, HOWARD J., *Ashbel Smith Professor of Biology* (1974). A.B., *University of Southern California*, 1952; M.S., 1953; Ph.D., *University of California at Berkeley*, 1958.
- ARVIDSON, ENID, *Visiting Assistant Professor of City and Regional Planning* (1993). B.A., *University of California at Santa Barbara*, 1979; M.R.P., *University of Massachusetts*, 1985; Ph.D., 1994.
- ASUNCION, ARELENE, *Assistant Professor of Psychology* (1992). B.A., *University of California at Santa Barbara*, 1986; Ph.D., 1992.
- ASWATH, PRANESH B., *Assistant Professor in Mechanical Engineering Department* (1990). B.S., *St. Joseph's College, Bangalore University*, 1982; B.E., *Industrial Institute of Science, Bangalore, India*, 1985; M.S., *Brown University*, 1987; Ph.D., 1990.
- BACON, JOHN D., *Professor of Biology* (1975). B.S., *Sul Ross State University*, 1966; M.S., *Texas A&M University*, 1970; Ph.D., *University of Texas at Austin*, 1975.
- BAKER, JULIE, *Assistant Professor of Marketing* (1992). B.A., *Iowa State University*, 1973; M.A., *University of Nebraska*, 1984; Ph.D., *Texas A&M University*, 1990.

FACULTY

- BAKER, LEWIS T., *Associate Professor of Humanities and Assistant Vice President for Academic Affairs* (1985). B.A., *University of Texas at Austin*, 1975; M.A., *Louisiana State University*, 1977; Ph.D., 1981.
- BAKER, R.C., *Professor of Information Systems and Management Sciences* (1972). B.A., *University of Texas at Austin*, 1964; Ph.D., *Texas A&M University*, 1971.
- BAKER, W.A., *Professor of Chemistry* (1971). B.S., *Texas A&I University*, 1955; Ph.D., *University of Texas at Austin*, 1959.
- BALSAM, WILLIAM L., *Professor of Geology* (1984). B.S., *Saint Lawrence University*, 1967; M.S., *Brown University*, 1969; Ph.D., 1973.
- BANIOS, EDWARD W., *Assistant Professor in Computer Science and Engineering Department* (1987). B.S., *Drexel University*, 1950; M.S., *University of Texas at Arlington*, 1984; Ph.D., 1986.
- BARKER, CALVIN L. R., *Professor of Mechanical Engineering* (1960). B.S., *University of Texas at Austin*, 1953; M.S., *California Institute of Technology*, 1954; Ph.D., 1958. *Professional Engineer*.
- BARR, WENDY J., *Assistant Professor of Nursing* (1986). B.S., *Loyola University*, 1969; M.S., *University of Massachusetts*, 1976; Ph.D., *Texas Woman's University*, 1985. *Registered Nurse*.
- BARRETT, MARJIE C., *Associate Professor of Social Work* (1978). B.A., *Texas Christian University*, 1959; M.S.S.W., *University of Texas at Austin*, 1962; Ph.D., *Texas Woman's University*, 1978.
- BARROS, CAROLYN A., *Assistant Professor of English* (1977). B.A., *University of Texas at Arlington*, 1973; M.A., *Texas Christian University*, 1978; Ph.D., *University of Texas at Dallas*, 1984.
- BASTIEN, JOSEPH W., *Professor of Anthropology* (1977). B.A., *Maryknoll College*, 1958; M.E., *State University of New York*, 1963; M.D., 1963; M.A., *Cornell University*, 1971; Ph.D., 1973.
- BAUM, EDWARD M., *Professor of Architecture and Dean of the School of Architecture* (1987). A.B., *Harvard College*, 1960; M.Arch., *Harvard University*, 1964. *Registered Architect*.
- BEATY, CHERYL, *Specialist in Social Work and Director of Field Instruction* (1980). B.A., *Midwestern State University*, 1968; M.S.S.W., *University of Texas at Arlington*, 1985.
- BEAUDRY, HARRY R., *Associate Professor of English* (1966). A.B., *Rice University*, 1952; M.A., *Boston University*, 1956; Ph.D., *Duke University*, 1968.
- BEEHLER, JOHN, *Assistant Professor of Accounting* (1988). B.S., *Pennsylvania State University*, 1977; M.B.A., *Indiana University*, 1982; Ph.D., 1985. *CPA*.
- BEEHLER, PAMELA J., *Assistant Professor of Exercise and Sport Studies* (1985). B.S., *Pennsylvania State University*, 1977; M.Ed., *East Stroudsburg University*, 1980; Ph.D., *Indiana University*, 1986.
- BEHBEHANI, KHOSROW, *Associate Professor in Biomedical Engineering Program* (1985). B.S., *Louisiana State University*, 1973; M.S., *Georgia Institute of Technology*, 1975; Ph.D., *University of Toledo*, 1979.
- BELLION, EDWARD, *Professor of Biochemistry and Associate Dean of Science* (1970). B.Sc., *University of Leeds*, 1965; Ph.D., 1968.
- BERNFELD, STEPHEN R., *Professor of Mathematics* (1975). B.S., *Rensselaer Polytechnic Institute*, 1965; Ph.D., *University of Maryland*, 1969.
- BERNSTEIN, IRA H., *Professor of Psychology* (1964). B.A., *University of Michigan*, 1959; M.A., *Vanderbilt University*, 1961; Ph.D., 1963.
- BERRY, MARIANNE, *Associate Professor of Social Work* (1990). B.A., *University of Chicago*, 1981; M.A., 1982; Ph.D., *University of California at Berkeley*, 1990.
- BING, ROBERT L., III, *Associate Professor of Criminology and Criminal Justice* (1991). B.A., *College of the Holy Cross*, 1975; M.S., *Florida State University*, 1976; Ph.D., 1987.
- BIRMINGHAM, JUDITH A., *Associate Professor of Social Work* (1978). B.S., *Lamar University*, 1965; M.S.S.W., *University of Texas at Arlington*, 1974.
- BLACK, TRUMAN D., *Professor of Physics* (1965). B.S., *University of Houston*, 1959; M.A., *Rice University*, 1962; Ph.D., 1964.
- BOND, MARY LOU, *Associate Professor of Nursing* (1989). B.S.N., *Texas Christian University*, 1962; M.S.N., *University of Pittsburgh*, 1973; Ph.D., *University of Texas at Austin*, 1984. *Registered Nurse*.
- BORDOLOI, BIJOY, *Assistant Professor of Information Systems and Management Sciences* (1991). M.A., *Jawaharlal Nehru University, New Delhi*, 1976; Ph.D., *Indiana University*, 1988.

FACULTY

- BOWEN, JAMES N., *Professor of Psychology (1963)*. B.A., *Hardin-Simmons University, 1960*; Ph.D., *University of Texas at Austin, 1963*.
- BOWLES, DORCAS D., *Professor and Dean of the School of Social Work (1993)*. B.S., *Tuskegee Institute, 1958*; M.S.W., *Smith College, 1960*; Ed.D., *University of Massachusetts, 1983*.
- BRADSHAW, DENNY, *Assistant Professor of Philosophy (1992)*. B.A., *Mankato State University, 1982*; Ph.D., *University of Iowa, 1988*.
- BRAGG, LOUIS H., *Professor of Biology (1960)*. B.S., *University of North Texas, 1953*; M.S., *1957*; Ph.D., *University of Texas at Austin, 1964*.
- BREDOW, JONATHAN W., *Assistant Professor in Electrical Engineering Department (1989)*. B.S., *Kansas State University, 1977*; M.S., *Iowa State University, 1980*; Ph.D., *University of Kansas, 1989*.
- BRIGHT, ELISE M., *Assistant Professor of Urban Affairs (1988)*. B.A., *University of Arizona, 1972*; M.A., *Harvard University, 1975*; Ph.D., *Texas A&M University, 1980*.
- BRODIE, EDMUND D., JR., *Professor and Chairman of the Department of Biology (1984)*. B.S., *Oregon College of Education, 1963*; M.S., *Oregon State University, 1967*; Ph.D., *1969*.
- BROWN, VINCENT, *Assistant Professor of Psychology (1991)*. B.A., *Carleton College, 1984*; Ph.D., *University of California at Irvine, 1991*.
- BURGESS-JACKSON, KEITH, *Assistant Professor of Philosophy (1989)*. A.B., *University of Michigan, 1979*; M.A., *Wayne State University, 1983*; J.D., *1983*; M.A., *University of Arizona, 1985*; Ph.D., *1989*.
- BURKART, BURKE, *Professor of Geology (1970)*. B.S., *University of Texas at Austin, 1954*; M.A., *1960*; Ph.D., *Rice University, 1965*.
- BURNS, NANCY, *Professor of Nursing (1976)*. B.S., *Texas Christian University, 1957*; M.S.N., *Texas Woman's University, 1974*; Ph.D., *1981*. Registered Nurse.
- BURQUEST, DONALD A., *Associate Professor of Linguistics (1975)*. B.A., *Wheaton College, 1961*; M.A., *University of California at Los Angeles, 1965*; Ph.D., *1973*.
- BUTTNER, RICHARD J., JR., *Assistant Professor of Finance and Real Estate (1993)*. B.B.A., *University of Georgia, 1987*; Ph.D., *1993*.
- BYRNE, ERIC J., *Assistant Professor in Computer Science and Engineering Department (1993)*. B.S., *University of Nebraska, 1983*; M.S., *Kansas State University, 1988*; Ph.D., *1993*.
- CALLICUTT, JAMES W., *Professor of Social Work (1968)*. B.S., *Memphis State College, 1951*; M.S.S.W., *University of Tennessee, 1958*; Ph.D., *Brandeis University, 1969*.
- CAMPBELL, JONATHAN A., *Associate Professor of Biology (1983)*. B.A., *University of Mississippi, 1969*; M.A., *University of Texas at Arlington, 1977*; Ph.D., *University of Kansas, 1982*.
- CAPOTE, MARIA, *Associate Professor of Foreign Languages (1968)*. B.A., *Southwestern State College, 1964*; M.A., *Texas Christian University, 1965*; Ph.D., *La Laguna University, Spain, 1981*.
- CARNEY, KIM, *Professor of Economics (1967)*. B.S., *Northwestern University, 1947*; M.A., *Southern Methodist University, 1965*; Ph.D., *1968*.
- CARROLL, BILL D., *Professor and Chairman of the Department of Computer Science and Engineering (1981)*. B.S., *University of Texas at Austin, 1964*; M.S., *1966*; Ph.D., *1969*. Professional Engineer.
- CARTER, RONALD L., *Professor in Electrical Engineering Department (1979)*. B.S., *Iowa State University, 1962*; M.S., *1964*; Ph.D., *Michigan State University, 1971*.
- CASH, FLOYD L., *Professor of Electrical Engineering and Associate Dean of the College of Engineering (1959)*. B.S., *University of Oklahoma, 1946*; M.S., *University of Texas at Austin, 1951*; Ph.D., *1955*. Professional Engineer.
- CAWTHON, ELISABETH A., *Assistant Professor of History (1988)*. B.A., *Louisiana Tech University, 1978*; M.A., *University of Virginia, 1981*; Ph.D., *1985*.
- CHAISSON, CHARLES C., *Associate Professor of Classical Studies (1983)*. B.A., *Yale University, 1974*; Ph.D., *1979*.
- CHAN, WEN S., *Associate Professor in Mechanical Engineering Department (1988)*. B.S., *National Cheng Kung University, 1969*; M.S., *Tennessee Technological University, 1972*; Ph.D., *Purdue University, 1979*.
- CHEN, MO-SHING, *Professor of Electrical Engineering (1962)*. B.S., *National Taiwan University, 1954*; M.S., *University of Texas at Austin, 1958*; Ph.D., *1962*. Professional Engineer.

FACULTY

- CHEN, TSU-FEN, *Associate Professor of Mathematics (1987)*. B.A., *National Tsinghua University, 1978*; M.S., *Carnegie-Mellon University, 1979*; Ph.D., 1984.
- CHRZANOWSKI, THOMAS H., *Associate Professor of Biology (1981)*. B.A., *Bloomfield College, 1974*; M.S., *University of South Carolina, 1976*; Ph.D., 1981.
- CHUONG, CHARLES, *Associate Professor in Biomedical Engineering Program (1985)*. B.S., *Cheng-Kung University, 1972*; M.S., *University of California at San Diego, 1977*; Ph.D., 1981.
- CHWIALKOWSKI, MICHAEL P., *Associate Professor in Electrical Engineering Department (1986)*. M.S., *Warsaw Technical University, 1978*; Ph.D., 1982.
- CICHOCK, MARK A., *Associate Professor of Political Science (1985)*. B.S., *University of Wisconsin at Stevens Point, 1976*; M.A., *University of South Carolina, 1979*; Ph.D., 1983.
- CLARK, JILL, *Associate Professor of Political Science (1978)*. B.S., *Iowa State University, 1965*; M.S., *University of Wisconsin in Milwaukee, 1971*; Ph.D., 1974.
- COBB, NORMAN H., *Assistant Professor of Social Work (1989)*. B.A., *Texas Tech, 1967*; M.Div., *St. Paul School of Theology, 1970*; M.S.S.W., *University of Texas at Arlington, 1979*; Ph.D., *University of California at Berkeley, 1986*.
- COHEN, PHILIP G., *Assistant Professor of English (1986)*. B.S., *American University, 1976*; M.A., *University of Southern California, 1978*; Ph.D., *University of Delaware, 1984*.
- COLE, RICHARD L., *Professor of Urban Affairs and Dean of the School of Urban and Public Affairs (1980)*. B.A., *University of North Texas, 1967*; M.A., 1968; Ph.D., *Purdue University, 1973*.
- COLLINS, STEVE A., *Assistant Professor of Civil Engineering (1990)*. B.S., *Georgia Institute of Technology, 1972*; M.S., *Mississippi State University, 1974*; Ph.D., *Georgia Institute of Technology, 1988*. *Professional Engineer*.
- COOK, DIANE J., *Assistant Professor in Computer Science and Engineering Department (1992)*. B.S., *Wheaton College, 1985*; M.S., *University of Illinois at Urbana, 1987*; Ph.D., 1990.
- CORDUNEANU, CONSTANTIN C., *Professor of Mathematics (1979)*. Ph.D., *University of Iasi, Romania, 1956*.
- CORLEY, HERBERT W., JR., *Professor of Industrial Engineering (1971)*. B.S., *Georgia Institute of Technology, 1966*; M.S., 1968; Ph.D., *University of Florida, 1971*. *Professional Engineer*.
- CORNEHLS, JAMES V., *Professor of Urban Affairs (1970)*. B.A., *University of the Americas, 1961*; Ph.D., *University of Texas at Austin, 1965*.
- COURTNEY, HARLEY M., *Professor of Accounting (1970)*. B.B.A., *Lamar University, 1955*; M.B.A., *Texas A&M University, 1961*; Ph.D., *University of Illinois, 1966*. CPA.
- COX, VERNE, *Professor of Psychology (1970)*. B.A., *University of Texas at Austin, 1960*; Ph.D., *University of Houston, 1964*.
- CRICK, REX E., *Professor of Geology (1979)*. B.A., *University of Kansas, 1973*; M.S., 1976; Ph.D., *University of Rochester, 1978*.
- CROSBY, ERNEST C., *Associate Professor of Civil Engineering (1979)*. B.E., *Memphis State University, 1969*; M.S., 1974; Ph.D., *University of Tennessee, 1979*. *Professional Engineer*.
- CROWDER, WILLIAM J., *Assistant Professor of Economics (1992)*. B.S., *Arizona State University, 1987*; Ph.D., 1992.
- CROWELL, THOMAS H., *Adjunct Assistant Professor of Linguistics (1982)*. M.A., *University of Michigan, 1967*; M.A., *Cornell University, 1976*; Ph.D., 1979.
- DANGEL, RICHARD F., *Professor of Social Work (1977)*. B.A., *Michigan State University, 1971*; M.S.W., *University of Michigan, 1973*; Ph.D., *University of Kansas, 1978*.
- DAVIS, ALAN W., *Associate Professor in Electrical Engineering Department (1983)*. B.S., *University of Michigan, 1963*; M.S., 1964; Ph.D., 1971.
- DAWSON, IRVING, *Professor of Political Science (1971)*. B.A., *University of North Texas, 1948*; M.A., *University of Texas at Austin, 1950*; Ph.D., 1957.
- DEL CASTILLO, ENRIQUE, *Assistant Professor in Industrial Engineering Department (1993)*. B.S., *Universidad Panamericana, 1986*; M. Eng., *Cornell University, 1988*; Ph.D., *Arizona State University, 1993*.

FACULTY

- DESS, GREGORY, *Professor of Management (1987)*. B.I.E., *Georgia Institute of Technology, 1971; M.B.A., Georgia State University, 1976; Ph.D., University of Washington, 1980.*
- DEVARAJAN, VENKAT, *Associate Professor in Electrical Engineering Department (1990)*. B.S., *Indian Institute of Technology, 1973; M.S., 1975; Ph.D., University of Texas at Arlington, 1979.*
- DIANA, LEONARD M., *Professor of Physics (1965)*. B.S., *Georgia Institute of Technology, 1948; Ph.D., University of Pittsburgh, 1953.*
- DIAS, RASIKA, *Assistant Professor of Chemistry (1992)*. B.S., *University of Peradeniya, Sri Lanka, 1983; Ph.D., University of California at Davis, 1988.*
- DICKINSON, ROGER A., *Professor of Marketing (1975)*. A.B., *Williams College, 1951; M.B.A., University of California at Los Angeles, 1955; Ph.D., Columbia University, 1967.*
- DILLON, WILLIAM E., *Associate Professor of Electrical Engineering (1971)*. B.S., *Texas A&M University, 1965; M.S., University of Texas at Arlington, 1969; Ph.D., 1972. Professional Engineer.*
- DILTZ, DAVID, *Associate Professor of Finance and Real Estate (1987)*. B.S., *Purdue University, 1976; M.S., University of Illinois, 1978; Ph.D., 1980.*
- DRAGAN, IRINEL, *Professor of Mathematics (1984)*. M.S., *University of Iasi, Romania, 1954; Ph.D., 1961.*
- DRAPER, PAUL A., *Assistant Professor of Physics (1991)*. B.A., *University of Kansas, 1978; M.S., 1980; Ph.D., Indiana University, 1987.*
- DUEHN, WAYNED., *Professor of Social Work (1970)*. B.A., *North Central College, 1961; M.S.W., Loyola University, 1964; Ph.D., Washington University, 1970.*
- DULANEY, W. MARVIN, *Assistant Professor of History (1986)*. B.A., *Central State University, Ohio, 1972; M.A., Ohio State University, 1974; Ph.D., 1984.*
- DUNCAN, CHESTER I., JR., *Professor of Architecture (1976)*. B.M.E., *Villanova College, 1946; M.S., University of Pennsylvania, 1950. Professional Engineer. FASCE.*



- DUNN, DANA L., *Assistant Professor of Sociology (1987)*. B.A., *University of Texas at Dallas, 1980; M.A., 1981; Ph.D., University of North Texas, 1987.*
- DUNN, WILLIAM MARCUS, *Accounting Alumni Professor of Accounting (1979)*. B.B.A., *University of Texas at Arlington, 1968; M.B.A., 1970; Ph.D., University of Florida, 1976. CPA.*
- DYER, DANNY D., *Professor of Mathematics (1963)*. B.S., *University of Texas at Arlington, 1961; M.S., Southern Methodist University, 1963; Ph.D., 1970.*
- DYSON, JULIA TAUSSIG, *Assistant Professor of Philosophy (1993)*. B.A., *Princeton University, 1988; M.A., Harvard University, 1991; Ph.D., 1993.*
- EAKIN, MARK E., *Associate Professor of Information Systems and Management Sciences (1980)*. B.S., *Tarleton State University, 1972; M.S., Texas A&M University, 1977; Ph.D., 1980.*
- EBERHART, ROBERT C., *Adjunct Professor and Director of the Biomedical Engineering Program (1978)*. A.B., *Harvard University, 1958; Ph.D., University of California at Berkeley, 1965.*
- EDMONDSON, JEROLD A., *Professor of Foreign Languages and Linguistics (1981)*. B.S., *Purdue University, 1963; M.A., University of California at Los Angeles, 1969; Ph.D., 1973; Dr. phil. habil., Technical University, Berlin, 1979.*
- EISENFELD, JEROME, *Professor of Mathematics (1972)*. B.S., *City College of New York, 1960; M.S., University of Chicago, 1964; Ph.D., 1966.*
- ELLIOTT, AUDLEY RAY, *Assistant Professor of Foreign Languages (1992)*. B.A., *Heidelberg College, 1984; M.A., Purdue University, 1987; Ph.D., Indiana University, 1992.*
- ELLIOTT, DOREEN, *Professor of Social Work (1988)*. B.A., *University of London, 1963; Ph.D., University of Wales, 1986.*
- ELLWOOD, BROOKS B., *Professor of Geology (1983)*. B.S., *Florida State University, 1970; M.S., University of Rhode Island, 1974; Ph.D., 1976.*
- ELMASRI, RAMEZ A., *Associate Professor in Computer Science and Engineering Department (1990)*. B.S., *Alexandria University, 1972; M.S., Stanford University, 1980; Ph.D., 1980.*
- ELSENBAUMER, RONALD L., *Professor of Chemistry and Director of Materials Science Program (1991)*. B.S., *Purdue University, 1973; Ph.D., Stanford University, 1978.*
- ERICKSON, JAMES R., *Professor of Psychology (1975)*. B.A., *University of Minnesota, 1958; Ph.D., 1963.*
- ESTES, EMORY D., *Professor of English (1956)*. B.A., *East Texas Baptist College, 1949; M.A., University of North Texas, 1956; Ph.D., Texas Christian University, 1970.*
- EVE, RAYMOND A., *Associate Professor of Sociology (1976)*. B.A., *University of North Carolina at Chapel Hill, 1969; Ph.D., 1975.*
- FAIRBANKS, ROBERT B., *Associate Professor of History (1983)*. B.A., *Greenville College, 1972; M.A., Indiana State University, 1974; Ph.D., University of Cincinnati, 1981.*
- FARIS, WENDY B., *Professor of English (1985)*. B.A., *Stanford University, 1967; M.A., Harvard University, 1970; Ph.D., 1975.*
- FARMER, JAMES, *Assistant Professor of Social Work (1990)*. B.A., *University of Northern Iowa, 1974; M.A., 1976; M.S.W., 1978; Ph.D., Ohio State University, 1986.*
- FARNSWORTH, S. REGENA, *Assistant Professor of Marketing (1993)*. B.B.A., *Chapman College, 1980; M.B.A., University of Texas at Arlington, 1989; Ph.D., Texas A&M University, 1993.*
- FEIGENBAUM, IRWIN, *Associate Professor of Foreign Languages and Linguistics (1979)*. A.B., *Duke University, 1959; M.A., Indiana University, 1961; Ph.D., University of Wisconsin-Milwaukee, 1978.*
- FERRIER, RICHARD B., *Professor of Architecture and Associate Dean of the School of Architecture (1968)*. B.Arch., *Texas Tech University, 1968; M.A., University of Dallas, 1972. Registered Architect.*
- FITZER, JACK, *Professor in Electrical Engineering Department (1967)*. B.S., *University of Missouri, 1951; M.S., Washington University, 1960; D.Sc., 1962.*
- FIX, GEORGE J., *Professor and Chairman of the Department of Mathematics (1986)*. B.S., *Texas A&M University, 1963; M.S., Rice University, 1965; Ph.D., Harvard University, 1968.*
- FLEISSIG, ADRIAN ROY, *Assistant Professor of Economics (1993)*. B.S., *University of Witwatersrand, 1985; M.A., 1988; Ph.D., North Carolina State, 1993.*

FACULTY

- FORMANOWICZ, DANIEL R., JR., *Associate Professor of Biology* (1985). B.S., *State University of New York at Fredonia*, 1976; M.S., *Adelphi University*, 1978; Ph.D., *State University of New York at Albany*, 1982.
- FRANCAVIGLIA, RICHARD V., *Associate Professor of History and Director of the Center for Greater Southwestern Studies and the History of Cartography* (1991). B.A., *University of California at Riverside*, 1967; M.A., *University of Oregon*, 1970; Ph.D., 1970.
- FRANCIS, ROBERT F., *Professor of Chemistry* (1955). B.S., *East Texas State University*, 1954; M.S., 1955; Ph.D., *Texas Christian University*, 1967.
- FRANK, LUANNE T., *Associate Professor of English* (1969). B.A., *University of North Carolina*, 1955; M.A., *Emory University*, 1959, 1963; Ph.D., *University of Michigan*, 1970.
- FRANKLIN, KARL J., *Adjunct Professor of Linguistics* (1977). A.B., *King's College*, 1950; M.A., *Cornell University*, 1965; Ph.D., *Australian National University*, 1969.
- FRY, JOHN L., *Professor of Physics* (1971). B.S., *Baylor University*, 1961; M.S., 1962; Ph.D., *University of California at Riverside*, 1966.
- FUKUCHI, CURTIS, *Assistant Professor of English* (1989). B.A., *University of Hawaii at Manoa*, 1978; M.A., *Harvard University*, 1980; Ph.D., 1986.
- FUNG, ADRIAN K., *Professor in Electrical Engineering Department* (1984). B.S., *Taiwan Provincial Cheng Kung University*, 1958; M.S., *Brown University*, 1961; Ph.D., *University of Kansas*, 1965.
- FUNKHOUSER, CHARLES W., *Professor of Education and Director of the Center for Professional Teacher Education* (1976). B.S., *University of Omaha*, 1963; M.S., *University of Nebraska at Omaha*, 1969; Ed.D., *University of Nebraska*, 1972.
- FURUBOTN, EIRIK G., *Eunice and James L. West Chair, Professor of Economics* (1982). A.B., *Brown University*, 1948; M.A., *Columbia University*, 1950; Ph.D., 1959.
- GAINES, J.H., *Professor of Aerospace Engineering and Engineering Mechanics* (1966). B.S., *University of Texas at Austin*, 1957; M.S., 1959; Ph.D., 1966. *Professional Engineer*.
- GALLMAN, ANDREW FRANKLIN, JR., *Adjunct Assistant Professor of Linguistics* (1993). B.A., *Millsaps College*, 1970; M.A., *University of Texas at Arlington*, 1974; Ph.D., 1983.
- GATES, ROGER H., *Professor of Marketing* (1970). B.S., *University of Florida*, 1966; M.B.A., 1967; Ph.D., 1973.
- GEISEL, PAUL N., *Professor of Urban Affairs* (1970). B.A., *Willamette University*, 1956; M.A., *Vanderbilt University*, 1958; Ph.D., 1962.
- GERLOFF, EDWIN A., *Professor of Management* (1970). B.B.A., *University of Texas at Arlington*, 1964; M.B.A., *University of North Texas*, 1966; Ph.D., *University of Texas at Austin*, 1971.
- GILLESPIE, ARTHUR A., *Associate Professor of Mathematics* (1960). B.A., *University of North Texas*, 1958; M.A., 1960.
- GINTOLE, GEORGE, *Associate Professor of Architecture* (1985). B.Arch., *The Cooper Union*, 1976; M.Arch., *Princeton University*, 1978.
- GIRARDOT, PETER R., *Professor of Chemistry* (1966). B.S., *University of Detroit*, 1944; M.S., *University of Michigan*, 1948; Ph.D., 1952.
- GOLDBERG, JOYCE S., *Associate Professor of History* (1982). B.A., *Indiana University*, 1972; M.A., 1973; Ph.D., 1981.
- GOLDSTEEN, JOEL B., *Professor of City and Regional Planning* (1976). B.Arch., *University of Pennsylvania*, 1963; M.Arch. and *Urban Design*, *Washington University*, 1969; Ph.D., *Michigan State University*, 1978. *Registered Architect*.
- GOOLSBY, ROGER D., *Associate Professor of Mechanical Engineering and Materials Science* (1980). B.S., *University of Texas at Arlington*, 1967; M.S., 1968; Ph.D., *University of California at Berkeley*, 1971. *Professional Engineer*.
- GORDON, LLOYD B., *Assistant Professor in Electrical Engineering Department* (1991). B.S., *Texas Tech University*, 1974; M.S., 1977; Ph.D., 1983.
- GRANVOLD, DONALD K., *Professor of Social Work* (1974). B.A., *Graceland College*, 1965; M.S.W., *University of Iowa*, 1970; Ph.D., 1975.

FACULTY

- GRAY, DAVID A., *Associate Professor and Acting Chairman of the Department of Management (1973)*. B.B.A., University of Iowa, 1967; M.A., 1969; Ph.D., University of Massachusetts, 1974.
- GREEN, GEORGE N., *Professor of History (1966)*. B.A., University of Texas at Austin, 1961; M.A., Florida State University, 1962; Ph.D., 1966.
- GREENSPAN, DONALD, *Professor of Mathematics (1978)*. B.S., New York University, 1948; M.S., University of Wisconsin, 1949; Ph.D., University of Maryland, 1956.
- GREGERSON, KENNETH JAMES, *Adjunct Professor of Linguistics (1977)*. B.A., Seattle Pacific College, 1961; M.A., University of Washington, 1963; Ph.D., 1971.
- GROSS, RUTH V., *Professor and Chair of the Department of Foreign Languages (1991)*. B.A., Northwestern University, 1967; M.Phil., Yale University, 1970; Ph.D., 1975.
- GROVE, SUSAN, *Professor and Assistant Dean of the School of Nursing (1978)*. B.S.N., University of Iowa, 1972; M.S., University of Oklahoma, 1975; Ph.D., Texas Woman's University, 1981. Registered Nurse.
- GUTIERREZ, JOSE A., *Associate Professor of Political Science (1993)*. B.A., Texas A&I University, 1966; M.A., St. Mary's University, 1968; Ph.D., University of Texas at Austin, 1976; J.D., University of Houston, 1988.
- GUY, R. JOSEPH, *Associate Professor of Architecture (1979)*. B.F.A., Texas Christian University, 1977; M.F.A., 1979.
- GUYNES, JAN L., *Associate Professor of Information Systems and Management Sciences (1985)*. B.S., University of Texas Southwestern Medical Center at Dallas, 1979; M.B.A., University of North Texas, 1981; Ph.D., 1985.
- HADAWAY, NANCY L., *Associate Professor of Education (1989)*. B.A., Texas A&M University, 1972; M.S., American Technological University, 1982; Ph.D., Texas A&M University, 1987.
- HAJI-SHEIKH, A., *Professor of Mechanical Engineering (1966)*. B.S., University of Tehran, Iran, 1956; M.S., University of Michigan, 1959; M.A., 1961; Ph.D., University of Minnesota, 1965. Professional Engineer.
- HALL, BETHANE PIERCE, *Associate Professor of Accounting (1985)*. B.S., Texas A&M University, 1975; M.P.A., University of Texas at Arlington, 1978; Ph.D., University of North Texas, 1987.
- HALL, THOMAS, *Public Accounting Professor of Accounting (1981)*. B.B.A., University of Texas at Arlington, 1974; M.P.A., 1975; Ph.D., Oklahoma State University, 1981.
- HAMILTON, R. TODD, *Associate Professor and Assistant Dean of the School of Architecture (1973)*. B.Arch., Carnegie-Mellon University, 1969; M.Arch., Massachusetts Institute of Technology, 1972. Registered Architect.
- HAN, CHIEN-PAI, *Professor of Mathematics (1982)*. B.A., National Taiwan University, 1958; M.A., University of Minnesota, 1962; Ph.D., Harvard University, 1967.
- HANDY, NANCY, *Assistant Professor of Nursing (1992)*. B.S.N., Baylor University, 1967; M.S., Texas Woman's University, 1976; Ph.D., 1992. Registered Nurse.
- HANSON, JEFFREY R., *Associate Professor of Anthropology (1986)*. B.S., University of Wisconsin, Stevens Point, 1972; M.A., Northern Illinois University, 1977; Ph.D., University of Missouri, Columbia, 1983.
- HARBISON-BRIGGS, KARAN, *Assistant Professor in Computer Science and Engineering Department (1987)*. B.S., University of Texas at Austin, 1972; M.A., 1976; M.S., University of Texas at Arlington, 1984; Ph.D., 1986.
- HARRISON, DAVID A., *Assistant Professor of Management (1989)*. B.S., Bowling Green State University, 1983; M.S., 1985; M.A., 1987; Ph.D., University of Illinois at Urbana-Champaign, 1988.
- HARROLD, FRANCIS B., *Associate Professor of Anthropology (1980)*. B.A., Loyola University of Chicago, 1970; M.A., 1974; Ph.D., University of Chicago, 1978.
- HART, MARY LOUISE, *Assistant Professor of Art (1993)*. B.A., Boise State University, 1976; B.A., University of Washington, 1978; M.A., 1983; Ph.D., University of California at Los Angeles, 1992.
- HARWOOD, JOHN RANDLE, *Assistant Professor of Landscape Architecture (1989)*. B.L.A., University of Guelph, 1987; M.L.A., University of Massachusetts, 1989.
- HASSELL, JOHN M., *Associate Professor of Accounting (1989)*. B.B.A., Baylor University, 1970; M.S., Oklahoma State University, 1973; M.B.A., Indiana University, 1982; Ph.D., 1983.

FACULTY

- HAWKINS, DOYLE L., JR., *Associate Professor of Mathematics (1983)*. B.S., Lamar University, 1976; M.S., Texas A&M University, 1977; Ph.D., University of North Carolina, Chapel Hill, 1983.
- HAYASHI, PAUL M., *Professor of Economics (1965)*. B.A., Meiji Gakuin University, 1955; B.D., Western Theological Seminary, 1959; M.S., University of Wisconsin, 1962; M.A., Southern Methodist University, 1965; Ph.D., 1969.
- HAYNES, SAM W., *Assistant Professor of History (1993)*. B.A., Columbia University, 1978; M.A., University of Houston, 1984; Ph.D., 1988.
- HEARD, CHINITA A., *Assistant Professor of Political Science (1993)*. B.S., Alabama State University, 1983; M.S., Florida State University, 1985; Ph.D., 1988.
- HEATH, LARRY F., *Associate Professor of Mathematics (1965)*. B.S., Washburn University of Topeka, 1960; M.A., University of Kansas, 1962; Ph.D., 1965.
- HEGSTAD, JO LORRAINE, *Associate Professor in Nursing (1981)*. B.S.N., University of Texas Medical Branch at Galveston, 1969; M.S., University of Colorado, 1972; Ph.D., Arizona State University, 1981. Registered Nurse.
- HEIJMANS, JOHANNES, *Assistant Professor of Mathematics (1987)*. B.A., Nijmegen University, 1974; M.A., 1978; M.S., Cornell University, 1983; Ph.D., 1986.
- HEKMAN, SUSAN J., *Professor of Political Science (1977)*. B.A., Carleton College, 1971; M.A., University of Washington, 1973; Ph.D., 1976.
- HELAL, ABDELSALAM, *Assistant Professor in Computer Science and Engineering Department (1992)*. B.S., Alexandria University, 1982; M.S., 1985; Ph.D., Purdue University, 1991.
- HELLIER, THOMAS R., JR., *Professor of Biology (1960)*. B.A., University of Florida, 1955; M.S., 1957; Ph.D., University of Texas at Austin, 1961.
- HENRY, JAY C., *Professor of Architecture (1972)*. B.Arch., Catholic University of America, 1962; M.Arch., University of Washington, 1969; Ph.D., University of California at Berkeley, 1974.
- HENSLER, DOUGLAS A., *Assistant Professor of Finance and Real Estate (1991)*. B.S.E., Princeton University, 1969; M.B.A., University of Portland, 1981; Ph.D., University of Washington, 1989.
- HERRING, SUSAN C., *Associate Professor of Linguistics (1992)*. B.A., State University College of New York, 1976; M.A., University of California at Berkeley, 1982; Ph.D., 1991.
- HEUSINKVELD, KAREN, *Associate Professor of Nursing (1983)*. B.S.N., South Dakota State University, 1967; M.S.N., University of Iowa, 1969; Dr.P.H., University of Texas School of Public Health, 1978. Registered Nurse.
- HIMARIOS, DANIEL D., *Associate Professor of Economics (1983)*. B.A., National and Kapodistrian University of Athens, Greece, 1978; M.A., Virginia Polytechnic Institute and State University, 1980; Ph.D., 1983.
- HISSONG, RODNEY V., *Assistant Professor of Urban Affairs (1988)*. B.S., Iowa State University, 1974; M.S., 1978.
- HO, LI CHIN, *Assistant Professor of Accounting (1990)*. B.B.A., National Taiwan University, 1981; M.P.A., University of Texas at Austin, 1984; Ph.D., 1990.
- HOEFER, RICHARD A., *Assistant Professor of Social Work (1992)*. B.S.W., University of Kansas, 1979; M.S.W., 1981; M.A., University of Michigan, 1984; Ph.D., 1989.
- HOLDER, LAWRENCE B., *Assistant Professor in Computer Science and Engineering Department (1991)*. B.S., University of Illinois at Urbana-Champaign, 1986; M.S., 1988; Ph.D., 1991.
- HOLLAND, THOMAS E., *Professor of Economics (1970)*. B.S., University of Tennessee, 1957; M.S., 1958; Ph.D., Duke University, 1963.
- HOPKINS, DEBRA, *Professor of Accounting (1987)*. B.F.A., Ohio University, 1971; M.B.A., 1974; Ph.D., Oklahoma State University, 1980.
- HOWARD, IRIS A., *Assistant Professor of Physics (1990)*. S.B., Massachusetts Institute of Technology, 1975; Ph.D., 1982.
- HSIA, PEI, *Professor in Computer Science and Engineering Department (1982)*. B.S., National Taiwan University, 1966; M.S., Pennsylvania State University, 1972; Ph.D., University of Texas at Austin, 1972.

FACULTY

- HUANG, TSENG, *Professor of Civil Engineering and Engineering Mechanics (1961)*. B.S., *National Chiao Tung University, 1947*; M.C.E., *University of Oklahoma, 1955*; Ph.D., *University of Illinois, 1960*. *Professional Engineer.*
- HUFF, BRIAN LLOYD, *Assistant Professor in Industrial Engineering Department (1994)*. B.S., *West Virginia University, 1985*; M.S., *University of Texas at Arlington, 1989*; Ph.D., 1993.
- HUFNAGEL, STEPHEN P., *Assistant Professor in Computer Science and Engineering Department (1987)*. B.A., *University of Texas at Austin, 1968*; Ph.D., 1987.
- HULLENDER, DAVID A., *Professor of Mechanical Engineering (1970)*. B.S., *Oklahoma State University, 1966*; M.S., 1967; Ph.D., *Massachusetts Institute of Technology, 1969*. *Professional Engineer.*
- HUNTER, MARY, *Professor of Social Work (1971)*. B.A., *University of North Texas, 1958*; M.S., 1960; M.S.W., *San Diego State College, 1968*; Ph.D., *Ohio State University, 1972*.
- HUQ, FAIZUL, *Associate Professor of Information Systems and Management Sciences (1987)*. B.A., *Franklin College of Indiana, 1980*; M.A., *Indiana University, 1982*.



FACULTY

- HUTTAR, GEORGE LEE, *Adjunct Professor of Linguistics (1973)*. B.A., Wheaton College, 1962; M.A., University of Michigan, 1964; Ph.D., 1967.
- HUTTAR, MARY L., *Adjunct Assistant Professor of Linguistics (1985)*. B.S., Wheaton College, 1962; M.A., University of Texas at Arlington, 1983.
- HWANG, SHINJA, *Adjunct Assistant Professor of Foreign Languages and Linguistics (1984)*. B.A., Ewha Women's University (Seoul, Korea), 1965; M.L.S., University of Oklahoma, 1968; M.A., University of Texas at Arlington, 1974; Ph.D., 1981.
- ICKES, WILLIAM, *Professor of Psychology (1982)*. B.S., Brigham Young University, 1969; Ph.D., University of Texas at Austin, 1973.
- IGNAGNI, JOSEPH A., *Assistant Professor of Political Science (1989)*. B.S., Michigan State University, 1981; M.S., Purdue University, 1984; M.A., Michigan State University, 1986; Ph.D., 1989.
- IMRHAN, SHEIK N., *Assistant Professor in Industrial Engineering Department (1986)*. B.S., University of Guyana, 1973; M.S., University of Alabama, 1981; Ph.D., Texas Tech University, 1983.
- ISRAEL-PELLETIER, AIMEE, *Associate Professor of French (1993)*. B.A., Monclair College, 1970; M.A., Rutgers University, 1972; Ph.D., 1981.
- IYER, RAJA K., *Associate Professor of Information Systems and Management Sciences (1984)*. B.S., R.E. College, Durgapur, India; M.S., University of Minnesota, 1972; M.B.A., 1975; Ph.D., 1984.
- JACKSON, RAYMOND L., *Associate Professor of Psychology (1979)*. A.B., Dartmouth College, 1972; M.A., University of Illinois, 1976; Ph.D., University of Colorado, 1979.
- JACOBSON, JOHN E., *Assistant Professor of Education (1990)*. B.S., Brigham Young University, 1975; M.Ed., 1978; Ed.S., 1983; Ed.D., 1990.
- JALLOH, ALUSINE, *Assistant Professor of History (1993)*. B.A., University of Sierra Leone, 1986; M.A., Howard University, 1989; Ph.D., 1993.
- JARBOE, GLEN R., *Associate Professor of Marketing (1982)*. B.B.A., University of Texas at Arlington, 1972; M.B.A., 1977; Ph.D., Purdue University, 1981.
- JOHNSON, BARBARA, *Assistant Professor of Nursing (1990)*. B.S.N., Texas Woman's University, 1975; M.S., 1976; M.S., University of Texas at Dallas, 1983; Ph.D., Texas Woman's University, 1988. Registered Nurse.
- JOHNSON, ROBERT M., *Professor of Mechanical Engineering and Materials Science and Acting Dean of the Graduate School (1967)*. B.S., University of Oklahoma, 1962; M.S., 1965; Ph.D., 1967. Professional Engineer.
- JONES, MARY ELAINE, *Associate Professor of Nursing (1982)*. B.S.N., Incarnate Word College, 1963; M.A.N., New York University, 1965; M.A., Southern Methodist University, 1979; Ph.D., 1981. Registered Nurse.
- JORDAN, CATHELEEN, *Associate Professor of Social Work (1985)*. B.A., University of Houston, 1973; M.S.S.W., University of Texas at Arlington, 1979; Ph.D., University of California at Berkeley, 1986.
- JOSHI, SHIV P., *Associate Professor in Aerospace Engineering Department (1988)*. B.S., Indian Institute of Technology, 1971; M.S., 1981; Ph.D., Purdue University, 1985.
- KAISER, JEROME, *Associate Professor of Physics (1986)*. B.S., University of East Anglia, England, 1980; Ph.D., 1984.
- KAMANGAR, FARHAD A., *Associate Professor in Computer Science and Engineering Department (1983)*. B.S., University of Tehran, 1975; M.S., University of Texas at Arlington, 1977; Ph.D., 1980.
- KANNAN, R., *Professor of Mathematics (1977)*. B.S., St. Xavier's College, Calcutta, 1963; M.S., Calcutta University, 1965; Ph.D., Purdue University, 1972.
- KATSIKAS, SUZANNE M., *Associate Professor and Acting Chair of the Department of Political Science (1969)*. B.A., University of New Hampshire, 1963; M.A., Brown University, 1964; Ph.D., University of Oklahoma, 1975.
- KAVI, KRISHNA M., *Professor in Computer Science and Engineering Department (1982)*. B.E., Indian Institute of Science, 1975; M.S., Southern Methodist University, 1977; Ph.D., 1980.
- KEILSTRUP, DUANE V., *Associate Professor of Foreign Languages (1960)*. B.A., University of Nebraska, 1957; M.A., 1959; Ph.D., 1973.

FACULTY

- KELLNER, HANS DODDS, *Professor of English and Director of the Rhetoric Program (1991)*. A.B., *Harvard College, 1966*; Ph.D., *University of Rochester, 1972*.
- KELLY, JANET ARLENE, *Assistant Professor of Education (1993)*. B.A., *Houston Baptist University, 1969*; M.A.T., *Texas Christian University, 1975*; Ph.D., *University of North Texas, 1993*.
- KENT, CAROLYN E., *Adjunct Assistant Professor of Linguistics (1983)*. A.B., *San Diego State College, 1960*; M.Ed., *University of North Texas, 1982*.
- KING, SHIRLEY A., *Associate Professor and Associate Dean of the School of Social Work (1979)*. B.A., *Spelman College, 1972*; M.S.W., *University of Pittsburgh, 1974*; Ph.D., *Washington University, 1979*.
- KLEMER, DAVID P., *Associate Professor in Electrical Engineering Department (1988)*. B.S., *University of Michigan, 1977*; M.S., 1978; Ph.D., 1982.
- KNOX, JO, *Assistant Professor of Social Work (1992)*. B.S.W., *Our Lady of the Lake University, 1980*; M.S.W., 1981; Ph.D., *University of California at Berkeley, 1990*.
- KONDRASKE, GEORGE VINCENT, *Professor in Electrical Engineering Department (1982)*. B.S., *University of Rochester, 1978*; M.S., *University of Texas at Arlington and University of Texas Southwestern Medical Center at Dallas*; Ph.D., 1982.
- KOPP, JAMES, *Associate Professor of Psychology (1970)*. B.A., *Miami University, 1960*; Ph.D., *University of Michigan, 1967*.
- KORZENIOWSKI, ANDRZEJ, *Associate Professor of Mathematics (1983)*. M.S., *Wroclaw University, 1974*; Ph.D., 1978.
- KOYMEN, ALI R., *Assistant Professor of Physics (1990)*. B.S., *University of Hacettepe, Turkey, 1977*; M.S., *University of Michigan, 1980*; Ph.D., 1984.
- KOZMAN, THEODORE, *Adjunct Professor in Electrical Engineering Department (1991)*. B.S., *University of Southern California, 1967*; M.S., 1969; Ph.D., *University of Tennessee, 1973*.
- KRUZIC, ANDREW P., *Assistant Professor in Civil Engineering Department (1988)*. B.S., *Loyola University of Los Angeles, 1975*; M.S., *University of California at Berkeley, 1976*; Ph.D., *University of California at Davis, 1984*.
- KUGLE, STEPHEN, *Assistant Professor in Mechanical Engineering Department (1982)*. B.Mus., *University of North Texas, 1969*; B.S., *University of Texas at Arlington, 1975*; M.S., 1977; Ph.D., 1987.
- KUNG, CHENHO, *Associate Professor in Computer Science and Engineering Department (1991)*. B.S., *Peking University, 1977*; M.S., *Norwegian Institute of Technology*; Ph.D., 1984.
- KYBA, FERNE, *Assistant Professor of Nursing (1990)*. B.S.N., *Saskatchewan University, 1961*; M.S.N., *University of Texas at Austin, 1976*; Ph.D., *Texas A&M University, 1990*. Registered Nurse.
- KYLE, DONALD G., *Associate Professor of History (1984)*. B.A., *York University, 1973*; M.A., *McMaster University, 1974*; Ph.D., 1981.
- LACKNER, BEDE KARL, *Professor of History (1969)*. B.Th., *San Anselmo, Rome, 1958*; M.A., *Marquette University, 1959*; Ph.D., *Fordham University, 1968*.
- LACY, DALLAS L., *Associate Professor of English (1965)*. B.A., *Hardin-Simmons University, 1957*; M.A., *University of North Texas, 1961*; Ph.D., *Louisiana State University, 1968*.
- LADDE, GANGARAMS., *Professor of Mathematics (1980)*. B.S., *People's College, Nanded, India, 1963*; M.S., *Marathwada University, Aurangabad, India, 1965*; Ph.D., *University of Rhode Island, 1972*.
- LARSON, MILDRED L., *Adjunct Assistant Professor of Linguistics (1980)*. B.A., *Wheaton College, 1947*; M.A., *University of Michigan, 1958*; Ph.D., *University of Texas at Arlington, 1978*.
- LAWLEY, TOMMY J., *Professor of Mechanical Engineering (1971)*. B.A., *Rice University, 1960*; B.S., 1961; M.S., *Southern Methodist University, 1966*; Ph.D., 1970. Professional Engineer.
- LAWRENCE, KENT L., *Professor and Acting Chairman of the Department of Mechanical Engineering and Engineering Mechanics (1961)*. B.S., *Texas Tech University, 1959*; M.S., 1960; Ph.D., *Arizona State University, 1965*. Professional Engineer.
- LECCA, PEDRO J., *Professor of Social Work (1979)*. B.S., *Fordham University, 1962*; M.S., *Long Island University, 1967*; Ph.D., *University of Mississippi, 1970*.
- LEE, WEI-JEN, *Associate Professor in Electrical Engineering Department (1986)*. B.S., *National Taiwan University, 1978*; M.S., 1980; Ph.D., *University of Texas at Arlington, 1985*.

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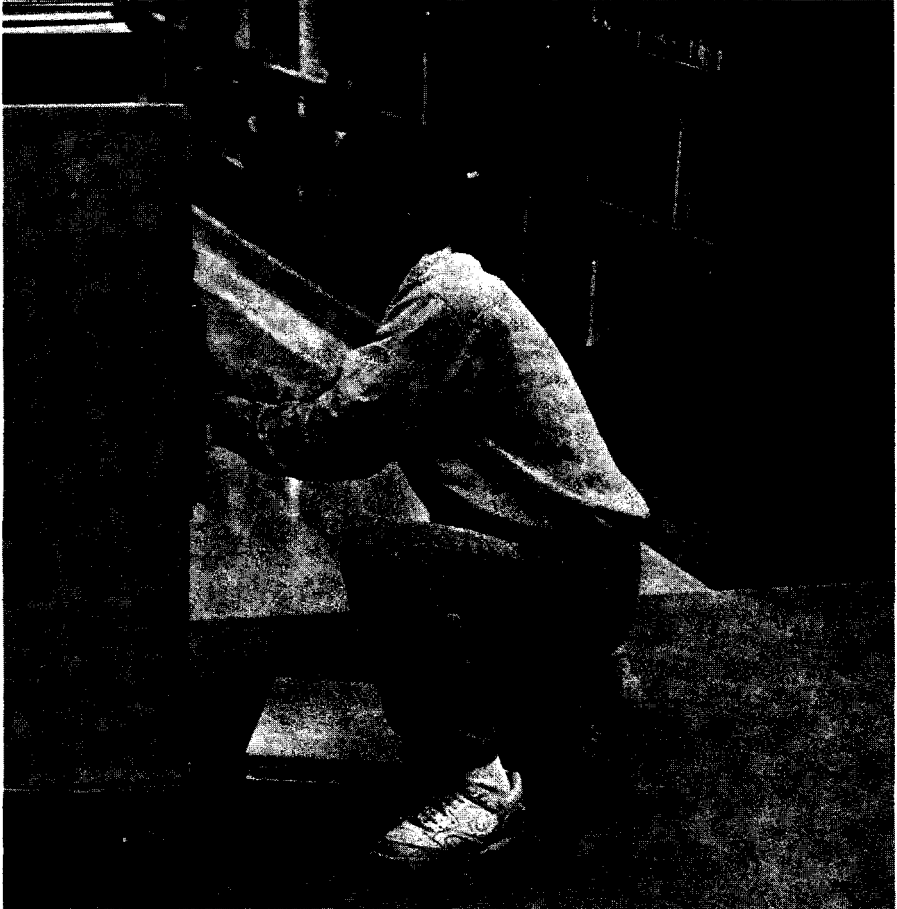
- LEVINE, DANIEL S., *Associate Professor of Mathematics (1983)*. B.A., *Harvard College, 1967*; M.S., *University of Chicago, 1968*; Ph.D., *Massachusetts Institute of Technology, 1975*.
- LEWIS, FRANK L., *Professor in Electrical Engineering Department and Moncrief-O'Donnell Chair for Automation and Robotics (1990)*. B.S., *Rice University, 1971*; M.S., *University of West Florida, 1977*; Ph.D., *Georgia Institute of Technology, 1981*.
- LIAO, GUOJUN, *Associate Professor of Mathematics (1989)*. M.A., *University of California at Berkeley, 1981*; Ph.D., 1985.
- LILES, DONALD H., *Professor of Industrial Engineering (1979)*. B.S., *University of Texas at Arlington, 1970*; M.S., 1974; Ph.D., 1978. *Professional Engineer*.
- LIN, J. T., *Assistant Professor of Mathematics (1988)*. B.S., *South China Normal University, 1957*; M.S., *Carnegie-Mellon University, 1980*; Ph.D., 1984.
- LIPPEL, PHILLIP, *Assistant Professor of Physics (1987)*. A.B., *Williams College, 1978*; M.S., *Brandeis University, 1983*; Ph.D., 1987.
- LITTLE, THOMAS H., *Assistant Professor of Political Science (1992)*. B.A., *University of North Carolina at Greensboro, 1986*; M.A., *Ohio State University, 1989*; Ph.D., 1991.
- LOCKWOOD, LARRY J., *Associate Professor and Acting Chairman of the Department of Finance and Real Estate (1982)*. B.S., *David Lipscomb College, 1975*; M.A., *Western Kentucky University, 1979*; M.S., *Purdue University, 1980*; Ph.D., 1982.
- LONGACRE, ROBERT E., *Adjunct Professor of Linguistics (1972)*. B.A., *Houghton College, 1943*; M.A., *University of Pennsylvania, 1953*; Ph.D., 1955.
- LOWY, MENAHEM, *Associate Professor in Electrical Engineering Department (1992)*. B.S., *Israel Institute of Technology, 1964*; M.S., 1975; Ph.D., *University of California at Berkeley, 1983*.
- LU, FRANK K., *Associate Professor of Aerospace Engineering (1987)*. B.A., *Cambridge University, 1976*; M.A., 1980; M.S., *Princeton University, 1983*; Ph.D., *Pennsylvania State University, 1988*. *Professional Engineer*.
- LUO, TIE, *Assistant Professor of Mathematics (1990)*. B.A., *China University of Science and Technology, 1982*; M.A., *Institute of System Sciences (China), 1984*; Ph.D., *Brandeis University, 1987*.
- MacKENNA, DAVID W., *Associate Professor of Political Science (1972)*. B.A., *University of North Texas, 1960*; M.A., 1967; Ph.D., 1972.
- MAGNUSSON, ROBERT, *Professor of Electrical Engineering (1984)*. B.S., *University of Central Florida, 1971*; M.S., *Georgia Institute of Technology, 1973*; Ph.D., 1976. *Professional Engineer*.
- MAHONEY, TIMOTHY A., *Assistant Professor of Philosophy (1991)*. A.B., *Dartmouth College, 1975*; M.A., *Northwestern University, 1979*; Ph.D., *University of Pennsylvania, 1991*.
- MAIZLISH, STEPHEN, *Associate Professor of History (1979)*. B.A., *University of California at Berkeley, 1967*; M.A., *University of Michigan, 1968*; Ph.D., *University of California at Berkeley, 1978*.
- MALDONADO, THERESA A., *Assistant Professor in Electrical Engineering Department (1990)*. B.S., *Georgia Institute of Technology, 1981*; M.S., 1982; Ph.D., 1990.
- MANN, MARTHA A., *Associate Professor of Psychology (1983)*. R.N., *Worcester City Hospital School of Nursing, 1973*; B.A., *Anna Maria College, 1975*; M.A., 1977; Ph.D., *State University of New York at Albany, 1983*.
- MANRY, MICHAEL T., *Associate Professor in Electrical Engineering Department (1982)*. B.S., *University of Texas at Austin, 1971*; M.S., 1973; Ph.D., 1976.
- MARK, RICHARD S., *Associate Professor of Accounting (1985)*. B.S., *University of Colorado, 1971*; J.D., 1974; L.L.M., *University of Denver, 1977*.
- MARSHALL, THOMAS R., *Professor of Political Science (1976)*. B.A., *Miami University, 1971*; Ph.D., *University of Minnesota, 1976*.
- MARTIN, JAMES I., *Assistant Professor of Social Work (1992)*. B.A., *University of Michigan, 1973*; M.S.W., 1979; Ph.D., *University of Illinois at Chicago, 1991*.
- MARTIN, ROBERT E., *Professor of Economics and Acting Dean of the College of Business Administration (1992)*. B.A., *Austin College, 1966*; M.A., *Texas Christian University, 1968*; M.A., *Southern Methodist University, 1978*; Ph.D., 1979.

FACULTY

- MARUSZCZAK, JOHN P., *Associate Professor of Architecture (1982)*. B.Arch., *The Cooper Union, 1975; M.Arch., Princeton University, 1980.*
- MARYNICK, DENNIS S., *Professor of Chemistry (1978)*. B.S., *California State University at Los Angeles, 1969; M.A., Harvard University, 1971; Ph.D., 1973.*
- MATTHYS, JOHN H., *Professor of Civil Engineering (1974)*. B.S., *University of Texas at Austin, 1964; M.S., 1967; Ph.D., 1972. Professional Engineer.*
- MAYADAS, NAZNEEN, *Professor of Social Work (1972)*. B.A., *Isabella Thoburn College, 1954; M.A., Allahabad University, 1956; M.S.S.A., Case Western Reserve University, 1961; D.S.W., Washington University, 1970.*
- MCALL, JOHN B., *Associate Professor of Economics (1964)*. B.S., *Texas Tech University, 1960; M.B.A., 1961; Ph.D., Oklahoma State University, 1968.*
- MCALLUM, KARIN, *Associate Professor of Communication (1973)*. B.S., *Sam Houston State University, 1957; M.A.T., Texas Christian University, 1972; Ph.D., University of North Texas, 1980.*
- MCCONNELL, DONALD K., JR., *Associate Professor of Accounting (1978)*. B.S., *Oklahoma State University, 1970; M.S., 1971; Ph.D., University of North Texas, 1981. CPA.*
- MCCRADY, WILLIAM B., *Professor of Biology (1962)*. B.S., *East Texas State University, 1954; M.S., 1958; Ph.D., University of Nebraska, 1961.*
- McDANIEL, CARL D., JR., *Professor and Chairman of the Department of Marketing (1970)*. B.S., *Little Rock University, 1963; M.S., Arizona State University, 1964; D.B.A., 1970.*
- McDERMOTT, JOHN, *Professor of Architecture (1982)*. B.Arch., *University of Notre Dame, 1966; M.Art, 1976. Registered Architect.*
- McDONALD, WILLIAM C., *Professor of Biology (1973)*. B.S., *University of Oklahoma, 1955; Ph.D., University of Texas at Austin, 1959.*
- McDOWELL, H. KEITH, *Professor and Chairman of the Department of Chemistry (1991)*. B.S., *Wake Forest University, 1966; Ph.D., Harvard University, 1972.*
- McDOWELL, JUDITH, *Associate Professor of English (1978)*. B.A., *University of Oregon, 1953; M.A., University of Minnesota, 1957; Ph.D., University of Denver, 1961.*
- McELHANON, KENNETH A., *Adjunct Assistant Professor of Linguistics (1977)*. B.A., *Wheaton College, 1961; Ph.D., Australian National University, 1970.*
- McELROY, JOHN H., *Professor in Electrical Engineering and Dean of the College of Engineering (1987)*. B.S., *University of Texas at Austin, 1966; M.S., Catholic University of America, 1973; Ph.D., 1978.*
- McKOWN, BARRY, *Associate Professor of Exercise and Sport Studies (1983)*. B.S., *South Dakota State University, 1966; M.S., 1967; Ph.D., University of Illinois at Urbana-Champaign, 1979.*
- McKINNEY, CAROL V., *Adjunct Assistant Professor of Foreign Languages and Linguistics (1986)*. B.A., *University of California at Los Angeles, 1968; M.A., University of Michigan, 1961; M.A., Southern Methodist University, 1985; Ph.D., 1985.*
- McKINNEY, NORRIS P., *Adjunct Assistant Professor of Linguistics (1977)*. B.S., *Purdue University, 1953; M.S., 1956; M.S., University of Michigan, 1962; Ph.D., 1965.*
- McMAHON, ROBERT F., *Professor of Biology (1972)*. B.A., *Cornell University, 1966; Ph.D., Syracuse University, 1972.*
- MEHTA, MADAN, *Professor of Architecture (1985)*. B.Arch., *University of Roorkee, India, 1961; M.Bldg.S., University of Sydney, 1967; Ph.D., University of Liverpool, 1974. Registered Architect.*
- MEIER, FRANCE A., *Professor in Industrial Engineering Department (1965)*. B.S., *Texas Tech University, 1951; M.S., University of Houston, 1959; D.Sc., Washington University, 1966.*
- MEINERS, ROGER EVERT, *Professor of Economics (1993)*. B.A., *Washington State University, 1970; M.A., University of Arizona, 1972; Ph.D., Virginia Polytechnic Institute, 1976; J.D., University of Miami, 1978.*
- MELGREN, ROGER, *Professor and Chairman of the Department of Psychology (1988)*. B.A., *University of Kansas, 1966; Ph.D., Indiana University, 1970.*
- MERRIFIELD, WILLIAM R., *Adjunct Professor of Linguistics (1974)*. B.A., *Wheaton College, 1954; M.A., Cornell University, 1963; Ph.D., 1965.*

FACULTY

- MILLS, JOHN J., *Professor in Mechanical Engineering Department, Automation and Robotics Research Institute Chair, and Director of Automation and Robotics Research Institute (1990)*. B.S., Glasgow University, Scotland, 1961; Ph.D., University of Durham, England, 1965.
- MINDEL, CHARLES H., *Professor of Social Work (1976)*. A.B., State University of New York at Stony Brook, 1964; A.M., University of Illinois, 1967; Ph.D., 1971.
- MITCHELL, O. ROBERT, *Professor in and Chairman of the Department of Electrical Engineering (1988)*. B.S., Lamar University, 1967; M.S., Massachusetts Institute of Technology, 1968; E.E., 1969; Ph.D., 1972.
- MOFFETT, JAMES M., *Associate Professor of English (1965)*. B.S., Appalachian State University, 1954; M.A., University of Arkansas, 1956; Ph.D., 1968.
- MONOSTORY, DENES, *Professor of Foreign Languages (1958)*. B.A., St. Olaf College, 1951; M.A., University of Texas at Austin, 1953; Ph.D., 1963.
- MOON, JHANG S., *Associate Professor of Political Science (1968)*. B.A., Southern Methodist University, 1959; M.A., Tulane University, 1961; Ph.D., 1963.
- MOORE, MARION E., *Associate Professor of Mathematics (1966)*. B.S., West Texas State University, 1957; M.S., Texas Tech University, 1960; Ph.D., University of New Mexico, 1968.
- MOORE, MICHAEL K., *Assistant Professor of Political Science (1992)*. B.A., Washburn University at Topeka, 1987; M.A., University of Nebraska, 1989; Ph.D., 1993.



FACULTY

- MOORE, THOMAS HOUSTON, *Adjunct Assistant Professor of Linguistics (1992)*. B.A., *San Diego State University, 1964*; M.A., *University of Michigan, 1966*; Ph.D., *University of California at Berkeley, 1974*.
- MORGAN, MARY M., *Adjunct Assistant Professor of Linguistics (1985)*. B.A., *University of North Carolina, 1959*; M.S., *Georgetown University, 1977*; Ph.D., 1980.
- MORREN, RONALD C., *Adjunct Assistant Professor of Linguistics (1985)*. B.S., *Bryan College, 1964*; M.A., *Michigan State University, 1967*; M.A.T., *New Mexico State University, 1969*; Ed.D., 1977.
- MORRIS, CHRISTOPHER, *Assistant Professor of History (1992)*. B.A., *University of Western Ontario, 1981*; M.A., 1985; Ph.D., *University of Florida, 1991*.
- MORRIS, TIMOTHY, *Assistant Professor of English (1990)*. B.A., *Michigan State University, 1979*; Ph.D., *Princeton University, 1983*.
- MULLENDORE, WALTER E., *Professor of Economics (1968)*. B.S., *Oklahoma State University, 1961*; M.S., 1963; Ph.D., *Iowa State University, 1968*.
- MUNCH, JAMES M., *Associate Professor of Marketing (1993)*. B.S., *St. Bonaventure University, 1973*; M.B.A., *Syracuse University, 1975*; Ph.D., *Pennsylvania State University, 1983*.
- MYERS, BEATRICE JANE, *Adjunct Assistant Professor of Linguistics (1972)*. B.A., *McMaster University, 1959*; M.A., *University of North Dakota, 1970*.
- MYKYTYN, PETER P., JR., *Associate Professor of Information Systems and Management Sciences (1985)*. B.S., *John Carroll University, 1963*; M.B.A., *Arizona State University, 1981*; Ph.D., 1985.
- NARRETT, DAVID E., *Associate Professor of History (1984)*. B.A., *Columbia University, 1973*; M.A., *Cornell University, 1976*; Ph.D., 1981.
- NEDDERMAN, WENDELL H., *Professor of Civil Engineering and President Emeritus of the University (1959)*. B.S., *Iowa State University, 1943*; M.E., *Texas A&M University, 1949*; Ph.D., *Iowa State University, 1951*. Professional Engineer. FASCE.
- NEILL, ROBERT L., *Associate Professor of Biology (1970)*. B.S., *Kansas State Teachers College, 1963*; M.S., 1968; Ph.D., *University of Oklahoma, 1970*.
- NESTELL, MERLYND K., *Associate Professor of Mathematics and Geology (1969)*. B.A., *Andrews University, 1957*; M.A., *University of Wisconsin, 1959*; Ph.D., *Oregon State University, 1966*.
- NEWCOMB, RICHARD, *Assistant Professor of Mathematics (1988)*. B.A., *University of Chicago, 1981*; Ph.D., *University of Wisconsin at Madison, 1988*.
- NOMURA, SEIICHI, *Associate Professor in Mechanical Engineering Department (1982)*. B.S., *University of Tokyo, 1974*; M.S., 1977; Ph.D., *University of Delaware, 1980*; D. Eng., *University of Tokyo, 1982*.
- NUNNALLY, WILLIAM C., *Professor in Electrical Engineering Department (1985)*. B.S., *Texas Tech University, 1969*; M.S., 1971; Ph.D., 1975.
- NUSSBAUM, CHARLES, *Assistant Professor of Philosophy (1991)*. B.S., *Julliard School of Music, 1969*; M.S., 1970; M.A., *New York University, 1980*; Ph.D., *Emory University, 1988*.
- O'QUINN, JOSIE LU, *Assistant Professor of Nursing (1988)*. B.S.N., *Texas Christian University, 1960*; M.S.N., *University of Texas at Austin, 1976*; Ph.D., 1989. Registered Nurse.
- OKIMI, PATRICIA, *Associate Professor of Nursing (1980)*. B.S.N., *Walla Walla College, 1957*; M.S.N., *Loma Linda University, 1961*; Ph.D., *University of North Texas, 1983*. Registered Nurse.
- ORDÓÑEZ, ELIZABETH, *Professor of Foreign Languages (1979)*. M.A., *University of California at Los Angeles, 1969*; Ph.D., *University of California at Irvine, 1976*.
- OTTO-BLIESNER, BETTE L., *Adjunct Assistant Professor of Geology (1990)*. B.S., *University of Wisconsin at Madison, 1972*; M.S., 1974; Ph.D., 1980.
- PALMER, STANLEY H., *Professor of History (1973)*. A.B., *Brown University, 1966*; Ph.D., *Harvard University, 1973*.
- PANTON, DON BRADLEY, *Professor of Finance and Real Estate (1989)*. B.S., *Purdue University, 1965*; M.S., 1966; Ph.D., *University of Arizona, 1972*.
- PAOLILLO, JOHN C., *Assistant Professor of Linguistics (1993)*. B.A., *Cornell University, 1986*; Ph.D., *Stanford University, 1992*.
- PAPE, ELINOR S., *Professor of Industrial Engineering (1972)*. B.S., *Southern Methodist University, 1960*; M.S., 1969; Ph.D., 1971. Professional Engineer.

FACULTY

- PARKER, CLINTON E., *Professor and Chairman of the Department of Civil Engineering (1982)*. B.S., Virginia Military Institute, 1957; M.S., University of Arizona, 1964; Ph.D., 1966. *Professional Engineer*.
- PARPIA, IJAZ H., *Associate Professor in Aerospace Engineering Department (1987)*. B.S., Indian Institute of Technology, 1980; M.S., Purdue University, 1982; Ph.D., 1986.
- PAULUS, PAUL, *Professor of Psychology (1970)*. B.A., Otterbein College, 1966; M.A., University of Iowa, 1970; Ph.D., 1971.
- PAYNE, FRED R., *Professor of Aerospace Engineering (1969)*. B.S., University of Kentucky, 1952; M.S., Pennsylvania State University, 1964; Ph.D., 1966. *Professional Engineer*.
- PERKINS, BOB F., *Professor of Geology (1975)*. B.S., Southern Methodist University, 1949; M.S., 1950; Ph.D., University of Michigan, 1956.
- PETERSEN, RUSSELL J., *Professor of Accounting and Dean of the College of Business Administration (1994)*. B.S., Oregon State University, 1963; M.S., University of Oregon, 1964; Ph.D., University of Washington, 1971.
- PETERSON, LYNN L., *Associate Professor in Computer Science and Engineering Department (1982)*. B.A., Wittenberg University, 1962; M.A., Duke University, 1963; M.S., University of Michigan, 1966; Ph.D., University of Texas Southwestern Medical Center at Dallas, 1978.
- PETRUSO, KARL M., *Associate Professor of Anthropology and Associate Dean of the College of Liberal Arts (1990)*. A.B., Villanova University, 1971; M.A., Indiana University, 1975; Ph.D., 1978.
- PETRY, THOMAS M., *Professor of Civil Engineering (1974)*. B.S., University of Missouri at Rolla, 1967; M.S., University of Missouri at Columbia, 1968; Ph.D., Oklahoma State University, 1974. *Professional Engineer*.
- PHILLIPS, PATRICK C., *Assistant Professor of Biology (1991)*. B.A., Reed College, 1986; M.S., University of Chicago, 1988; Ph.D., 1991.
- PHILP, KENNETH ROY, *Professor and Chairman of the Department of History (1968)*. B.A., Michigan State University, 1963; M.A., University of Michigan, 1964; Ph.D., Michigan State University, 1968.
- PICKARD, MYRNA R., *Professor and Dean of the School of Nursing (1976)*. B.S., Texas Wesleyan College, 1957; M.Ed., 1964; M.S., Texas Woman's University, 1974; Ed.D., Nova University, 1976. *Registered Nurse*.
- PIKE, KENNETH, *Adjunct Professor of Foreign Languages and Linguistics (1979)*. Th.B., Gordon College, 1933; Ph.D., University of Michigan, 1942.
- PINNEY, WILLIAM E., *Associate Professor of Information Systems and Management Sciences (1969)*. B.S., University of Florida, 1964; M.B.A., 1965; Ph.D., 1967.
- PINNO, ANDRZEJ, *Associate Professor of Architecture (1977)*. M.Arch., Warsaw Polytechnic Institute, 1952; B.A., Warsaw Academy of Fine Arts, 1963; M.Arch., Harvard University, 1966. *Registered Architect*.
- POMERANTZ, MARTIN, *Professor of Chemistry (1976)*. B.S., City College of New York, 1959; M.S., Yale University, 1961; Ph.D., 1964.
- PORTER, LAURIN ROLAND, *Assistant Professor of English (1990)*. B.A., University of Missouri, 1967; M.A.T., Harvard University, 1968; Ph.D., University of Detroit, 1976.
- PORTER, THOMAS E., *Professor of English (1978)*. A.B., Loyola University of Chicago, 1949; Ph.L., West Baden Pontifical Institute, 1952; M.A., Loyola University of Chicago, 1954; Th.L., West Baden Pontifical Institute, 1959; M.A., Catholic University of America, 1960; Ph.D., University of North Carolina, 1965.
- POWELL, LINTON, *Professor of Music (1976)*. B.M., Florida State University, 1966; M.F.A., University of Georgia, 1969; Ph.D., University of North Carolina, 1974.
- PRABHU, VASANT K., *Professor in Electrical Engineering Department (1991)*. B.S., Karnatak University, 1958; B.E., Indian Institute of Science, 1962; M.S., Massachusetts Institute of Technology, 1963; D.Sc., 1966.
- PRICE, KENNETH H., *Associate Professor of Management (1973)*. B.A., Fairleigh Dickinson University, 1966; M.A., Michigan State University, 1969; Ph.D., 1973.
- PRICE, MARTIN, *Professor of Architecture (1977)*. B.Arch., University of Pennsylvania, 1955. *Registered Architect*.

FACULTY

- PRIEM, RICHARD L., *Assistant Professor of Management (1990)*. B.A., *Saint Olaf College, 1971*; M.S., *University of Arkansas, 1980*; Ph.D., *University of Texas at Arlington, 1990*.
- PRIEST, JOHN W., *Associate Professor of Industrial Engineering (1982)*. B.S., *General Motors Institute, 1973*; M.S., *University of Texas at Arlington, 1975*; Ph.D., 1980. *Professional Engineer*.
- QASIM, SYED, R., *Professor of Civil Engineering (1973)*. B.S., *Muslim University, Aligarh, India, 1957*; M.S., 1962; Ph.D., *West Virginia University, 1965*. *Professional Engineer*.
- QUICK, JAMES C., *Professor of Management (1977)*. A.B., *Colgate University, 1968*; M.B.A., *University of Houston, 1975*; Ph.D., 1977.
- QUINN, MARGARET, *Visiting Assistant Professor of Social Work (1990)*. B.A., *University of Texas at Arlington, 1978*; M.S.S.W., 1980; Ph.D., *Texas Woman's University, 1986*.
- RAJ, VIJAY KUMAR, *Assistant Professor in Computer Science and Engineering Department (1986)*. B.E., *University of Mysore, India, 1972*; Ph.D., *University of Illinois at Urbana-Champaign, 1985*.
- RAJA, M.K., *Professor of Information Systems and Management Sciences (1981)*. B.E., *University of Madras, 1966*; M.E., *Indian Institute of Technology, 1968*; M.S., *University of Houston, 1978*; Ph.D., *Texas Tech University, 1971*.
- RAJESHWAR, KRISHNAN, *Professor of Chemistry (1983)*. B.S., *University College, Trivandrum, India, 1969*; M.S., *Indian Institute of Technology, 1971*; Ph.D., *Indian Institute of Science, 1974*.
- RAMSDELL, PENNY S., *Assistant Professor of Social Work (1988)*. B.A., *University of Oklahoma, 1967*; M.S.S.W., *University of Texas at Arlington, 1975*; Ph.D., 1986.
- RAO, K. R., *Professor in Electrical Engineering Department (1966)*. B.E., *University of Madras, 1952*; M.S., *University of Florida, 1959*; M.S., 1960; Ph.D., *University of New Mexico, 1966*.
- RASHEED, ABDUL, *Associate Professor of Management (1988)*. B.S., *Kerala University, India, 1972*; P.G.D.M., *Indian Institute of Management, 1981*; Ph.D., *University of Pittsburgh, 1988*.
- RAY, ASOK K., *Associate Professor of Physics (1984)*. B.S., *Calcutta University, 1967*; B.Tech., 1969; M.S., *Oklahoma State University, 1973*; M.S., *Texas Tech University, 1975*; Ph.D., 1977.
- REASER, DONALD F., *Associate Professor of Geology (1961)*. B.S., *Southern Methodist University, 1953*; M.S., 1958; Ph.D., *University of Texas at Austin, 1974*.
- REDDICK, ROBERT J., *Associate Professor of English (1975)*. B.S., *University of Minnesota, 1966*; M.A., 1969; Ph.D., 1975.
- REED, SHERMAN, *Senior Lecturer in Electrical Engineering Department (1989)*. B.S., *University of Oklahoma, 1956*; M.S., *Newark College of Engineering, 1958*.
- REEDER, HARRY P., *Associate Professor of Philosophy (1982)*. B.A., *University of Illinois, 1968*; M.A., *University of Waterloo, 1974*; Ph.D., 1977.
- REINHARDT, STEVEN G., *Associate Professor of History (1987)*. B.A., *Southern Illinois University, 1971*; M.A., *University of Wisconsin, Madison, 1973*; Ph.D., *Northern Illinois University, 1982*.
- REINHARTZ, DENNIS, *Associate Professor of History (1973)*. A.B., *Rutgers University, 1966*; A.M., 1967; Ph.D., *New York University, 1970*.
- REINHARTZ, JUDY, *Professor of Education (1973)*. A.B., *Rutgers University, 1966*; M.A., *Seton Hall University, 1970*; Ph.D., *University of New Mexico, 1977*.
- RENSCH, CALVIN R., *Adjunct Professor of Linguistics (1975)*. B.A., *Wheaton College, 1954*; M.A., *University of Pennsylvania, 1963*; Ph.D., 1966.
- RICHMOND, DOUGLAS W., *Professor of History (1976)*. B.A., *University of Washington, 1968*; M.A., 1971; Ph.D., 1976.
- RIDGWAY, MARY E., *Associate Professor of Exercise and Sport Studies (1976)*. B.S., *University of North Texas, 1966*; M.A., *Texas Woman's University, 1971*; Ph.D., 1974.
- RINGS, LANA, *Associate Professor of Foreign Languages (1985)*. B.A., *Washburn University of Topeka, 1970*; M.A., *University of Missouri, 1973*; Ph.D., *University of Southern California, 1985*.
- ROBBINS, FRANK ERNEST, *Adjunct Professor of Linguistics (1990)*. B.A., *Houghton College, 1949*; M.A., *Cornell University, 1960*; Ph.D., 1965.
- ROBINETTE, GARY O., *Associate Professor of Landscape Architecture (1988)*. B.S.L.A., *Michigan State University, 1962*; M.L.A., 1963. *Registered Landscape Architect*.

FACULTY

- ROBINSON, JAMES V., *Professor of Biology (1978)*. B.S., Polytechnic Institute of Brooklyn, 1967; M.S., 1971; Ph.D., Utah State University, 1978.
- RODNITZKY, JEROME L., *Professor of History (1966)*. B.A., University of Chicago, 1959; M.A.T., 1962; Ph.D., University of Illinois, 1967.
- ROEMER, KENNETH M., *Professor of English (1971)*. B.A., Harvard University, 1967; M.A., University of Pennsylvania, 1968; Ph.D., 1971.
- ROGERS, KATHERINE JAMES, *Assistant Professor in Industrial Engineering Department (1994)*. B.S., University of Missouri, 1979; M.S., University of Texas at Arlington, 1981; Ph.D., 1985.
- ROME, RICHARD, *Assistant Professor of Landscape Architecture (1989)*. B.L.A., Louisiana State University, 1968; M.L.A., University of Texas at Arlington, 1989.
- ROSEN, S. PETER, *Professor of Physics and Dean of the College of Science (1990)*. B.A., Oxford University, 1954; M.A., 1957; Ph.D., 1957.
- ROSS, WILBUR R., *Professor of Accounting (1974)*. B.B.A., Texas A&I University, 1956; M.B.A., University of Texas at Austin, 1962; Ph.D., 1965. CPA.
- ROTH-JOHNSON, DANIELLE, *Assistant Professor of Foreign Languages (1992)*. B.A., Southern Methodist University, 1984; M.A., Stanford University, 1989; Ph.D., 1992.
- ROUSE, LINDAP, *Associate Professor of Sociology (1985)*. B.S., Cornell University, 1968; M.A., Adelphi University, 1972; Ph.D., Florida State University, 1979.
- RUBINS, R.S., *Professor of Physics (1969)*. B.A., St. Catherine's College, Oxford University, 1957; Ph.D., 1961.
- RUTHERFORD, RONALD C., *Assistant Professor of Finance and Real Estate (1989)*. B.A., Valdosta State College, 1980; M.S., 1981; M.A., University of Arizona, 1988; M.B.A., University of Georgia, 1986; Ph.D., 1988.
- SÁNCHEZ, JOSE G., *Associate Professor of Foreign Languages (1975)*. B.A., New Mexico Highlands University, 1958; M.A., University of Illinois, 1960; Ph.D., University of Colorado, 1970.
- SARKIS, JOSEPH, *Assistant Professor of Information Systems and Management Sciences (1991)*. B.S., State University of New York at Buffalo, 1985; M.B.A., 1986; Ph.D., 1991.
- SAXON, GERALD D., *Adjunct Associate Professor of History and Assistant Director of Libraries for Special Collections (1987)*. B.A., Lamar University, 1973; M.A., 1975; Ph.D., University of North Texas, 1979.
- SCHELLY, ZOLTAN A., *Professor of Chemistry (1977)*. B.S., Vienna Technical University, 1962; D.Sc., 1967.
- SCHIEBER, JUERGEN, *Associate Professor of Geology (1986)*. B.S., University of Tuebingen, 1978; Ph.D., University of Oregon, 1985.
- SCHKADE, LAWRENCE L., *Ashbel Smith Professor of Information Systems and Management Sciences (1969)*. B.B.A., Lamar University, 1956; M.B.A., Louisiana State University, 1957; Ph.D., 1961.
- SCHOECH, RICHARD J., *Professor of Social Work (1979)*. B.A., University of Texas at Austin, 1968; M.S.W., University of Texas at Arlington, 1973; Ph.D., 1978.
- SCOTESE, CHRISTOPHER R., *Associate Professor of Geology (1990)*. B.S., University of Illinois at Chicago, 1976; Ph.D., University of Chicago, 1985.
- SEATH, DONALD D., *Professor of Aerospace Engineering (1965)*. B.S., Iowa State University, 1954; M.S., 1959; Ph.D., 1963. Professional Engineer.
- SEMPER, WILLIAM, *Assistant Professor of Mathematics (1988)*. B.A., Vassar, 1981; M.S., Cornell University, 1984; Ph.D., 1988.
- SEMPLE, JOHN, *Assistant Professor of Information Systems and Management Sciences (1992)*. B.S., McGill University, 1983; M.S., 1985; Ph.D., University of Texas at Austin, 1990.
- SHANNON, MARY COLEEN, *Associate Professor of Social Work (1970)*. B.A., Texas Christian University, 1962; M.S.W., Tulane University, 1965; Ph.D., Texas Woman's University, 1978.
- SHARMA, SURESH C., *Professor of Physics (1977)*. B.S., Agra University, India, 1965; M.S., Meerut University, India, 1967; Ph.D., Brandeis University, 1976.
- SHIEH, TSAY-JIU, *Associate Professor in Electrical Engineering Department (1985)*. B.S., National Taiwan University, 1976; M.S., University of Cincinnati, 1983; Ph.D., 1985.

FACULTY

- SHIRAZI, BEHROOZ, *Associate Professor in Computer Science and Engineering Department (1990)*. B.S., *Tehran College of Sciences and Business, 1976*; M.S., *University of Oklahoma, 1980*; Ph.D., 1985.
- SHOULTS, RAYMOND R., *Professor in Electrical Engineering Department (1975)*. B.S., *New Mexico State University, 1963*; M.S., 1969; Ph.D., *University of Texas at Arlington, 1974*.
- SILVA, DAVID JAMES, *Assistant Professor of Linguistics (1993)*. A.B., *Harvard University, 1982*; M.A., *Cornell University, 1989*; Ph.D., 1992.
- SIMON, CASSANDRA E., *Assistant Professor of Social Work (1993)*. B.A., *University of New Orleans, 1982*; M.S.W., *Louisiana State University, 1986*; Ph.D., *University of Texas at Arlington, 1992*.
- SIMOWITZ, ROSLYN, *Associate Professor of Political Science (1986)*. B.A., *Brooklyn College, 1971*; M.A., *Indiana University, 1973*; Ph.D., 1979.
- SIRCAR, SUMIT, *Associate Professor of Information Systems and Management Sciences and Associate Dean of the College of Business Administration (1980)*. B.M.E., *Jadavpur University, 1967*; M.B.A., *Kent State University, 1973*; D.B.A., *Harvard University, 1976*.
- SLINKMAN, CRAIG, *Associate Professor of Information Systems and Management Sciences (1979)*. B.S., *Bowling Green University, 1974*; M.B.A., 1975; Ph.D., *University of Minnesota, 1984*.
- SMATRESK, NEAL J., *Associate Professor of Biology (1982)*. B.A., *Gettysburg College, 1973*; M.A., *State University of New York at Buffalo, 1978*; Ph.D., *University of Texas at Austin, Port Aransas Marine Laboratory, 1980*.
- SMITH, JOHANNA M., *Assistant Professor of English (1988)*. B.A., *University of San Francisco, 1969*; M.A., *Claremont Graduate School, 1971*; Ph.D., 1985.
- SMITH, RUSSELL L., *Assistant Professor of Chemistry (1990)*. B.S., *Clemson University, 1980*; M.A., *University of Texas at Austin, 1984*; Ph.D., 1986.



FACULTY

- SMITH, SHELLEY L., *Professor of Sociology and Anthropology (1991)*. B.S., B.A., *Southern Methodist University, 1984*; A.M., *University of Michigan, 1985*; Ph.D., 1990.
- SMITH, CHARLES V., JR., *Professor of Electrical Engineering (1969)*. B.S., *University of Texas at Arlington, 1962*; M.S., *Oklahoma State University, 1964*; Ph.D., *Massachusetts Institute of Technology, 1968*. *Professional Engineer*.
- SMITS, ALLAN W., *Assistant Professor of Biology (1988)*. B.A., *California State University, Fresno, 1975*; M.A., *California State University at Hayward, 1978*; Ph.D., *University of Kansas, 1984*.
- SMYTHE, DONALD J., *Assistant Professor of Economics (1992)*. B.A., *Carleton University, 1982*; M.A., 1983; M.Phil., *Yale University, 1989*; Ph.D., 1991.
- SOBOL, HAROLD, *Professor in Electrical Engineering and Associate Dean of the College of Engineering (1988)*. B.S., *City College of New York, 1952*; M.S., *University of Michigan, 1956*; Ph.D., 1960.
- SOLOMON, LANNY M., *Professor of Accounting (1978)*. B.S., *Miami University, 1968*; M.B.A., *Case Western Reserve University, 1970*; Ph.D., 1973. CPA.
- SOUFLEE, FEDERICO, JR., *Assistant Professor of Social Work (1980)*. B.A., *University of Texas at El Paso, 1957*; M.S.S.W., *University of Texas at Austin, 1964*; Ph.D., *University of Texas at Arlington, 1988*.
- SPINDLER, MAX, *Associate Professor of Civil Engineering (1970)*. B.S., *Cooper Union, 1961*; M.S., *Northwestern University, 1963*; Ph.D., 1968. *Professional Engineer*.
- SPURLOCK, WILLIAM H., *Associate Professor of Art (1982)*. B.A., *Trinity University, 1970*; M.A., *University of New Mexico, 1974*; Ph.D., *Union Graduate School, 1977*.
- ST. CLAIR, CLAIRE, *Associate Professor of Nursing (1979)*. B.S., *Simmons College, 1947*; M.A., *University of Nevada, 1973*; Ed.D., *Brigham Young University, 1977*. *Registered Nurse*.
- STACEY, WILLIAM A., *Associate Professor of Sociology and Chairman of the Department of Sociology and Anthropology (1970)*. B.A., *Mississippi State University, 1960*; M.A., 1961; Ph.D., *Florida State University, 1970*.
- STANOVSKY, JOSEPH J., *Associate Professor of Aerospace Engineering and Engineering Mechanics (1966)*. B.S., *Southern Methodist University, 1948*; M.S., *University of Texas at Austin, 1951*; Ph.D., *Pennsylvania State University, 1966*. *Professional Engineer*.
- STERNER, ROBERT W., *Associate Professor of Biology (1988)*. B.S., *University of Illinois, 1980*; Ph.D., *University of Minnesota, 1986*.
- STETSON, RANAE, *Assistant Professor of Education (1990)*. B.S., *University of Nevada at Las Vegas, 1982*; M.Ed., 1987; Ed.D., *University of Houston, 1991*.
- STEVENS, GLADSTONE T., JR., *Professor and Chairman of the Department of Industrial Engineering (1975)*. B.S., *University of Oklahoma, 1956*; M.S., *Case Institute of Technology, 1962*; Ph.D., *Oklahoma State University, 1966*. *Professional Engineer*.
- STEVENS, JAMES W., *Professor of Political Science (1969)*. B.A., *Florida State University, 1962*; M.A., 1964; Ph.D., 1966.
- STEWART, GEORGE L., *Professor of Biology (1977)*. B.S., *Tulane University, 1969*; Ph.D., *Rice University, 1973*.
- STOCKS, JOHN TIMOTHY, *Assistant Professor of Social Work (1990)*. B.A., *University of Baltimore, 1976*; M.A., *University of Florida, 1979*; M.S.W., *Florida State University, 1987*; Ph.D., 1990.
- STORY, DALE, *Professor of Political Science and Acting Dean of the College of Liberal Arts (1978)*. B.A., *Southern Methodist University, 1972*; M.A., *Indiana University, 1974*; Ph.D., 1978.
- STUART, JOHN A., *Professor of Foreign Languages (1965)*. M.A., *University of Montreal, 1953*; Ph.D., 1959; *Docteur (Lettres), University of Paris, 1970*.
- STUDERUS, LENARD H., *Associate Professor of Foreign Languages (1974)*. B.A., *University of Washington, 1964*; M.A., *San Diego State College, 1967*; Ph.D., *University of Colorado, 1974*.
- STUPPY, DOROTHY, *Assistant Professor of Nursing (1990)*. B.S.N., *University of Miami, 1973*; M.S.N., *Florida International University, 1976*; Ph.D., *University of Texas at Austin, 1982*. *Registered Nurse*.
- SU, JIANZHONG, *Assistant Professor of Mathematics (1990)*. B.S., *Shanghai Jiaotong University, 1984*; Ph.D., *University of Minnesota, 1990*.

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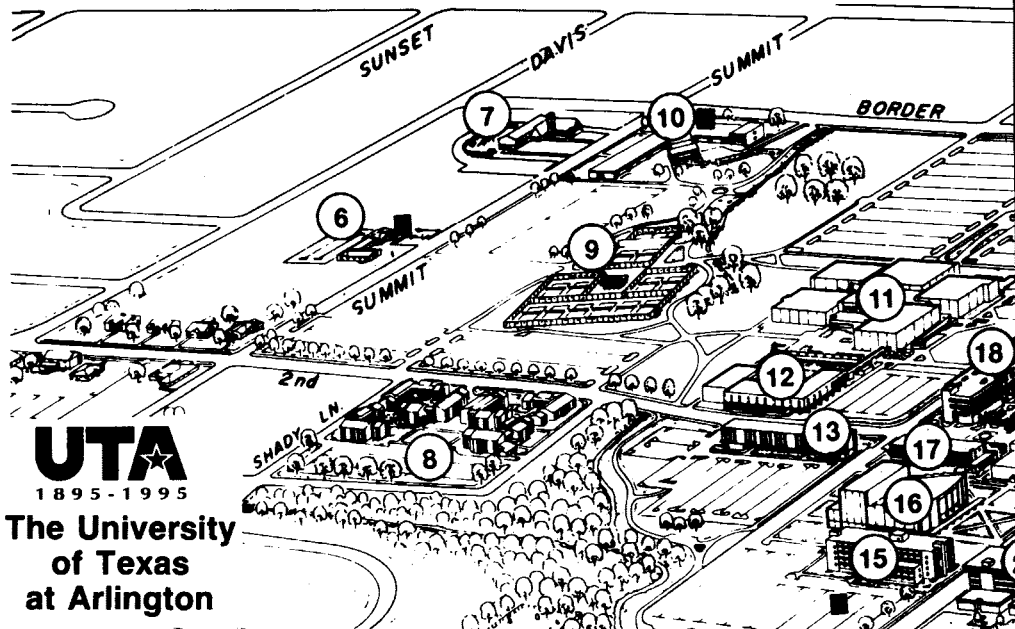
- SUMMERLIN, EDITH, *Assistant Professor of Nursing (1989)*. B.S.N., *Ohio State University, 1957*; M.S.N., *Catholic University of America, 1967*; Ph.D., *American University, 1976*. Registered Nurse.
- SUNDEL, MARTIN, *Professor of Social Work (1979)*. B.A., *St. Mary's University, 1961*; M.S.S.W., *Our Lady of the Lake, 1963*; M.A., *University of Michigan, 1968*; Ph.D., *University of Michigan, 1968*.
- SWANSON, PEGGY E., *Professor of Finance and Real Estate (1978)*. B.B.A., *University of North Texas, 1957*; M.B.E., 1965; M.A., *Southern Methodist University, 1967*; Ph.D., 1978.
- SWEARINGEN, C. JAN, *Associate Professor of English (1986)*. B.A., *University of Texas at Austin, 1971*; M.A., 1974; Ph.D., 1978.
- SWIDLER, STEVEN, *Associate Professor of Finance and Real Estate (1988)*. B.A., *Oberlin College, 1975*; M.S., *Brown University, 1976*; Ph.D., 1981.
- TAEBEL, DELBERT A., *Professor of Urban Affairs (1970)*. B.A., *Ripon College, 1956*; M.A., *San Jose State College, 1965*; Ph.D., *University of Texas at Austin, 1971*.
- TAYLOR, DALMAS A., *Professor of Psychology and Provost (1993)*. B.A., *Western Reserve University, 1959*; M.S., *Howard University, 1961*; Ph.D., *University of Delaware, 1965*.
- TAYLOR, MARTIN E., *Professor and Chairman of the Department of Accounting (1988)*. B.Comm., *University of Cape Town, 1966*; M.B.A., *University of Texas at Austin, 1970*; Ph.D., 1974. CPA.
- TAYLOR, PAT D., *Associate Professor and Director of Landscape Architecture (1992)*. B.S., *Texas Tech University, 1967*; M.S., 1969; Ph.D., *University of Texas at Austin, 1983*.
- TERNAY, ANDREW L., JR., *Professor of Chemistry (1969)*. B.S., *College of the City of New York, 1959*; M.S., *New York University, 1962*; Ph.D., 1963.
- THOMPSON, DAVID S., *Assistant Professor in Aerospace Engineering Department (1987)*. B.S., *Mississippi State University, 1979*; M.S., 1980; Ph.D., *Iowa State University, 1986*.
- TIMMONS, RICHARD B., *Professor of Chemistry (1977)*. B.S., *St. Francis Xavier University, Canada, 1958*; Ph.D., *The Catholic University of America, 1962*.
- TJUATJA, SAIBUN, *Assistant Professor in Electrical Engineering Department (1993)*. B.S., *University of Texas at Arlington, 1987*; M.S., *Purdue University, 1988*; Ph.D., *University of Texas at Arlington, 1992*.
- TOLBERT, ROSALYN, *Associate Professor of Nursing (1976)*. B.S., *Texas Christian University, 1951*; M.S., *Texas Woman's University, 1974*; Ph.D., 1986. Registered Nurse.
- TONG, ALBERT Y., *Associate Professor in Mechanical Engineering Department (1983)*. B.S., *University of Hawaii, 1977*; M.S., *California Institute of Technology, 1978*; Ph.D., *Carnegie-Mellon University, 1983*.
- TOWNSEND, DABNEY WINSTON, JR., *Associate Professor and Chair of the Department of Philosophy and Humanities (1973)*. B.S., *Duke University, 1963*; B.D., *Drew University, 1966*; Ph.D., *Emory University, 1970*.
- TRASK-CARDENAS, JILL A., *Assistant Professor of Education and Assistant Professor of Economics (1989)*. B.S., *University of Kansas, 1977*; M.S., *University of North Texas, 1984*; Ph.D., 1989.
- TSAY, JEFFREY JING-HUEI, *Associate Professor of Accounting (1974)*. B.B.A., *National Chengchi University, 1966*; M.A., *University of Missouri, 1969*; Ph.D., 1973. CPA, CMA.
- TUCKNESS, DAN G., *Assistant Professor in Aerospace Engineering (1991)*. B.S., *Southeastern Oklahoma State University, 1981*; M.S., *University of Texas at Austin, 1985*; Ph.D., 1988.
- TURBEVILLE, F. SIMONE, *Associate Professor of English (1961)*. Ph.D., *Bocconi University, Milan, Italy, 1951*; Ph.D., *Indiana University, 1960*.
- UNDERWOOD, KATHLEEN, *Associate Professor of History (1981)*. B.A., *University of Colorado, 1969*; M.A., *University of California at Los Angeles, 1976*; Ph.D., 1982.
- VAN ROMPAEY, STEPHEN E., *Assistant Professor of Sociology and Anthropology (1993)*. B.A., *University of California at San Diego, 1979*; M.A., *Stanford University, 1986*; Ph.D., 1993.
- VARDELL, SYLVIA M., *Associate Professor of Education (1990)*. B.S., *University of Texas at Austin, 1976*; Ph.D., *University of Minnesota, 1983*.
- VIÑA, FREDERICK, *Associate Professor of Foreign Languages (1963)*. B.A., *Colorado State College, 1957*; M.A., *University of New Mexico, 1960*.

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- VITANZA, VICTOR, *Associate Professor of English (1981)*. B.A., *University of Houston, 1967*; M.A., 1970; Ph.D., *Northern Illinois University, 1975*.
- VON MALTZAHN, WOLF-WERNER, *Professor of Biomedical Engineering Program (1979)*. Abitur, *Staatliches Gymnasium Kiel, 1966*; M.S., *Ohio State University, 1971*; *Diplom-Ingenieur, University of Stuttgart, 1974*; Ph.D., *University of Hannover, 1979*. *Professor Engineer*.
- WALKER, ROGER S., *Professor of Computer Science and Engineering (1973)*. B.S., *University of Texas at Austin, 1963*; M.S., 1970; Ph.D., 1972. *Professional Engineer*.
- WALLER, DAVID VINCENT, *Assistant Professor of Sociology and Anthropology (1993)*. B.A., *University of Florida, 1985*; M.A., *University of California at Riverside, 1989*; Ph.D., 1993.
- WALTER, STEPHEN LESLIE, *Adjunct Associate Professor of Linguistics (1990)*. B.A., *Washington Bible College, 1969*; M.A., *University of Texas at Arlington, 1976*; Ph.D., 1980.
- WALTHER, LARRY, *Associate Professor of Accounting (1980)*. B.B.A., *University of Texas at Arlington, 1976*; M.P.A., 1977; Ph.D., *Oklahoma State University, 1980*. CPA.
- WANG, BO PING, *Professor in Mechanical Engineering Department (1983)*. B.S., *National Taiwan University, 1967*; M.S., *University of Missouri, 1970*; Ph.D., *University of Virginia, 1974*.
- WARREN, EDDIE N., *Associate Professor of Mathematics (1963)*. B.S., *Sam Houston State University, 1960*; M.A., 1962; Ph.D., *University of North Texas, 1988*.
- WATKINS, TED R., *Associate Professor of Social Work (1979)*. B.A., *University of North Texas, 1961*; M.S.W., *Louisiana State University, 1963*; D.S.W., *University of Pennsylvania, 1976*.
- WATTS, THOMAS D., *Professor of Social Work (1974)*. B.A., *Wichita State University, 1963*; M.S.W., *Arizona State University, 1970*; D.S.W., *Tulane University, 1976*.
- WEED, FRANK, *Associate Professor of Sociology (1975)*. B.A., *Hanover College, 1965*; M.A., *University of Illinois, 1967*; Ph.D., *University of Missouri, 1974*.
- WEEMS, BOB P., *Associate Professor in Computer Science and Engineering Department (1985)*. B.A., *Lewis University, Illinois, 1980*; M.S., *Northwestern University, 1982*; Ph.D., 1984.
- WEGNER, ROBERT L., *Associate Professor of City and Regional Planning (1982)*. B.C.P., *Harvard University, 1950*; M.R.P., M.P.A., 1952.
- WEISS, ALEXANDER, *Associate Professor of Physics (1984)*. B.S., *City College of New York, 1976*; Ph.D., *Brandeis University, 1983*.
- WENDELL, MARGARET M., *Adjunct Assistant Professor of Linguistics (1981)*. B.A., *Wheaton College, 1942*; M.A., *University of Texas at Arlington, 1978*.
- WERTH, RONALD N., *Professor of Foreign Languages (1977)*. B.A., *Fordham University, 1961*; Ph.D., *Cornell University, 1965*.
- WEST, R.N., *Professor and Chairman of the Department of Physics (1987)*. B.S., *University of London, England, 1961*; Ph.D., *University of London, England, 1966*.
- WHEELER, KENNETH G., *Associate Professor of Management (1979)*. B.A., *University of California at Berkeley, 1965*; M.B.A., *California State University, 1967*; Ph.D., *University of Minnesota, 1978*.
- WHITE, ANDREW P., *Professor of Physics (1991)*. B.Sc., *University of Southampton, 1969*; Ph.D., *Westfield College, University of London, 1972*.
- WHITE, JAMES B., *Associate Professor of Chemistry (1986)*. B.S., *University of California at Los Angeles, 1978*; Ph.D., *University of Texas at Austin, 1983*.
- WHITESIDE, MARY M., *Professor and Chair of the Department of Information Systems and Management Sciences (1984)*. B.A., *University of Texas at Austin, 1965*; M.S., *Texas Tech University, 1966*; Ph.D., 1974.
- WHITMORE, DONALD H., *Professor of Biology (1973)*. B.A., *Indiana University, 1966*; Ph.D., *Northwestern University, 1971*.
- WICKHAM, JOHN S., *Professor and Chairman of the Department of Geology (1992)*. B.A., *Pomona College, 1960*; Ph.D., *Johns Hopkins University, 1969*.
- WILLIAMS, JAMES C., *Associate Professor in Civil Engineering Department (1986)*. B.S., *University of New Mexico, 1976*; M.S.C.E., 1977; Ph.D., *University of Texas at Austin, 1986*.

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- WILSON, DONALD R., *Professor of Aerospace Engineering and Director of Aerospace Engineering Program (1968)*. B.S., *Georgia Institute of Technology, 1961*; M.S., *University of Tennessee, 1965*; Ph.D., *University of Texas at Arlington, 1973*. *Professional Engineer.*
- WINSLOW, ELIZABETH H., *Associate Professor of Nursing (1984)*. B.S., *Columbia University, 1965*; M.S.N., *University of Pennsylvania, 1972*; Ph.D., *Texas Woman's University, 1982*. *Registered Nurse.*
- WOFFORD, JERRY C., *Professor of Management (1966)*. B.A., *Baylor University, 1959*; Ph.D., 1962.
- WOLFF, JOHN A., *Associate Professor of Geology (1983)*. B.S., *University of Leeds, 1976*; Ph.D., *University of London, 1983*.
- WOOD, JAMES A., *Associate Professor of Communication (1989)*. B.A., *Willamette University, 1953*; Ph.D., *Cornell University, 1967*.
- WOOD, NANCY V., *Associate Professor and Chair of Department of English (1989)*. B.A., *University of Oregon, 1956*; M.A., *Cornell University, 1963*; Ph.D., *Rutgers University, 1972*.
- WOODS, ROBERT L., *Associate Professor in Mechanical Engineering Department (1974)*. B.S., *Southern Methodist University, 1968*; M.S., *Oklahoma State University, 1970*; Ph.D., 1971.
- WORRELL, DAN L., *Professor and Chair of Marketing (1993)*. B.S., *Louisiana State University, 1971*; M.S., 1974; Ph.D., 1978.
- WRIGHT, BETH S., *Assistant Professor of Art (1984)*. A.B., *Brandeis University, 1970*; M.A., *University of California at Berkeley, 1972*; Ph.D., 1978.
- WRIGHT, CARROLL LEE, JR., *Associate Professor of Architecture (1968)*. B.Arch., *University of Texas at Austin, 1963*; M.Arch., 1968. *Registered Architect.*
- WRIGHT, GEORGES., *Dean Emeritus of the School of Architecture (1971)*. B.A., *Williams College, 1940*; M.Arch., *Harvard University, 1949*; M.Arch., 1952. *Registered Architect.*
- WYERS, MARY ELLEN, *Professor and Associate Dean of the School of Nursing (1976)*. B.S.N., *University of Virginia, 1959*; M.Ed., *Texas Christian University, 1971*; Ed.D., *Nova University, 1976*; M.S.N., *University of Texas at Austin, 1981*. *Registered Nurse.*
- WYMAN, SHERMAN M., *Associate Professor of Urban Affairs (1972)*. A.B., *Stanford University, 1957*; M.P.A., *Syracuse University, 1959*; Ph.D., *University of Southern California, 1969*.
- YARDLEY, MICHAEL, *Associate Professor of Architecture (1979)*. A.B., *Washington University, 1959*; M.A., *New York University, 1965*.
- YEUNG, KAI-SHING, *Professor of Electrical Engineering (1983)*. B.S., *Hong Kong University, 1970*; Dipl.-Ing., 1974; Dr.-Ing., *University of Karlsruhe, West Germany, 1977*. *Professional Engineer.*
- YOST, LARRY, *Adjunct Assistant Professor of Foreign Languages and Linguistics (1980)*. B.S., *West Virginia University, 1961*; Ph.D., *University of Maryland, 1968*.
- YOST, WILLA, *Adjunct Assistant Professor of Foreign Languages and Linguistics (1980)*. B.S., *West Virginia University, 1961*; M.A., 1970.
- YOU, SEUNG MUN, *Assistant Professor in Mechanical Engineering Department (1990)*. B.S., *Seoul National University, 1982*; M.S., *University of Minnesota at Minneapolis, 1986*; Ph.D., 1990.
- YOUN, HEE YONG, *Assistant Professor in Computer Science and Engineering Department (1991)*. B.S., *Seoul National University, 1977*; M.S., 1979; Ph.D., *University of Massachusetts, 1988*.
- YOUNG, ROBERT L., *Associate Professor of Criminology and Criminal Justice and Director of Criminal Justice Program (1991)*. B.A., *Auburn University, 1972*; M.A., *University of Kentucky, 1977*; Ph.D., *University of Michigan, 1982*.
- YOUSSEFZADEH, BLIAN, *Assistant Professor of Architecture (1989)*. B.S., *University of Texas at Arlington, 1981*; M.Arch., *Cornell University, 1984*.
- YU, MURIEL M., *Assistant Professor of Social Work (1989)*. L.L.B., *Soochow University, 1958*; M.R.E., *New Orleans Baptist Theological Seminary, 1962*; M.S.W., *University of Oklahoma, 1971*; Ph.D., *University of Oklahoma, 1981*.
- YUAN, ROBERT L., *Professor of Civil Engineering and Engineering Mechanics (1968)*. B.S., *National Chen-Kung University, 1960*; M.S., *University of Illinois, 1964*; Ph.D., 1968. *Professional Engineer.*
- ZIEGLER, LAWRENCE F., *Professor and Acting Chair of Economics (1969)*. B.S., *University of North Dakota, 1959*; M.S., 1960; Ph.D., *University of Iowa, 1969*.

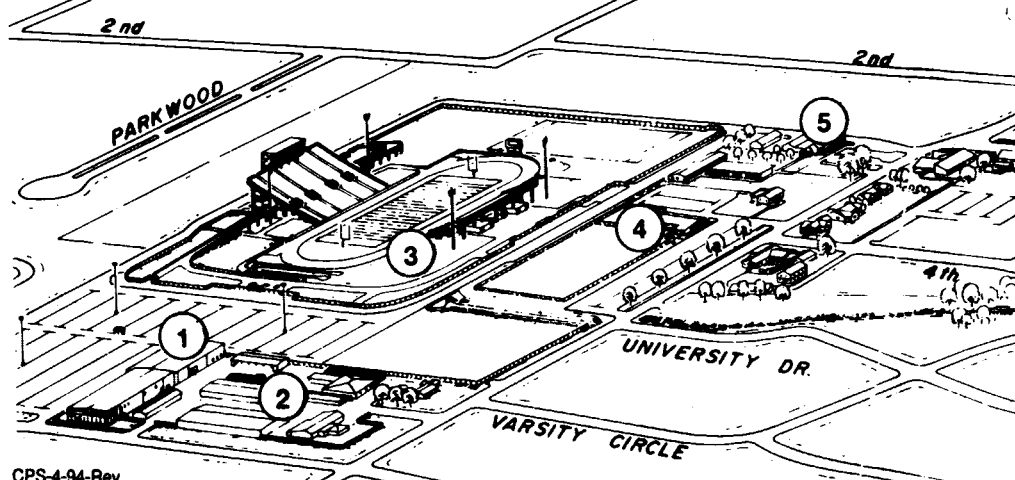
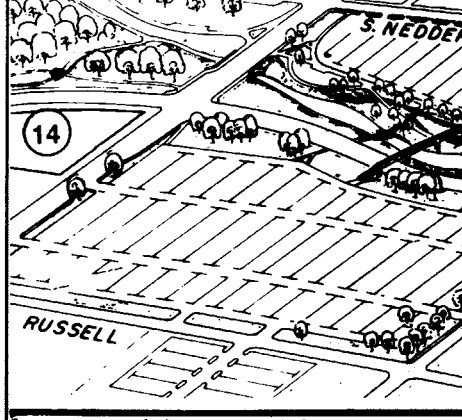


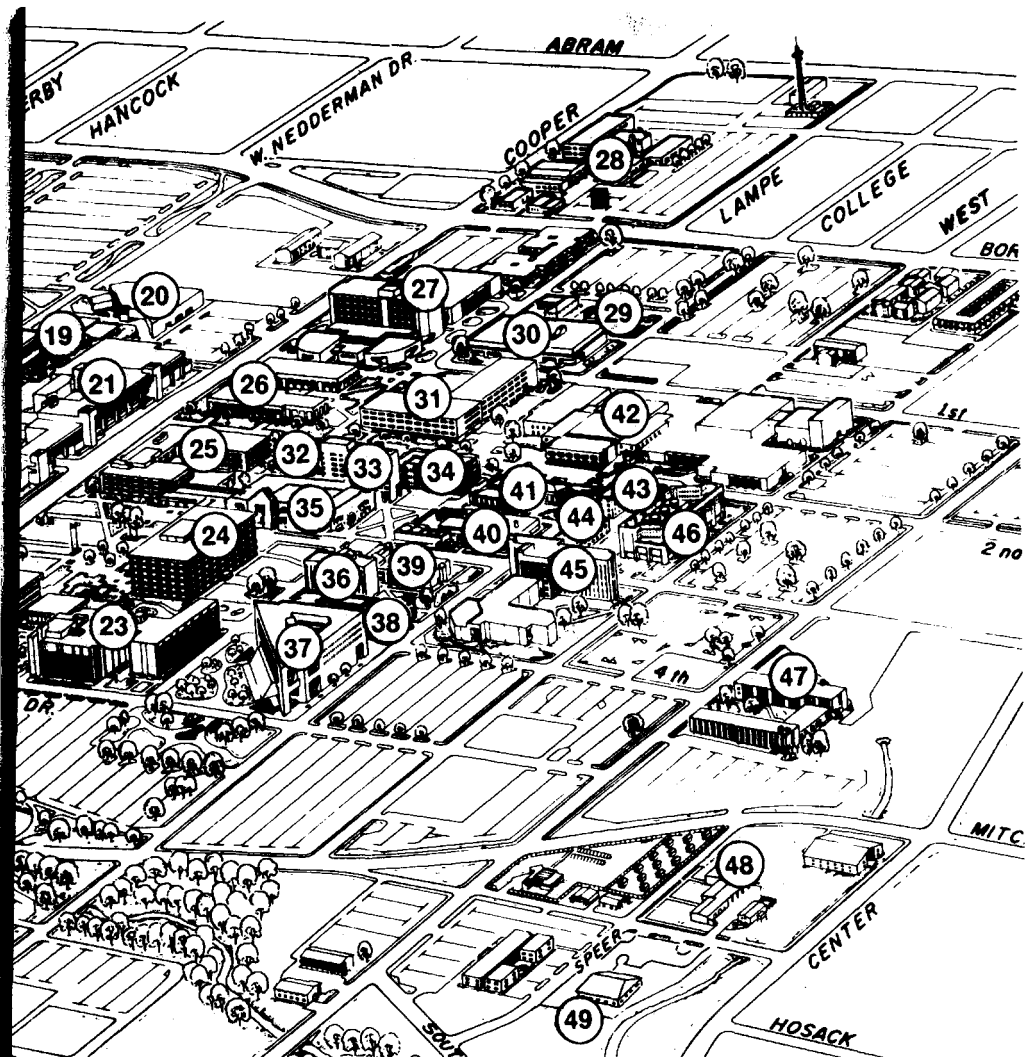
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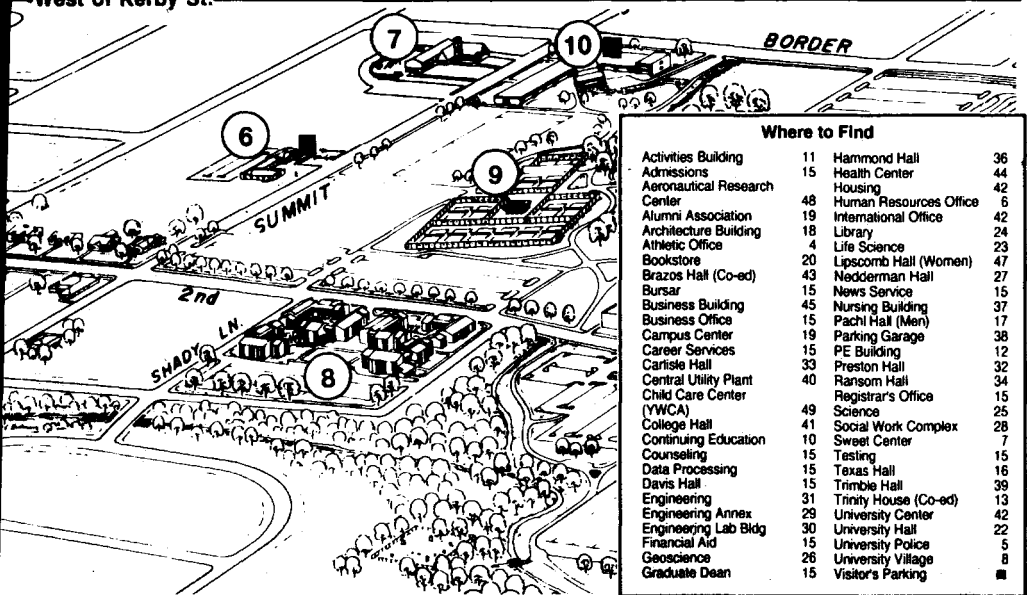
Legend

- | | |
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| 1. Central Service Building | 25. Science |
| 2. Maintenance Shop | 26. Geoscience |
| 3. Maverick Stadium | 27. Nedderman Hall |
| 4. Maverick Building | 28. Social Work Complex |
| 5. Police Building | 29. Engineering Annex |
| 6. Human Resources Office | 30. Engineering Lab Building |
| 7. Sweet Center | 31. Engineering |
| 8. University Village | 32. Preston Hall |
| 9. Tennis Center | 33. Carlisle Hall |
| 10. Swift Center | 34. Fansom Hall |
| 11. Activities Building | 35. Science Addition |
| 12. PE Building | 36. Hammond Hall |
| 13. Trinity House (Co-ed) | 37. Nursing Building |
| 14. Centennial Apartments
(under construction) | 38. Parking Garage |
| 15. Davis Hall | 39. Trimble Hall |
| 16. Texas Hall | 40. Central Utility Plant |
| 17. Pacht Hall (Men) | 41. College Hall |
| 18. Architecture Building | 42. University Center |
| 19. Campus Center | 43. Brazos Hall (Co-ed) |
| 20. Bookstore | 44. Health Center |
| 21. Fine Arts Building | 45. Business Building |
| 22. University Hall | 46. Thermal Energy Plant |
| 23. Life Science | 47. Lipscomb Hall (Women) |
| 24. Library | 48. Aeronautical Research Center |
| | 49. Child Care Center (YWCA) |



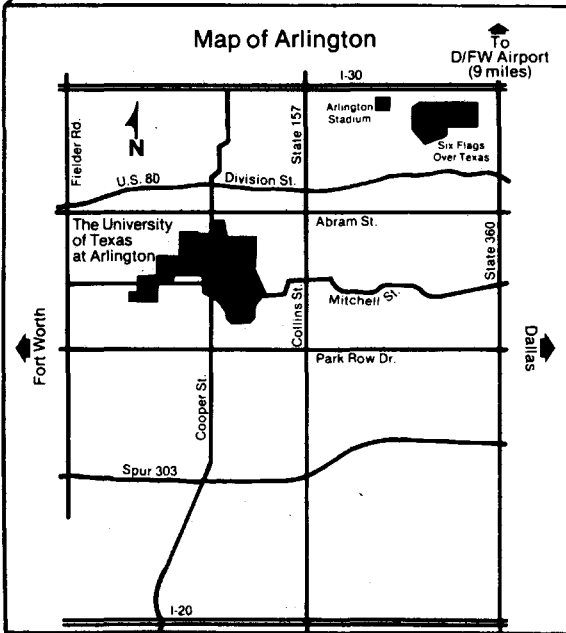
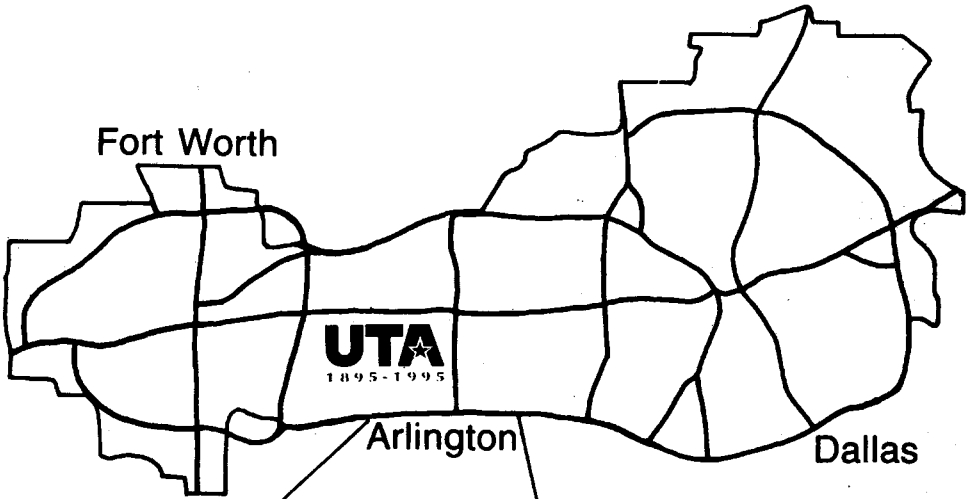


West of Kerby St.



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CAMPUS AND GRADUATE SCHOOL CALENDAR, 1995-1996

Dates of particular importance to graduate students are shown in boldface type. Graduating students should see p. 48 for the final semester checklist. All Graduate School deadlines, unless otherwise stated, are final at 5 p.m. of the date specified (p. 49). **The Graduate School may change this calendar if conditions warrant.**

SUMMER SESSIONS 1996

	FALL 1995	SPRING 1996	1st 5 Weeks	2nd 5 Weeks	11 Weeks																								
Application Deadlines	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 40%;">International Student Application and Readmission Deadline</td> <td style="text-align: center;">April 14</td> <td style="text-align: center;">Sept. 1</td> <td style="text-align: center;">Jan. 19</td> <td style="text-align: center;">Jan. 19</td> <td style="text-align: center;">Jan. 19</td> </tr> <tr> <td>U.S. Student Application Deadline</td> <td style="text-align: center;">June 23</td> <td style="text-align: center;">Oct. 20</td> <td style="text-align: center;">March 29</td> <td style="text-align: center;">March 29</td> <td style="text-align: center;">March 29</td> </tr> <tr> <td>U.S. Student Readmission Application Deadline</td> <td style="text-align: center;">July 21</td> <td style="text-align: center;">Nov. 22</td> <td style="text-align: center;">April 19</td> <td style="text-align: center;">April 19</td> <td style="text-align: center;">April 19</td> </tr> </table>					International Student Application and Readmission Deadline	April 14	Sept. 1	Jan. 19	Jan. 19	Jan. 19	U.S. Student Application Deadline	June 23	Oct. 20	March 29	March 29	March 29	U.S. Student Readmission Application Deadline	July 21	Nov. 22	April 19	April 19	April 19						
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Application for Thesis/Dissertation Tuition Reduction	Should be filed no less than one week prior to student's planned registration																												
NEW STUDENT REGISTRATION	Aug. 22-25	Jan. 8-12	May 28-31	July 8, 9	May 28-31																								
First Day of Classes	Aug. 28	Jan. 16	June 3	July 10	June 3																								
Late Registration	Aug. 28, 29	Jan. 16, 17	June 3, 4	July 10, 11	June 3, 4																								
Census Date: Final Date to Reserve Graduate Courses for Graduate Credit	Sept. 12	Jan. 30	June 6	July 16	June 6																								
Completion of "X" Grade from Previous Semester:																													
Last date to submit work to instructor	Oct. 6	Feb. 23																											
Last date to submit grade change to Dean of the Graduate School	Oct. 20	March 8																											
Midsemester: Last Date to Drop or Withdraw (p. 44)	Oct. 20	March 8	June 19	July 29	July 9																								
Graduation Deadlines	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 40%;">Deadline For GRADUATION: Last Date to File Application for Graduation, Pay Diploma Fee, and File Final Program of Work</td> <td style="text-align: center;">Sept. 27</td> <td style="text-align: center;">Feb. 15</td> <td style="text-align: center;">July 3</td> <td style="text-align: center;">July 3</td> <td style="text-align: center;">July 3</td> </tr> <tr> <td>Final Date to Request Master's Exam/Dissertation Defense, and Submitting Copy to Supervising Committee</td> <td style="text-align: center;">Nov. 13</td> <td style="text-align: center;">March 29</td> <td style="text-align: center;">July 12</td> <td style="text-align: center;">July 12</td> <td style="text-align: center;">July 12</td> </tr> <tr> <td>Final Date to Hold Master's Examination/Dissertation Defense and to Submit Copy of Thesis/Dissertation to Graduate School for Mechanical Check</td> <td style="text-align: center;">Nov. 27</td> <td style="text-align: center;">April 12</td> <td style="text-align: center;">July 26</td> <td style="text-align: center;">July 26</td> <td style="text-align: center;">July 26</td> </tr> <tr> <td>Final Date to Submit Approved Thesis/Dissertation to the Graduate School, and to Submit Report of Final Master's Examination/Dissertation Defense</td> <td style="text-align: center;">Dec. 4</td> <td style="text-align: center;">April 19</td> <td style="text-align: center;">Aug. 2</td> <td style="text-align: center;">Aug. 2</td> <td style="text-align: center;">Aug. 2</td> </tr> </table>					Deadline For GRADUATION: Last Date to File Application for Graduation, Pay Diploma Fee, and File Final Program of Work	Sept. 27	Feb. 15	July 3	July 3	July 3	Final Date to Request Master's Exam/Dissertation Defense, and Submitting Copy to Supervising Committee	Nov. 13	March 29	July 12	July 12	July 12	Final Date to Hold Master's Examination/Dissertation Defense and to Submit Copy of Thesis/Dissertation to Graduate School for Mechanical Check	Nov. 27	April 12	July 26	July 26	July 26	Final Date to Submit Approved Thesis/Dissertation to the Graduate School, and to Submit Report of Final Master's Examination/Dissertation Defense	Dec. 4	April 19	Aug. 2	Aug. 2	Aug. 2
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Final Exams	Dec. 11-15	May 6-10	July 8	Aug. 13	Aug. 12, 13																								
End of Semester Deadline (see in <i>Absentia</i> Registration, p. 49)	Dec. 18	May 13	Aug. 16	Aug. 16	Aug. 16																								
Graduation Exercises:	Dec. 16	May 11	Aug. 17	Aug. 17	Aug. 17																								
HOLIDAYS: Labor Day—Sept. 4	Thanksgiving—Nov. 23-26	MLK Day—Jan. 15	Spring Vacation—March 18-24	Easter—April 5-7																									

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