The University of Texas at Arlington

Graduate Catalog 1976-1977

VOL. LIX NO. 8 JULY 1976

CAMPUS AND GRADUATE SCHOOL CALENDAR, 1976-77

Dates of particular importance to graduate students shown in boldface type.

	FALL 1976	SPRING 1977	SUMMER SESSIONS, 1977		
			FIRST SIX WEEKS	SECOND SIX WEEKS	TWELVE WEEKS
Registration	Aug. 25-27	Jan. 12-14	May 27	July 8	May 27
First Day of Classes	Aug. 30	Jan. 17	May 30	July 11	May 30
Late Registration Closes	Sept. 2	Jan. 20	May 31	July 12	May 31
Labor Day Holiday	Sept. 6				
Census Date	Sept. 11	Jan. 29	June 2	July 14	June 2
Final date for Undergraduate Students to Reserve Courses for Graduate Credit	Sept. 11	Jan. 29	June 2	July 14	June 2
In order to qualify for graduation at end of current semester final date for:					
1. Master's program students to file Application for Candidacy					
2. Ph.D. Candidates to file Final Degree Plan					
3. Masters and doctoral students to file Diploma Application and pay Diploma Fee	Oct. 18	Mar. 18	June 13	July 25	June 13
Midsemester (Last date to drop course with automatic W)	Oct. 21	Mar. 10	June 16	July 28	July 6
Final date for requesting Ph.D. Dissertation Defense	Oct. 25	Mar. 25	June 6	July 11	June 6
Final date for requesting Final Master's Examination	Nov. 8	Apr. 5	June 13	July 11	July 11
Final date for submitting completed copy of thesis or dissertation to examining committee	Nov. 10	Apr. 8	June 17	July 15	July 15
Final date to hold Dissertation Defense or Final Master's Examination	Nov. 24	Apr. 22	June 27	July 29	July 29
Thanksgiving Holidays (inclusive dates)	Nov. 25-28				
Final date for submitting approved thesis or dissertation, Dissertation Defense Report, and Final Master's Examination Report to Graduate School and for paying binding and dissertation microfilming fees	Nov. 29	Apr. 29	July 1	Aug. 5	Aug. 5
Spring Vacation (inclusive dates)		Apr. 4-10			
Independence Day Holiday			July 4		
Final date to drop courses	Dec. 2	Apr. 28	June 30	Aug. 11	Aug. 5
Dead Week Begins	Dec. 4	Apr. 30			
Final Examinations	Dec. 10-16	May 6-12	July 6, 7	Aug. 17,18	Aug. 11-17
Grades due in Registrar's Office	Dec. 20	May 16	July 11	Aug. 19	Aug. 19
Official End of Semester	Dec. 20	May 21	July 7	Aug. 19	Aug. 19
Commencement (8 p.m.)		May 21			

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BOARD OF REGENTS
The University of Texas System

GOVERNMENT

The government of the University of Texas at Arlington is vested in a nine-member Board of Regents of the University of Texas System, selected from different portions of the state, nominated by the Governor, and appointed by and with the advice and consent of the Senate. The Chancellor is the chief administrative officer of the University of Texas System. The chief administrative officer of the operations of UT Arlington is the President, under the authority of the Chancellor 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.**

In accordance with Title VI of the Civil Rights Act of 1964, Executive Order 11246, as amended, Title IX of the Educational Amendments of 1972, and the Rules and Regulations of the Board of Regents of the University of Texas System, the University of Texas at Arlington reaffirms that no person shall, on the basis of race, color, national origin, religion or sex, 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. Any inquiries concerning the application of this policy should be directed to the University's Affirmative Action officers.

THE UNIVERSITY

The University of Texas at Arlington is located on a modern, 300-acre campus in the center of the Dallas/Fort Worth metroplex. 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 metroplex 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 seventeen institutions in the University of Texas System. It is fully accredited by the Southern Association of Colleges and Schools and the Association of Texas Colleges and Universities. The University comprises the Colleges of Business Administration, Engineering, Liberal Arts, and Science, the Graduate School of Social Work, the School of Architecture and Environmental Design, the Institute of Urban Studies, 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 Engineering Council for Professional Development. 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 University of Texas at Arlington was founded in 1895 as Arlington College, a private liberal arts school located "far from the temptations of city life." The college changed with the times and its surroundings, undergoing a succession of names and ownerships until 1917 when it became a state-supported junior college, named Grubbs Vocational College, in the Texas A&M System. It was renamed North Texas Junior Agricultural College in 1923 and Arlington State College in 1949. It was a successful junior college, building a reputation as a fine engineering and agricultural school. In 1959 it was elevated to senior college rank, and, in 1965, was transferred to the University of Texas System. The 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 45 states and 65 foreign countries enrolled at the present time. Today the enrollment is over 13,000 undergraduate and 2,000 graduate students.

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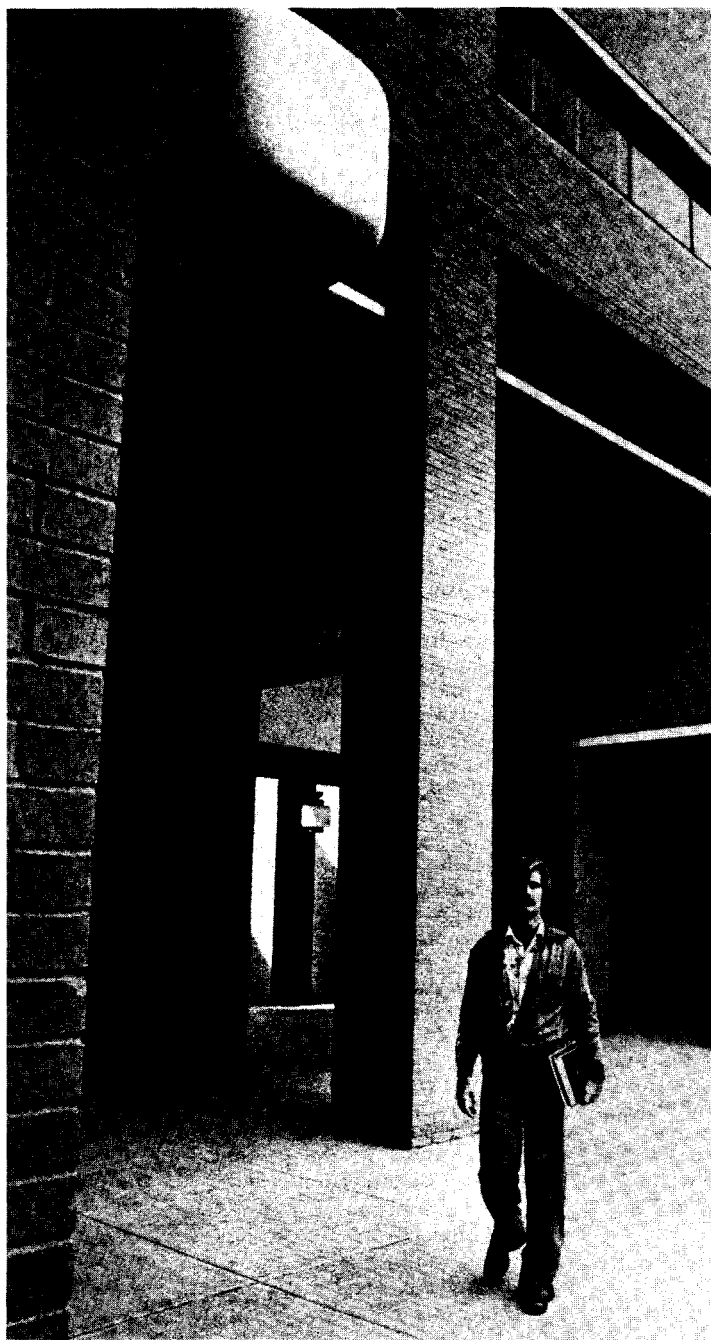
THE GRADUATE SCHOOL

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 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 34 disciplines or interdisciplinary programs and six doctoral degrees involving the faculties of more than 20 departments and interdepartmental areas.
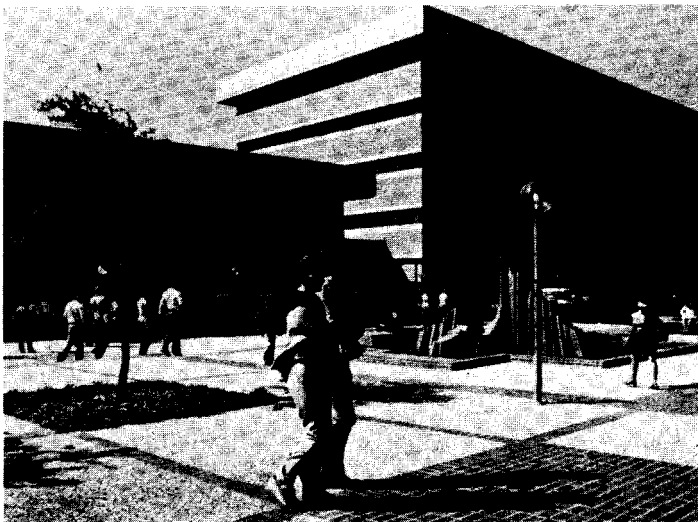
DIRECTORY OF OFFICES

All of the offices listed below, except Student Health Services, 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.

Admissions: Rm. 123, 273-3401

Foreign Student Admissions and Student Visas: Rm. 123, 273-3401

Graduate School (Office of the Dean): Rm. 234, 273-2681

Graduate Advisor: See departmental and program description

Counseling and Testing: Rm. 201, 273-2601

Financial Aid (Loans, grants-in-aid, part-time employment, college work-study, financial counseling): Rm. 252, 273-3561

Foreign Student Advisor: Rm. 260, 273-3361

Handicapped Students Information: Rm. 260, 273-3361

Health Center: 3rd and West Streets, 273-2771

Housing: Rm. 260, 273-3361

Placement Service: Rm. 216, 273-3672

Students' Attorney: Rm. 260, 273-3361

Transcripts and Records: Rm. 123, 273-3371

Veterans' Affairs Office: Rm. 260, 273-3361

FACILITIES FOR ADVANCED STUDIES AND RESEARCH

THE LIBRARY

The Library, housed in a seven-story, air-conditioned building, contains a rapidly expanding collection of more than 575,000 books, including government documents and technical reports. In addition, the Library subscribes to more than 2,650 periodicals and newspapers and maintains a collection of recorded tapes, discs, microfilms, motion pictures, film strips, slides, maps, and video tapes. Books are on open shelves, making it possible for students to locate research materials easily and to browse through related books. Seating is provided for more than 1,700 students, including about 1,000 at individual carrels.

Each of the public service departments—Humanities-General, Science-Engineering, Business-Social Science, Users' Services, Government Publications, Special Collections, and Archives and Manuscripts—are staffed with professional librarians and experienced assistants.

The Library is particularly strong in several specialized areas. For example, the collection of American literature of the late nineteenth century located on the second floor, is one of the finest collections of its type in the country. Special collections described below contain valuable resources for graduate and advanced research.

The *Jenkins Garrett Library* of Texana and the Mexican War is part of the Department of Special Collections. The Garrett Library contains more than 6,000 printed books as well as manuscripts, maps, and pamphlets, of primary research material in early Texas history and the U.S.-Mexican War. The Garrett Library has recently been supplemented by materials from the Eberstadt Collection, giving the University of Texas at Arlington one of the world's strongest collections of Mexican War resources. Located in specially designed quarters on the sixth floor, the Department of Special Collections is open 8-5 Monday through Friday and 10-6 Saturday. Seating for twenty-four individual researchers is provided along with a conference room.

The *Division of Archives and Manuscripts* originated as a research center of primary resources documenting the history of organized labor in Texas. The Texas State AFL-CIO has designated the Library as the official depository for its records. Many local unions are also depositing records. The division has grown through the years to include an ever enlarging selection of taped interviews of individuals involved in the Texas labor movement as well as the papers of prominent Texas political leaders and those of reform and humanitarian groups. Over one-hundred valuable collections of archival materials are housed on the sixth floor. New and extensive additions to the division include the microfilmed copies of the official state, notorial, and ecclesiastical archives of Yucatan, Mexico, and of almost all extant Yucatecan newspapers. **9**

The *Regional Historical Resource Depository Program* of the Texas State Library has designated the University of Texas at Arlington as one of its regional depositories. As such it houses and makes available to researchers historically valuable, non-current record of county, municipal, and special governmental units in Texas.

The *Minorities Cultures Center* provides support materials to the University's instructional programs related to American Indians, Blacks, and Chicanos. The expanding collection includes circulating and reference books in addition to periodicals, newspapers, microfilm, government documents, pamphlets, audio text cassettes, and recorders. Art and artifacts by and about the three minority groups are displayed periodically. The Archives and Manuscripts Division is adding papers, letters, taped interviews, and other primary source materials concerning prominent Texans from these minorities.

Graduate students will find it helpful to become acquainted with the librarians assigned to the special collections and their subject fields and to seek assistance in library research procedures. To supplement the library collection, the *Inter-Library Loan Department* attempts to locate and borrow research materials not in the Library. As a member of the Inter-University Council of the North Texas area, teletype inquiries will help to locate materials and to obtain much of it very quickly, often saving the student travel time to other campuses. As a member of the *Center for Research Libraries,* more than three million volumes, thirteen thousand journal subscriptions and numerous special research collections are available on inter-library loan to the students and faculty of the University.

As an additional service to graduate students, the Inter-University Council Library Courtesy Card will enable such students to go directly to IUC libraries and to borrow materials needed in connection with their research. This card may be obtained by application to the Assistant University Librarian for Public Services or the Head of Users' Services.

The Library also maintains an audio-visual service with listening-recording booths, listening rooms, and projection rooms for motion pictures. Audio-visual services include the preparation of video tapes, transparencies, slides, audio tapes, and graphic materials; and the provision of projection equipment, recording equipment, and video monitors. Coin-operated photocopy machines are located on the second, third and fourth floors, and a photocopy center is located on the fifth floor along with rental typewriters.

Fall and Spring Library hours are:

Monday-Thursday	7:45 a.m. - 11:45 p.m.
Friday	7:45 a.m. - 6:00 p.m.
Saturday	10:00 a.m. - 6:00 p.m.
Sunday	1:00 p.m. - 11:00 p.m.

Summer Library hours are:

Monday-Thursday	7:15 a.m. - 11:00 p.m.
Friday	7:15 a.m. - 5:00 p.m.
Saturday	10:00 a.m. - 5:00 p.m.
Sunday	2:00 p.m. - 10:00 p.m.

RESEARCH CENTERS, DIVISIONS, AND SERVICES

APPLIED MATHEMATICS CENTER

The Department of Mathematics directs the Center for Applied Mathematics. Its purpose is to involve students and faculty in mathematical problems arising in other disciplines on campus and industry. Thus, the Center serves as a resource for the academic, business, and industrial communities.

ART COLLECTIONS AND MUSEUMS

The Department of Art hosts an ongoing series of public lectures, films, workshops, and special events centered around a large and well-equipped gallery. Cooperation is continual with neighbor institutions as well as the Dallas Museum of Fine Arts, Fort Worth Art Museum, Amon Carter Museum of Western Art, and the Kimbell Art Museum. The Metroplex area attracts major artists and performers from all over the country and a very stimulating environment exists for all of the arts.

BUSINESS AND ECONOMIC RESEARCH CENTER

The Center for Business and Economic Research was established in 1971 to conduct research projects for interested businesses and governmental agencies. Since then, several funded projects have been conducted through the Center with the assistance of graduate and undergraduate students in Business Administration, Economics, and Accounting. Through an "Occasional Reports" series, the Center publishes faculty research of interest to members of the business, labor, and government communities.

CONSTRUCTION RESEARCH CENTER

The Construction Research Center is engaged in research and educational activities that support the construction industry. The research programs are primarily in the areas of Civil Engineering and Architecture, but they also involve the Departments of Mechanical Engineering, Industrial Engineering, Geology, and Economics, and the College of Business. 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. Another advisory group of architects and engineers meets three times each year.

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ECONOMIC EDUCATION CENTER

The Center for Economic Education was established in 1972 with the aid of a grant from the Texas Council on Economic Education. Its purpose is to offer training in economics to elementary and secondary teachers through special summer institutes, inservice programs, off-campus programs, and the dissemination of appropriate curriculum materials.

ENERGY POLICY STUDIES CENTER

The Center for Energy Policy Studies conducts research related to energy, particularly long-range assessments of policy. It is a part of the Institute of Urban Studies, and like the Institute's projects, the Center's activities normally involve the participation of many disciplines, especially economics, architecture, engineering, and the sciences. In addition to providing research opportunities for faculty and students, the Center also functions as an information clearing house on energy issues with a special emphasis on information related to energy-efficient buildings.

ENERGY SYSTEMS RESEARCH CENTER

The Energy Systems Research Center is concerned principally with electrical power generation, transmission, and distribution and emphasizes planning and operational aspects of practical power systems. The Center serves undergraduate, graduate, and continuing education students and practicing engineers. The Center was established in 1968 and has attained national recognition as one of the most important research centers of its kind in the United States and is the largest center of its type in the Southwest. The graduate program is well established with the equivalent of 20 full-time students and 5 full-time staff members per semester. The ESRC offers special non-degree graduate programs and in-plant and on-campus continuing education programs for practicing power system engineers. The short course, "Modeling and Analysis of Modern Power Systems," now in its twelfth year, is continually updated to reflect the most advanced concepts and practices in planning, design, and operation of electrical power systems and has become one of the outstanding programs in the industry. The Center sponsors a Distinguished Lecture Series and informal industrial seminars as part of the graduate program. The ESRC provides practical academic programs with maximum flexibility. Research at the Center emphasized practical application. Graduate assistantships, fellowships, and post-doctoral fellowships are available for qualified candidates.

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 Manuscripts, and the Minority Cultures Center.

HUMAN RESOURCE CENTER

The Human Resource Center is an adjunct facility to the Graduate School of Social Work. It supports classroom and field instruction in a variety of ways including the use of sophisticated technological equipment, such as video-tape and biofeedback apparatus. The Center also serves as a facilitating resource for the development and implementation of student and faculty research. Continuing education for social work professionals and other groups include local, regional, and national programs. Seminars, workshops, and other training modalities are developed to meet specific individual, agency, or multi-agency needs. Finally, the Center staff offers personalized social services for the student body of the University as well as the community.

INNER CONTINENTAL SHELF CORE REPOSITORY

In 1973 the Department of Geology established the Inner Continental Shelf Core Repository. The Repository houses sediment cores from the inner continental shelves of the United States collected by the Army Corps of Engineers. Useful in engineering as well as geological studies, these cores will ultimately represent the entire coastal area of the continental United States as well as the Great Lakes. Currently there are approximately 1,500 cores from both the east and west coasts.

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, four miles 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, bilingual educators, government officials, and others. A number of competitive graduate Fellowship Grants are provided by the Center each semester.

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 over two-hundred American and twenty-eight foreign universities and archives. 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 13

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 and instruction in the use of computer programs.

MICROCRYSTAL POLYMER SCIENCE CENTER

The Center for Microcrystal Polymer Center, the first center of its kind in the world, conducts research in a new field of polymer science. Microcrystal Polymer Science is of interest to biologists, biochemists, physicists, materials engineers, and others; it proffers unique opportunities for interdisciplinary investigations. Extensive industrial potentials are foreseen because of the fundamental properties of individual polymer microcrystals which, in the form of suspensions, possess properties not possible from conventional forms of polymer products. The new Center has the primary objectives of conducting basic research on polymer microcrystals and training students in this field so that they may qualify as future leaders in polymer science both for academe and industry.

PLANNING RESEARCH AND DESIGN CENTER

The Planning Research and Design Center was created in November 1973 and became operational in January 1974. The Center utilizes interdisciplinary research efforts by the architecture faculty and graduate students with the primary objective of conducting studies in environmental planning and design for application by local, state, and federal agencies. Since its inception, the Center has received research funds totalling $187,000 primarily from the EPA, HUD, and HEW. It has developed model procedures for environmental analysis, planning and design. Fourteen research publications have been completed including three model procedures for preparing environmental impact statements and review records for water quality management and housing and community development projects. The current programs at the Center include preparation of environmental handbooks and conducting training programs for EPA and HUD officials as well as the Council of Governments and city and county officials in Texas, Oklahoma, New Mexico, Arkansas, and Louisiana.

PUBLIC TRANSPORTATION CENTER

The Public Transportation Center was created in 1972 "to provide a dynamic forum for multi-disciplined research, training, and public information concerning all aspects of public transpor-

tation." Principal areas of activity center around planning, design, construction, economics, law, operations, maintenance, finance, and administration of transportation facilities and services as well as the interaction of transportation systems with the physical, economic, and social environment they are designed to serve. The Center is University wide in scope: faculty and students from many departments and colleges participate in the research and training activities. Each discipline contributes heavily in those particular problem areas best suited to that particular discipline. The activities, however, are not isolated efforts; they result from the fertile exchange of ideas and information between the various disciplines.

URBAN STUDIES RESEARCH AND SERVICE DIVISION

The mission of the Urban Studies Research and Service Division, established in 1967, is to provide guidance to public agencies seeking to anticipate and deal effectively with local issues and organizational changes. The Division employs several full-time research faculty members and qualified graduate students who work as Research Associates and participate actively in the Divisions projects. The Division has maintained a strong and active program of problem and policy-oriented research, advisory services, and continuing education for local, regional, and state officials.

PUBLICATIONS

ALLEGORICA

Allegorica is a new journal of comparative literature devoted to Medieval and Renaissance Studies; it is published by the Department of English. *Allegorica* makes available to scholars and students works previously unknown in translation. The texts are printed bilingually with the original and a modern translation on facing pages. In addition, reviews of books relevant to the material in the journal appear in each issue. The publication will be particularly helpful to students interested in the problems of translation. Student clerical positions are usually available.

AMERICAN LITERARY REALISM, 1870-1910

American Literary Realism, 1870-1910 is a scholarly quarterly with a bibliographic and textual focus. Established in 1967, *ALR* has won international recognition for its annotated bibliographies and checklists and for its willingness to treat minor as well as major American writers of the designated period. Students contributions prepared according to the professional specifications of the journal may be considered for publication; student clerical positions are usually available. *ALR* is published by the Department of English.

HAROLD FREDERIC EDITION

The staff of the Harold Frederic Edition, one of fourteen editions associated with Modern Language Association's Center for Editions of American Authors, is engaged in the preparation of a projected fifteen-volume edition of the works of Harold Frederic, late nineteenth-century American novelist and journalist. The volumes are being edited under the direction of the edition staff—members of the Department of English—and published by the Texas Christian University Press. Graduate students from the Department of English work along with staff members in all phases of the research and preparation of the critical texts.

THE JOURNAL OF NONLINEAR ANALYSIS — THEORY, METHODS AND APPLICATIONS

The *Journal of Nonlinear Analysis — Theory, Methods and Applications* (Pergamon Press) is edited by the Chairman of the Department of Mathematics. This journal affords students and faculty the opportuntiy of a role in an important area of mathematics. The Department of Mathematics also publishes faculty and student research results as technical reports. Approximately two-hundred American and foreign institutions receive copies of these reports.

WALTER PRESCOTT WEBB MEMORIAL LECTURES

The lectures, now in their eleventh year, are delivered each spring in honor of Texas' most distinguished historian, Walter Prescott Webb. The lectures are published annually by the University of Texas at Austin Press. Now considered among the most prestigious history lecture series in the country, the Webb Memorial Lectures give graduate students and others the opportuntiy to meet and to hear some of the nation's oustanding historians.

WORLD LITERATURE WRITTEN IN ENGLISH

Now beginning its fifteenth year of publication, the bi-annual journal *World Literature Written in English* is the official organ of the Modern Language Association's section on "English Literature Other Than British and American." Internationally known as the outstanding journal in Commonwealth literature, *WLWE* contains interviews, articles, bibliographies. and reviews addressed primarily to writing from India, Africa, the West Indies, Canada, New Zealand, and Australia. The journal is especially valuable to graduate students completing theses in Commonwealth literature. Student clerical positions are usually available. *WLWE* is published by the Department of English.

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. 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.

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 or an acceptable combination of experience and formal education; (2) satisfactory academic standing at the last institution attended; (3) an acceptable score on the aptitude tests of tht Graduate Record Examination or the Graduate Management Admission Test, if required 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. In addition, some departments may require a score on the advanced portion of the Graduate Record Examination or an additional test such as the Miller Analogies Test; see the departmental requirements for this information.

ADMISSION OF FOREIGN STUDENTS

A applicant who does not hold a bachelor's degree from an accredited U. S. college or university must provide the following: (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 bachelor's degree or its equivalent from an accredited college or university, with a satisfactory grade-point average; (4) an acceptable score on the aptitude tests of the Graduate Record Examination or Graduate Management Admission Test, if required by the department or program to which application is being made; (5) if his native language is *not* English and he does *not* hold a bachelor's or master's degree from an accredited U. S. institution, an acceptable score (normally, at least 525) on the Test of English as a Foreign Language (TOEFL); (6) acceptance into a departmental program; and (7) certification on

an official University of Texas at Arlington Financial Statement form (available from the Director of Admissions) that the student has adequate funds to finance his graduate studies.

ADMISSION PROCEDURES

NEW STUDENTS

An applicant holding a degree or degrees from a United States or foreign university should file an application form (available from the Director of Admissions) and the following credentials at least 60 days (30 days for University of Texas at Arlington degree holders) prior to the beginning of the semester or summer session in which he plans to register: (1) *official* transcripts of all undergraduate and graduate college work previously taken; (2) scores on the aptitude tests of the Graduate Record Examination or Graduate Management Admission Test, if applicable; and (3) three letters of recommendation completed according to the instructions accompanying the official application form. Foreign students must submit by the same deadline the additional creditials listed above in the section on Admission of Foreign Students.

FORMER STUDENTS

A student previously registered in the University of Texas at Arlington Graduate School and wishing to resume graduate work after an absence of one semester or longer should file through the Graduate Advisor in his program an application for readmission at least 20 days before the beginning of registration for the semester in which he 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 was not enrolled in the Graduate School, official transcripts of all courses must be submitted.

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 for admission (see below). Some departments also require a score on the GRE advanced test in the major field; this requirement, if applicable, is stated under the departmental or program requirements given later in this catalog.

Information bulletins and test application blanks can be obtained from Educational Testing Service, Box 955, Princeton, New Jersey 08540 U.S.A. or from the Testing and Counseling Office of the University of Texas at Arlington. The GRE is given 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 Edu-

cational Testing Service approximately one month in advance of each test, therefore an applicant should secure the information bulletin and application blank at least six weeks in advance. A minimum of six weeks should be allowed for the examination results to reach the University.

GRADUATE MANAGEMENT ADMISSION TEST (GMAT)

The Graduate Management Admission Test score is required for admission to graduate work in Business Administration and may be substituted for the GRE aptitude scores for admission to the Master of Professional Accounting program. Information bulletins and test application forms can be obtained from Educational Testing Service, Box 966, Princeton, New Jersey 08540 U.S.A. or from the Testing and Counseling Office of the University of Texas at Arlington. The GMAT is given four times a year (usually in November, January, March, and July). The University of Texas at Arlington is an approved test center for the GMAT. The GMAT and GRE application procedures are the same.

TEST OF ENGLISH AS A FOREIGN LANGUAGE (TOEFL)

An applicant whose native language is *not* English must submit a satisfactory score (normally 525) on the Test of English as a Foreign Language (TOEFL). In some departments an applicant holding a bachelor's or a master's degree from an accredited college or university may not be required to submit a TOEFL score. The waiver of the TOEFL score requirement must be recommended by the applicants' Graduate Advisor and approved by the Dean of the Graduate School. The TOEFL is given at various centers in the United States and abroad at least four times each year. Application forms and information bulletins may be obtained from the Educational Testing Service, Box 899, Princeton, New Jersey 08540 U.S.A., from American embassies and consulates and offices of the United States Information Service, or from the Office of Testing and Counseling at the University of Texas at Arlington. The application procedure is the same as for the GRE. The University of Texas at Arlington is an approved testing center for the TOEFL.

OTHER ADMISSIONS TESTS

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

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 that (1) he has **19**

been accepted under one of the categories of admission listed below or that, (2) his applicancy has been denied, or (3) that a decision has been deferred for reasons listed in the notice. An admission permit will be issued by the Director of Admissions stating the conditions of admission and period of validity for the permit.

UNCONDITIONAL ADMISSION

An applicant meeting all the requirements given above is normally granted unconditional admission.

PROBATIONARY ADMISSION

An applicant not meeting 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 be appointed to 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 credentials prior to the admission deadline but otherwise appearing 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 be appointed to an assistantship until unconditional admission status has been achieved. Foreign students not residing in the United States at the time of application may not be admitted on a provisional basis.

SPECIAL STUDENTS

A student wishing to take graduate courses at the University of Texas at Arlington but not planning 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 student wishes to study. 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; however, no more than 9 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 grades in all courses taken as a special student will be considered in computing a student's grade-point average. Special students may not hold assistant-ships or enroll in research, thesis, internship, or dissertation courses.

A student engaged in a graduate degree program at another institution and wishing to take courses at the University of Texas at Arlington for transfer to that institution may be admitted as a special student.

Admission as a special student in no way guarantees subsequent unconditional admission into a graduate program or into the Graduate School. Under normal circumstances a student who has been denied admission to or dropped from the Graduate School will not be allowed to enroll as a special student.

GRADUATE STUDENT ADVISING

After being admitted, the student should confer with the Graduate Advisor of the proposed major area, preferably in a personal interview, 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 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 would not be applied toward the degree.

REGISTRATION SCHEDULE

Students should consult the Graduate School calendar printed inside the front cover of this catalog. Specific registration instructions are published by the Registrar each semester and summer session

RESTRICTION ON ADMISSION

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

TUITION AND FEES

The tuition rates and fees listed in this section are in effect at the time of compilation; however, due to conditions which may arise beyond the control of the University of Texas at Arlington, tuition rates and fees may be changed at any time without advance notice. The University reserves the right to modify any fee in accordance with unforeseen conditions.

TUITION

REGULAR SESSIONS AND 12-WEEK SUMMER SESSION

The tuition rates below include $8 per capita plus $5 per hour Building Use Fee, $2.50 per hour Student Activity Fee with $30 maximum and $1 per hour Health Service Fee with $10 maximum.

Semester Hours	Resident Students	Non-Residents, Foreign Students	Foreign Students (Exempt Country)
1	$ 66.50	$ 56.50	$216.50
2	75.00	105.00	225.00
3	83.50	153.50	233.50
4	92.00	202.00	242.00
5	100.50	250.50	250.50
6	109.00	299.00	259.00
7	117.50	347.50	267.50
8	126.00	396.00	276.00
9	134.50	444.50	284.50
10	143.00	493.00	293.00
11	150.50	540.50	300.50
12	158.00	588.00	308.00
13	165.00	633.00	313.00
14	174.00	678.00	318.00
15	183.00	723.00	333.00
16	192.00	768.00	352.00
17	201.00	813.00	371.00
18	210.00	858.00	390.00
19	219.00	903.00	409.00
20	228.00	948.00	428.00
Each Additional Hour	9.00	45.00	19.00

6-WEEK SUMMER SESSIONS

The tuition rates below include $4 per capita plus $5 per hour Building Use Fee, $2.50 per hour Student Activity Fee with $15 maximum and $1 per hour Health Service Fee with $5 maximum.

Semester Hours	Resident Students	Non-Residents, Foreign Students	Foreign Students (Exempt Country)
1	$ 37.50	$ 52.50	$112.50
2	46.00	101.00	121.00
3	54.50	149.50	129.50
4	63.00	198.00	138.00
5	71.50	246.50	146.50
6	79.00	294.00	154.00
7	87.00	339.00	159.00
8	96.00	384.00	176.00
Each Additional Hour	9.00	45.00	19.00

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, and certain other employee categories employed at least half-time in positions which relate to their degree programs will be charged the same rate as a Texas resident.

2. Holders of certain competitive scholarships in the amount of $200.00 or more awarded through the University of Texas at Arlington scholarship committee will be charged the same rate as a Texas resident.

3. Certain non-resident students age 18 or under who have been classified as Texas residents at previous registrations will be charged the same rate as a Texas resident.

4. Students registered for thesis or dissertation credit only, in those instances where such credit is the final credit hour requirement for the degree in progress, will be entitled to a tuition rate not to exceed $12 for resident students or $50 for non-resident and foreign students. To qualify for the thesis-only or dissertation-only tuition reduction the student is required to:

   a. have a degree plan on file in the Graduate School prior to registration for the semester in which he is applying for the reduction;

   b. have no incomplete grades on his record whether or not the courses apply to the degree plan;

   c. have completed all coursework on the degree plan; and

   d. notify the Graduate School of intention to request tuition reduction at least 7 days prior to registration. **23**

FEES

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

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

Graduation fees are paid in the semester in which the student graduates and include those listed below. Deadlines for paying these fees are given in the Graduate School calendar printed inside the front cover of this *Catalog.*

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

PROPERTY DEPOSIT FEE

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 from time to time, and if charges have been made against the deposit, the student will be required to bring the deposit up to $10.

PHOTO IDENTIFICATION CARD FEE

Each student registering at the University of Texas at Arlington is required to pay an annual $2 Photo Identification Card Fee renewable at the beginning of the Fall Semester each year. 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, when cashing checks at the University Bookstore, Student Center, or Bursar's Office, for admission to various University activities such as athletic events, and other situations in which personal identification is required. The replacement charge for lost Photo Identification Cards is $2.

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:

	Automobile		Motorcycles	
	Day	Night	Day	Night
Fall Semester	$18	$10	$10	$ 5
Spring Semester	10	6	5	3
First Summer Session	5	4	2	2
Second Summer Session	4	4	1	1

Commuting students have found that car pools are an economical way to travel between home and school. 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 a.m. to 9 p.m. and from 7 a.m. to 5 p.m. on Friday. Complete parking regulations are available at the office.

Students who graduated at the end of the Fall Semester or who terminate their enrollment for other reasons at the end of the Fall Semester or beginning of the Spring Semester may receive a partial refund of the parking fee provided they turn in the remnants of their decal and that the transaction be made on or before the Spring Semester Census Date.

LABORATORY FEES

Laboratory fees are charged for various science and engineering laboratory courses. Courses for which laboratory fees are charged and the amounts of the fees are listed in the course description section of this *Catalog*.

STUDENT ACTIVITY FEE

The Student Activity Fee is required of all students and provides either free or reduced fees to intercollegiate events at home, formal competition events, newspaper, and activity programs in E. H. Hereford Student Center.

HEALTH SERVICE FEE

The compulsory Health Service Fee entitles a student to the services of the Student Health Center but does not cover medication or x-ray charges.

LATE REGISTRATION FEE

There shall be a compulsory fee for late registration fee of $5 for the first day, plus $2.50 for each additional late day, with the maximum amount being $15 for any one semester or session.

DIPLOMA FEE

Upon graduation each student will be required to pay a $2.50 Diploma Fee. This fee includes the cost of a diploma cover. 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.

BINDING FEE

Students writing theses, internship reports and dissertations are required to pay a $13.50 Binding Fee at the time the three

copies of the final approved thesis, internship report, or dissertation are submitted to the Graduate School. If the thesis, report, or dissertation is larger than one volume an additional $13.50 per volume of three copies each will be charged. One copy of the thesis, internship report, or dissertation is deposited in the University Archives, one in the Library, and the third in the departmental library.

MICROFILMING FEE

The $25 Microfilming Fee includes the cost of microfilming one official copy of the dissertation by University Microfilms, Ann Arbor, Michigan, and the publication of the dissertation abstract in *Dissertation Abstracts International*. University Microfilms deposits one positive microform copy of the dissertation in the Library of Congress.

DISSERTATION COPYRIGHT FEE (optional)

If the student wishes to secure copyright of his thesis or dissertation in his own name, copyright arrangements will be completed for a total fee of $15 payable at the time the final thesis or dissertation copies are submitted to the Graduate School.

RESIDENCY REGULATIONS

All students attending the University of Texas at Arlington who are non-residents of this state will be charged additional tuition in accordance with the state law.

According to interpretations by the Coordinating Board, Texas College and University System, of Article 2654c, Vernon's Civil Statutes, with amendments through 1969, the following information pertains: "An individual under eighteen (18) years of age, living away from his family, and whose family resides in another state or has not resided in Texas for the 12-month period immediately preceding the date of registration shall be classified as a non-resident student; or an individual eighteen (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 indvidual in the state is primarily for the purpose of attending an educational institution. After residing in Texas for at least twelve (12) months, 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, Texas College and University System.

Two of the most common exceptions included in the state statute are as follows: (1) A non-resident who marries a resident of Texas is entitled to pay the resident tuition fee regardless of the length of time lived in Texas; proof of marriage must be submitted to the Registrar's Office prior to registration. (2) Usually, a member of the United States Military Forces is entitled to pay the resident tuition fee for the member or the member's dependents, providing that each semester he or she submits to the fee

assessors in registration a letter from his or her commanding officer stating that he is currently on permanent assignment in the state.

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.

REFUNDS

A student will receive a full refund of fees paid only if he cancels his registration through the Registrar's Office before the first day of classes of a semester. A student who withdraws from the University during the first week of classes (or the equivalent during summer sessions) will receive a 75 per cent refund of fees paid. Students withdrawing after the first week but prior to the Census Date will receive a 50 per cent refund of fees paid. A student resigning after the Census Date will receive no refunds. This policy applies to tuition, laboratory fees, private instruction fees, building use fees, fees for extension courses, fees for the use of the bowling alley during regular physical training courses, and residence hall room rent. The policy does not apply to other fees not specifically mentioned.

Refund checks cannot be prepared until a computerized audit of fees has been performed after the Census Date; thus, refunds normally cannot be issued until approximately six weeks after a semester starts.

The unused portion of the housing deposit will be refunded at the end of the lease period if the resident's room has been thoroughly cleaned and no damage has been incurred, inventory card completed, and room key returned to the Housing Office. The Business Office will mail the refund to the student at the address specified on the inventory card.
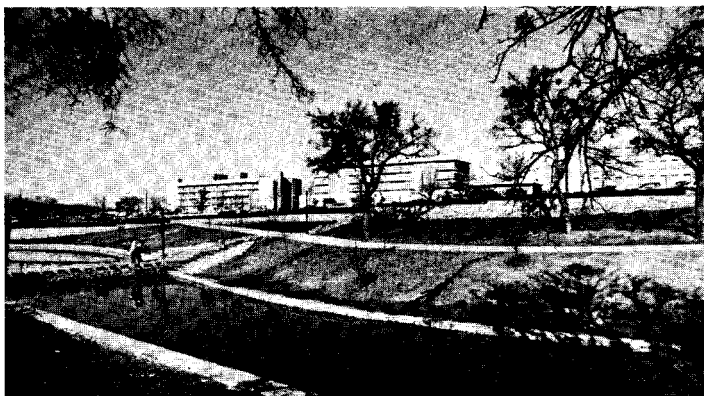
STUDENT SERVICES AND FINANCIAL AID

HOUSING

Students desiring campus housing should make application as early as possible before registration. Applications and information are available at the Housing Office, 260 Davis Hall, 273-2706. Reservations for residence hall space are for two semesters and are not valid until an application and the housing deposit are received in the Housing Office. Applications cancelled after the cancellation date for the current term will result in forfeiture of the housing deposit.

For off-campus housing, contact the Rent Properties Office, 411 South Cooper, 273-2583. The University has a limited number of rent houses available for married students.

STUDENT HEALTH SERVICES

The full-time staff is equipped to care for most routine health needs of students. There is no charge for seeing a physician, but charges—at cost—are made for medicine, x-rays and laboratory tests. Inpatients are also charged for laundry and meals.

Because the Service is not equipped to provide obstetrical, surgical, dental and other more extensive diagnostic and hospital services, students are urged to subscribe to an appropriate medical insurance program (see below).

State Law Regarding Immunization: State law requires all students of institutions of higher learning to present a physician's proof of immunization to tetanus and diphtheria; specifically, proof of a minimum of three doses, the last of which was within the past ten years. Students who have not yet reached their 19th birthday must show proof of a minimum of three oral polio doses, one of which must have been after age four. State law permits students to register without having presented proof of immunization, but stipulates that they must immediately proceed to meet the requirements. These immunizations are available at the Health Center at cost.

STUDENT HEALTH INSURANCE

Because the Student Health Service is not able to meet all medical care needs, particularly the more extensive diagnostic and inpatient services of a general hospital, students are strongly urged to consider subscribing to an appropriate medical insurance program.

For information concerning the current student health and accident insurance, contact the Student Life Office, Room 260, Davis Hall, 273-3361.

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COUNSELING AND TESTING SERVICE

The Office of Counseling and Testing, located in room 201, Davis Hall (273-2601), offers educational-vocational, study habits, and personal/social counseling. The office also distributes applications for the Graduate Record Examination, Graduate Management Admission Test, Law School Admission Test, National Teachers Exams, and the Test of English as a Foreign Language. The office administers the Graduate Record Examination, Graduate Management Admission Test, and Test of English as a Foreign Language on national dates and the Miller Analogies Test by appointment.

The Office of Counseling and Testing also maintains a library of vocational information and catalogs of other universities.

PLACEMENT SERVICE

The Placement Office, in Room 216, Davis Hall, provides career employment assistance and counseling for graduates of masters and Ph.D. level programs. Specialized effort is necessary in many instances in order to adequately be prepared; consequently, the student should contact the Placement Service at the beginning of his last semester on campus.

Each Fall and Spring semester, industrial, governmental and educational organizations visit the Placement Office for on-campus interviews with students interested in employment with their firms. In order to take advantage of these interviews, the student must be registered for Placement Service. Further information can be obtained by calling 273-3672.

HANDICAPPED STUDENTS

The objective of the Educational Support Services Office for Handicapped Students is to help integrate physically impaired students into college and later a career. The Coordinator of the Services Office requires a personal interview 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 handicapped students with general campus orientation and registration. For further information contact the Office of the Dean of Student Life, 260 Davis Hall, 273-3361.

VETERANS' ASSISTANCE

Veterans attending or planning to attend the University of Texas at Arlington can find assistance in two areas:

VETERANS' AFFAIRS OFFICE (V.A.O.)—The objective of this service is to assist veterans in their transition into university   29

life and in career considerations. The Director of Veterans' Affairs, in the Student Life Office in 260 Davis Hall (273-3361), has assistants specializing in financial aid, testing and counseling, and career placement. These assistants may be contacted in the Financial Aid Office, the Counseling and Testing Office, and the Placement Office, depending on the kind of counseling needed.

VETERANS' ADMINISTRATION REPRESENTATIVES (VET REPS)—Questions concerning eligibility for and payment of VA benefits may be answered by veterans' representatives in the Registrar's Office.

STUDENTS' ATTORNEY

The students' attorney will be available to advise students regarding legal and university-related problems and to assess their need for further legal assistance. The Office of the Students' Attorney is located in 260 Davis Hall, 273-3361.

STUDENT CONDUCT AND DISCIPLINE

The University of Texas at Arlington reserves the right to impose a disciplinary penalty, including restriction of enrollment, on any student for disciplinary or academic reasons. Academic dishonesty may result in referral to the Discipline Coordinator. Information about the various judicial bodies, 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," a copy of which is in the Office of the Dean of Student Life, 260 Davis Hall, 273-3361.

FINANCIAL AID

The Financial Aid Office is located at 252 Davis Hall, 273-3561.

PART-TIME EMPLOYMENT
The Financial Aid Office maintains a file of part-time jobs in this area for students who need this type of employment. Local businesses and campus employers keep in close touch with this office to inform the students of job openings.

SHORT-TERM LOANS
Loans up to $150 are made for current expenses and are to be repaid during the semester in which the money is borrowed. Applicants must have a grade point ratio of 2.0 and have completed 15 semester hours at the University of Texas at Arlington. A co-signer may be required. Application deadline will be 2 days **30** prior to the first day of registration for any semester.

ASSISTANCE BASED ON NEED

Students anticipating the use of any of the following financial aid programs (other than Federally Insured Loans) should process a Parents' Confidential Statement or a Student's Financial Statement through the Financial Aid Office, University of Texas at Arlington, Arlington, Texas 76019, telephone (817) 273-3561. *Early application is encouraged.*

GRANTS-IN-AID

The State of Texas has made available a limited amount of funds as grants-in-aid to needy students not to exceed half of the student's financial need or $100 per month, whichever is less.

LONG-TERM LOANS

UT Arlington participates in several long-term loan programs. The common element in all long-term loans is the deferred repayment provision that permits a student to repay the loan after termination of full-time studies at the University. The programs offered at the University of Texas at Arlington are Hinson-Hazelwood College Student Loan Program, National Direct Student Loan Program, and the Federally Insured Loan Program.

COLLEGE WORK-STUDY

Students who need a job to help pay for college expenses may be eligible for employment at the University of Texas at Arlington under federally supported Work-Study Programs. To work under this program, a student must be in good standing, or be accepted for enrollment. The student's eligibility depends on his need for employment to defray college expenses, with preference given to applicants with the greatest financial need. Employment is available in many departments on campus and in a limited number of off-campus locations.

BUILDING USE WAIVER

In cases of exceptional financial need the state provides for a waiver of the $5 per hour Building Use Fee. Students qualifying for this type of assistance will still be required to pay the $8 Building Use Base Fee.

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.

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.

GENERAL GRADUATE SCHOOL REGULATIONS AND INFORMATION

STUDENT RESPONSIBILITY

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

COMMITTEES ON GRADUATE STUDIES

Each graduate program is governed by a Committee on Graduate Studies. The committee is composed of all the members of the graduate faculty in the program. Graduate faculty from allied fields may serve on the committee, when appropriate.

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. 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.

COURSE GRADES AND NUMBERING SYSTEM

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 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.

No student will be allowed to repeat a course in order to change a passing grade. A student may repeat a course only if 33

that course is specifically designated 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 on the student's average.

Incomplete grade—A student who has been unable to complete all the class or laboratory assignments in a semester or term may, at the discretion of the instructor, receive an X designating a temporary grade. The incomplete grade must be removed within one calendar year or it will be changed automatically to an F. All incomplete grades must be removed from the student's record before the degree will be awarded.

Credit for research, thesis, or dissertation courses—All research, dissertation, and thesis courses will be graded on a pass-fail basis. A final grade may be given in a research or thesis course only if the work is completed during the semester in which the student is registered in the course.

If a student undertakes a research, thesis, or dissertation course and does not complete the course in the semester for which he is registered in the course, a grade designation of R (research in progress) will be given instead of an X. The grade of R is a permanent grade, but is not included in any academic evaluation and does not carry any credit value. A student re-receiving a grade of R must re-register for the course in order to obtain academic credit. This grade may be issued only to graduate students for the above-mentioned courses.

Course numbering 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.

5341. POLITICAL SCIENCE (2-3) 3

1. "Political Science" is the departmental designation for the specific course listed.
2. The first digit (5 in the above example) denotes the level or the year in which the course is usually taken.
3. The second digit (3) denotes the semester hour credit of the course.
4. The third and fourth digits (4 and 1) indicate the departmental designation of the course and make the number unique within the department or program.
5. The first figure in parentheses indicates the clock hours per week devoted to theory. Theory includes recitations and lectures.
6. The second figure in parentheses indicates the clock hours per week devoted to practice. Practice includes work done in the laboratory, shop, drawing room or field.
7. The final figure is the credit value of the course. The unit of credit is the "semester hour" which involves one hour of theory and/or from two to four hours of practice per week for one semester of 18 weeks.

Each department or program has been assigned a unique four character prefix for use in course designations on registration documents, transcripts, and other University records. For example, the Political Science 5341 course described above would appear on student records as POLS 5341. The four character

prefix is given in parentheses after the department or program name in the catalog section describing the academic departments and programs.

COURSE AUDITING, CHANGES, AND LOAD

Auditing—The auditing of courses is a privilege open to any person (if space is available) who has credit in the course or has a demonstrated need. Auditing grants the privilege of hearing and observing only, and does not grant credit. 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 and Dean of the Graduate School. When the form has been completed and approved, the applicant if currently enrolled pays a fee of $5 per course; if not enrolled, the applicant pays $25 per course.

Adding and dropping courses—A student who wishes to change a schedule by either dropping or adding a course must first consult with his 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 student may not drop a course during the last two weeks of a semester.

(3) A student dropping a course prior to the mid-semester date will receive a grade of W which will appear on the student's permanent records but will not be used in computing his grade point average. A student dropping a course after the mid-semester date will receive a grade of W only if at the time of the drop the student is passing the course (has a grade of A, B, or C); otherwise an F will be received.

(4) A student who desires to drop all courses for which he or she is enrolled is reminded that such action results in withdrawal from the University. The student should indicate the intention to withdraw and drop all courses by filing a properly executed resignation form in the Office of Student Administration.

Withdrawal—A student who wishes to withdraw (resign) voluntarily from the University must execute the proper resignation form in the Office of Student Administration.

Maximum 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 Graduate Dean only in exceptional circumstances.

CONTINUATION IN THE GRADUATE SCHOOL

Regardless of conditions surrounding the student's admission, continuation from semester to semester in the Graduate School is permitted only if (1) satisfactory progress is made in absolv- 35

ing admission conditions, and (2) the student maintains a 3.0 average on all work undertaken while in Graduate School. If the student at any time fails to maintain an overall 3.0 grade-point average on all work undertaken as a graduate student, he or she must during the next semester of attendance raise his or her average on all work taken while in Graduate School to a 3.0 grade-point average. A graduate student undertaking less than a full academic load (nine semester hours of advanced course work) will have his or her record evaluated the semester that the first nine semester hours of course work is completed at this institution. The academic record of the student will thereafter be evaluated at the conclusion of each additional nine semester hours of course work. The carrying of less than a full load does not, however, absolve the student of the responsibility of meeting admission conditions within the prescribed period of time. Failure to meet the grade-point requirement will result in automatic dismissal from Graduate School. Following such dismissal, the student may be readmitted for further graduate study in either the same or a different area only if a petition (accompanied by a complete record of all college or university work previously undertaken) has been approved by the appropriate Committee on Graduate Studies and the Dean of the Graduate School.

EXTENSION WORK AND CORRESPONDENCE COURSES

Extension—Work done in extension classes may be applied toward an advance 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.

COURSE AND TRANSFER CREDIT

Maximum undergraduate credit—No more than 9 hours of advanced baccalaureate course work 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. No course applied to any one degree, graduate or undergraduate, may be applied to any other degree, either directly or by substitution.

Transfer credit—Credit will be granted for equivalent course work from other institutions in the University of Texas System upon the approval of the appropriate Committee on Graduate Studies and the Dean of the Graduate School. Credit for graduate level work completed at other institutions of recognized standing may, upon the recommendation of the department or other academic unit concerned, be accepted for a maximum of one-half of the formal graduate level course work requirement

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

REGISTRATION OF GRADUATE ASSISTANTS

Graduate Teaching Assistants and Graduate Research Assistants may register for a *maximum* of 12 semester hours per semester and for a *minimum* of 9 semester hours per semester. They may register for no more than 12 semester hours and for no less than 6 semester hours for the three summer sessions. Upon recommendation of the department and approval of the Dean of the Graduate School the minimum registration limit may be waived for students who have completed all course work and are registered for thesis only. In accepting an assistantship appointment a student agrees to devote one half of his effort to his graduate studies and the other half to his assistantship responsibilities and, therefore, agrees to hold no employment other than the assistantship. Graduate Assistants are under the direction of the department chairman with regard to assistantship responsibilities and assignments.

GRADUATE REGISTRATION OF SENIORS

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 courses for graduate credit under the following conditions:

1. All work for undergraduate credit must be completed dur-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 file with the Graduate Dean a "Reservation of Courses for Graduate Credit by Undergraduate Students" (available in the Graduate School Office) no later than the Census Date of the semester or session. 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.

A maximum of 12 hours of credit may be applied to a graduate degree 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 courses to be reserved for graduate credit. **37**

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 School or, at the student's option, the Catalog of any subsequent year in which the student was a resident graduate student.

Degrees are awarded at the end of the Fall Semester, the Spring Semester, and each summer session, but formal public ceremonies are held only at the conclusion of the Spring Semester.

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 he expects to graduate. 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 calendar** published inside the front cover of this Catalog:

1. All graduating students must file a Diploma Application and pay the Diploma Fee. 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:
    file
    a. the application for candidacy;
    b. three unbound copies of the final approved thesis or internship report;
    c. a completed Master's Thesis Data Sheet;
    d. the Final Master's Examination Report; and
    pay
    e. the thesis binding fee.

3. **Doctoral degree candidates** must:
    file
    a. the final degree plan;
    b. three unbound copies of the final approved dissertation;
    c. a completed Doctoral Dissertation Data Sheet;
    d. the Dissertation Defense Report; and
    pay
    e. the dissertation binding and microfilming fees.

For more information about the submission of acceptable theses, internship reports, and dissertations, consult *An Illustrated Guide to the Preparation of Theses and Dissertations* available from the Graduate School Office.

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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 send a written request for a copy of the record. Another person may not see a student's educational records unless written permission is 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 such parts relating to that student.

Students may have official copies of their UT Arlington transcripts mailed to other institutions or they may obtain a copy for their own use. A student must sign a request form in the Registrar's Office or send a signed, written request to release the transcript. Requests will not be accepted by telephone or from persons other than the student unless the student has given written permission.

The "Family 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, weights and heights of members of athletic teams, dates of attendance, degrees and awards received and the last educational institution attended. Each semester UT Arlington publishes a Student Directory that is available to students and the public. It contains the following information: the student's name, classification, 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 violate 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, applicants must submit their Social Security number. It 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.

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	*Accounting*	M.P.A.
	Administration	PH.D.
Administration	*Business Administration*	PH.D.
	Social Work	PH.D.
	Urban Affairs	PH.D.
Aerospace Engineering	*Aerospace Engineering*	M.S.
	Engineering: Undifferentiated	PH.D.
Architecture and Environmental Design	*Architecture*	M.ARCH.
	City & Regional Planning	M.C.R.P.
	Environmental Design	M.A.
Biology	*Biology*	M.A.
Biomedical Engineering	*Biomedical Engineering*	M.S., PH.D., M.D./PH.D.
	Clinical Engineering	
	CERTIFICATE OF INTERNSHIP	
	CERTIFICATE OF RESIDENCY	
Business Administration	*Business Administration*	M.B.A.
	Administration	PH.D.
Chemistry	*Chemistry*	M.A.
Civil Engineering	*Civil Engineering*	M.S.
	Engineering: Undifferentiated	PH.D.
Computer Science	*Computer Science*	M.S.
	Engineering: Undifferentiated	PH.D.
Criminal Justice	*Criminal Justice*	M.A.
Economics	*Economics*	M.A.
Education		
Electrical Engineering	*Electrical Engineering*	M.S.
	Engineering: Undifferentiated	PH.D.
Engineering	*Engineering Interdisciplinary*	PH.D.
Engineering Mechanics	*Engineering Mechanics*	M.S.
	Engineering: Undifferentiated	PH.D.
English	*English*	M.A.
	Humanities	M.A., PH.D.
	Teaching	M.A.T.

Foreign Languages and Linguistics	Foreign Language	M.A.
	Linguistics	M.A.
	Humanities	M.A., PH.D.
	Teaching	M.A.T.
Geology	Geology	M.S.
History	History	M.A.
	Archival Administration	CERTIFICATE OF ARCHIVAL ADMINISTRATION
Humanities	Humanities	M.A., PH.D.
	Teaching	M.A.T.
Industrial Engineering	Industrial Engineering	M.S.
	Engineering: Undifferentiated	PH.D.
Interdisciplinary Studies	Interdisciplinary Studies	M.A., M.S.
Materials Science	Materials Science	M.S.
	Engineering: Undifferentiated	PH.D.
Mathematics	Mathematics	M.A.
	Mathematical Sciences	PH.D.
Mathematical Sciences	Mathematics, Applied Mathematics	PH.D.
Mechanical Engineering	Mechanical Engineering	M.S.
	Engineering: Undifferentiated	PH.D.
Physics	Physics	M.A.
	Radiological Physics	M.S.
Political Science	Political Science	M.A.
Psychology	General Experimental Psychology	M.A., PH.D.
Radiological Physics	Radiological Physics	M.S.
Social Work	Social Work	M.S.S.W.
	Administration	PH.D.
Sociology	Sociology	M.A.
Urban and Regional Affairs	Urban Affairs	M.A.
	Administration	PH.D.

REQUIREMENTS FOR THE MASTER'S DEGREE

The following minimum requirements apply to all master's degrees including the M.A., M.S., M. Arch., M.A.T., M.B.A., M.C.R.P., M.P.A., and M.S.S.W. offered by the University of Texas at 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.

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 or written examination or both to an applicant in order to assess his undergraduate preparation for graduate work in his chosen area. The committee may require the student to eliminate deficiences in undergraduate preparation before 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.

DEGREE PLANS AND HOURS REQUIRED

Three degree plans (thesis, thesis substitute, and non-thesis) leading to the master's degree are available. All departments except Business 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 6 hours in thesis courses. 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 his 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. 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 3 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 or (2) reports prepared in certain graduate seminar, conference or research courses. The internship substitute requires a minimum of 6 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 only in the following departments or programs:

Accounting	Foreign Languages and Linguistics
Architecture	History
Biology	Humanities
Biomedical Engineering	Industrial Engineering
Business Administration	Interdisciplinary Studies
Chemistry	Materials Science
Civil Engineering	Mathematics
Computer Science	Mechanical Engineering
Criminal Justice	Social Work
Electrical Engineering	Urban Affairs
Engineering Mechanics	

DEGREE PLAN APPROVAL

A degree plan 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 is applying 9 or more semester hours of transfer credit to his degree program, the degree plan must be filed during the student's first semester whether or not he 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 an application for candidacy with the Dean of the Graduate School approximately 60 days prior to the end of the semester in which he plans to receive his degree (see Graduate School calendar for date).

FINAL MASTER'S EXAMINATION

A final program examination is required for all master's degree candidates. For *thesis degree plan* candidates the examination will be an oral defense of the thesis. The examination will be conducted by 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 last 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 written and oral. The scope, content, and form of the examination(s) shall be determined by the student's supervising committee.

At least two weeks prior to the time the thesis defense or

comprehensive examination (oral, written or both) is to be given the candidate should submit a request to the Office of the Graduate Dean for designation of an official examination place, time, and date.

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

MASTER'S THESIS AND INTERNSHIP REPORT

The final copies of the master's thesis or internship report must be prepared according to the regulations described in *An Illustrated Guide to the Preparation of Theses and Dissertations* available from the Graduate School Office. Consult the catalog section on Tuition and Fees for thesis and internship report binding fees.

TIME LIMITS

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 (M.A.)

The University of Texas at Arlington offers the M.A. degree in the following areas:

Biology	Interdisciplinary Studies
Chemistry	Linguistics
Economics	Mathematics
English	Physics
Environmental Design	Political Science
Foreign Languages	Psychology
History	Sociology
Humanities	Urban Affairs

MASTER OF SCIENCE (M.S.)

The University of Texas at Arlington offers the M.S. degree in the following areas:

Aerospace Engineering	Geology
Biomedical Engineering	Industrial Engineering
Civil Engineering	Interdisciplinary Studies
Computer Science	Materials Science
Electrical Engineering	Mechanical Engineering
Engineering Mechanics	Radiological Physics

SPECIALIZED AND PROFESSIONAL MASTER'S DEGREES

The University of Texas at Arlington offers the following specialized and professional masters degrees:

Master of Architecture
Master of Arts in Teaching (see Humanities program)
Master of Business Administration
Master of City and Regional Planning (see Architecture)
Master of Professional Accounting
Master of Science in Social Work

Requirements for each of these degrees are listed under the appropriate department or program.

CERTIFICATES

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

Archival Administration (History)
Internship in Clinical Engineering (Biomedical Engineering)
Residency in Clinical Engineering (Biomedical Engineering)

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

REQUIREMENTS FOR THE DOCTOR OF PHILOSOPHY DEGREE

The Doctor of Philosophy (Ph.D.) 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 Doctor of Philosophy listed below set the minimum standards required by the Graduate School. The meeting of all of these requirements does not result in the automatic awarding of the doctoral degree. Most departments and programs have additional requirements and high level of scholarly achievement that must be met by successful Ph.D. candidates. In all Ph.D. 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.

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 Doctor of Philosophy 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 Ph.D. 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 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 Ph.D. degree programs in Engineering and Humanities but a substitute is permitted in the Ph.D. program in Psychology. There is no foreign language requirement for the Ph.D. in Administration except when knowledge of a foreign language is appropriate for the dissertation research.

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 two semesters of a foreign language course. 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 that he has 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 his 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 to retake the examination after a specified period, or (4) failure and termination in the program.

The Diagnostic Evaluation report must be filed in the Gradu-

ate 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 course work beyond appropriate master's level course work or the equivalent.

DOCTORAL COMMITTEES

After passing the diagnostic evaluation the Dean of the Graduate School will assign the student an advisory 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 Ph.D. in Administration committee will include one or more representatives from each of the five academic fields included in the student's program. The committee is responsible for design and direction of the student's program. After the student has successfully completed the comprehensive examination (see next paragraph) the doctoral 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 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 his 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 compehensive examination may be written or oral or both written and oral. Its scope, content, and form shall be determined by the student's advisory 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 the names 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.

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. **47**

ADMISSION TO CANDIDACY

Upon passing the comprehensive examination the student becomes eligible for admission to candidacy. The application for candidacy 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.

DISSERTATION

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 *An Illustrated Guide to the Preparation of Theses and Dissertations* available from the Graduate School Office.

DISSERTATION DEFENSE

An application for the dissertation defense must be filed in the Graduate School by the student no later than 5 weeks before the final date for submission of approved dissertations and dissertation defense reports. The dissertation examining committee must have copies of the dissertation at least two weeks prior to the dissertation defense.

The dissertation defense will be oral and open to all members (faculty, students, and invited guests) of the University community. The questioning of the candidate will be generally directed by the student's dissertation advisory 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 report must be filed along with three unbound copies of the final approved dissertation in the Graduate School no later than three weeks before the date on which the degree is to be conferred. When the final 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.

Academic Programs
and
Courses of Instruction

DEPARTMENTAL PROGRAMS
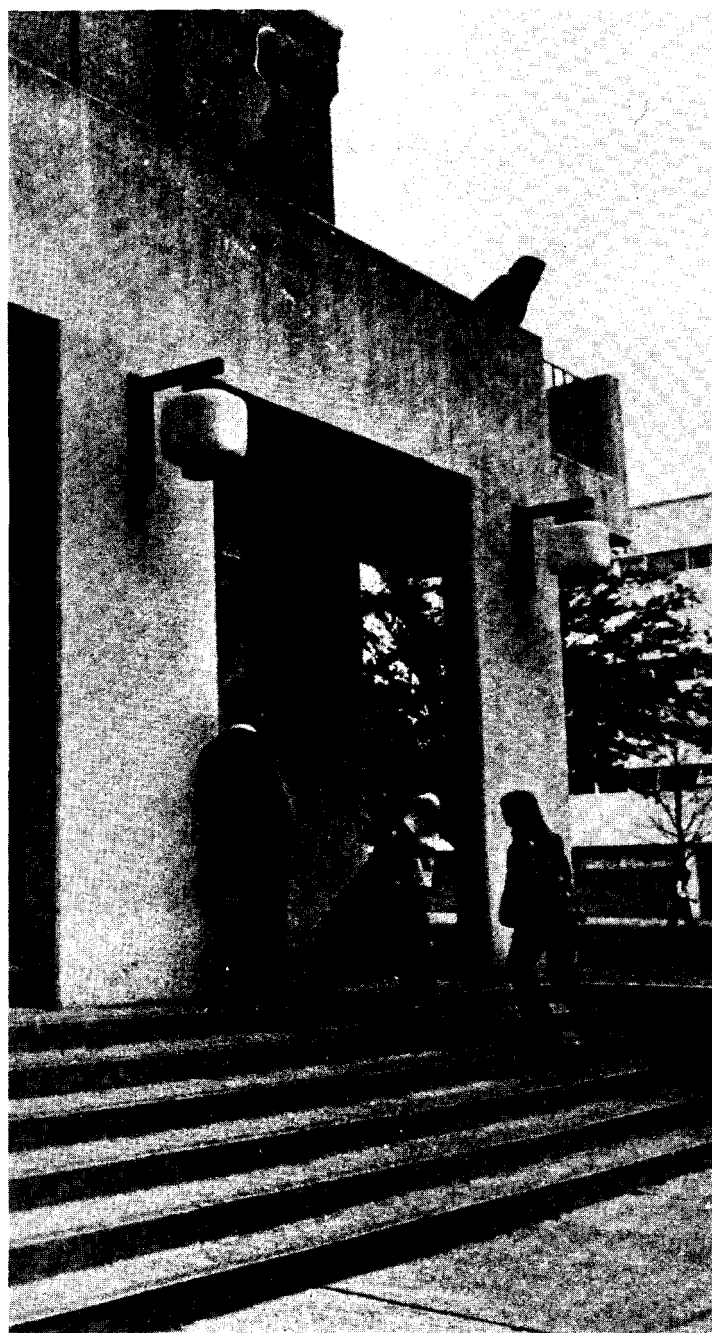
Department of ACCOUNTING (ACCT)

Areas of Study   *Degrees*

Accounting   **M.P.A.**

Administration (See Interdepartmental and
    Intercampus Programs, p. 194)   **PH.D.**

Masters Degree Plans: Thesis and Thesis Substitute

Chairman: Wilbur R. Ross   311 Business   273-3481

Graduate Advisor: H. Jim Snavely
                          312 Business   273-3481

Graduate Faculty:

    Professors Courtney, Imke, Ross, Snavely
    Associate Professors Foran, Vargo
    Assistant Professors Abbott, McGillivray, Raiborn,
      Tsay

OBJECTIVE

The objective of the Master of Professional Accounting Degree program is to prepare students for careers as professional accounts, in public, private, or government accounting. As a part of this larger objective the program is designed to provide the educational background to become Certified Public Accountants or to attain appropriate professional certification. In addition, the program is designed to provide the student with a sound understanding in selected fields such as finance, management, behavioral sciences, management sciences and economics. Thus, the program seeks to provide the student with a broad perspective, which is a requisite to success both as a profesional accountant and as a top-level financial or business executive.

DEGREE REQUIREMENTS

Admission to the Master of Professional Accounting Degree program is based upon the general admission requirements of the Graduate School. However, a satisfactory score on either the Graduate Management Admission Test or the Graduate Record Examination may be used to qualify an applicant for admission to the program.

The program, which can be completed by part-time students who attend classes during the evening hours, is designed to accommodate students with divergent educational backgrounds and career interests.

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 **51**

Accounting Program (thirty semester hours as shown below); in addition, they must complete the requirements of the Category I MPA program which includes 30 semester hours of work if the student chooses to write a thesis. If the student chooses not to write a thesis, 33 semester hours (including a thesis substitute) are required.

FOUNDATION PROGRAM

Semester I

Accounting Analysis I
  (ACCT 5301)
Economic Analysis I
  (ECON 5309)
Statistics (BUSA 5301)
Decision Models and Informa-
  tion Systems (MASI 5311)
Behavioral Science in Manage-
  ment (MANA 5311)

Semester II

Accounting Analysis II
  (ACCT 5302)
Economic Analysis II
  (ECON 5311)
Marketing (MARK 5311)
Finance (FINA 5311)
Management (MANA 5312)

CATEGORY I MPA PROGRAM

Financial Accounting I — ACCT 5311
Financial Accounting II — ACCT 5312
Accounting for Management Planning and Control —
  ACCT 5322
Federal Income Tax — ACCT 3315
Auditing — ACCT 4318
Law I — BUSA 3311
A graduate level accounting elective
A graduate level non-accounting elective

In addition to the courses listed above (or their equivalent) the student will either prepare a thesis or take Contemporary Issues in Accounting Theory (ACCT 5327) and prepare a thesis substitute.

Background Category II: Students who have an undergraduate degree in business administration with their major area of study being some field other than accounting are included in this category. These students typically need not take any of the Foundation Program courses. They will, however, fulfill the requirements of the Category I MPA program as listed above. Equivalent courses taken in a student's previous degree program cannot be repeated for credit. A minimum of 30 semester hours of work is required if the student chooses to write a thesis. Otherwise 33 semester hours (including a thesis substitute) are required.

Background Category III: This category includes students who have an undergraduate degree in accounting or a degree in business administration with a major in accounting. The student, with the assistance and consent of the Graduate Advisor, will develop a course of study designed to meet his educational needs in light of previous academic work and career objectives.

A minimum of 12 semester hours of accounting is to be selected from the courses offered, except that the accounting internship may not be included in this minimum. Of the semester hours required, six semester hours may be represented by undergraduate courses. Undergraduate courses submitted for graduate credit

must be approved by the student's Graduate Advisor. At least six semester hours of graduate courses in business administration and/or economics are required including an appropriate graduate course in statistics or management science. Also required is three semester hours of study of administrative processes emphasizing the integrating analysis and policy determination at the overall management level. This requirement is waived if the student has had a similar course at the undergraduate level. A minimum of 30 semester hours of work is required if the student chooses to write a thesis. If the student chooses not to write a thesis, 33 semester hours (including a thesis substitute) are required.

During the final semester, students who have written a thesis must defend their thesis in an oral examination; students who have not written a thesis must take a comprehensive examination over the subject matter contained in their programs of work.

The above requirements are in addition to the general regulations and requirements given in the introductory sections of this catalog.

5301. ACCOUNTING ANALYSIS I (3-0) 3 hours credit—An introductory study of the concepts, purposes, problems, methodology, and terminology of financial accounting.

5302. ACCOUNTING ANALYSIS II (3-0) 3 hours credit—An introductory study of the concepts, purposes, problems, methodology, and terminology of managerial accounting.

5310. INTRODUCTION TO BUSINESS TAXATION (3-0) 3 hours credit—An introduction to the Internal Revenue Code, Treasury Regulations and other tax literature applicable to business entities. Topics covered include tax planning for the sole proprietorship, partnership and corporation. This course cannot be taken for credit by persons who previously have taken a course in Federal Income Taxation. Prerequisite: Accounting 5301 or equivalent and graduate standing.

5311. FINANCIAL ACCOUNTING I (3-0) 3 hours credit—An examination of the financial accounting process, of the problems encountered in the preparation of the financial statements, and of the concepts and principles used in the resolution of these problems. Prerequisite: Accounting 5301 or equivalent.

5312. FINANCIAL ACCOUNTING II (3-0) 3 hours credit—Involves study of additional problems encountered in the preparation of financial statements. Topics included are: price level and fair-value accounting, analysis of financial statements from incomplete records, partnerships, and consolidations. Prerequisite: Accounting 5311 or equivalent.

5313. ACCOUNTING THEORY (3-0) 3 hours credit—A basic theory course examining the history and development of accounting theory, the forces which have influenced this development, different concepts of income, and significant problem areas in asset and liability measurement.

5315. TAX PLANNING AND RESEARCH (3-0) 3 hours credit—An intensive study of the more complex provisions of the internal revenue code pertaining to individuals, partnerships, corporations, and estates and trusts. Tax planning for the business enterprise is emphasized throughout the course, as is student research into tax problem areas. Prerequisite: accounting 3315 (Federal Income Tax).

5318. STUDIES IN AUDITING (3-0) 3 hours credit—A critical analysis of generally accepted auditing standards; the nature

of auditing and its application in opinion audits, internal audits, management audits, and S.E.C. reporting; and special problems such as legal liability, professional conduct, communications and human relations, sampling and auditing E.D.P. Prerequisite: accounting 4318 (Auditing).

5320. GOVERNMENTAL AND INSTITUTIONAL ACCOUNT-ING (3-0) 3 hours credit—Budgeting, accounting, and financial reporting principles for government and other non-profit entities. Designed for graduate students in urban studies and social work as well as graduate business majors. Prerequisite: Accounting 5301 or equivalent.

5321. CASES IN FINANCIAL ACCOUNTING (3-0) 3 hours credit—This course is designed to improve the student's ability to deal with complex problem areas in financial accounting and to sharpen his understanding and application of accounting concepts and principles. A variety of significant and complex accounting cases and problems are considered and analyzed in detail during this intensive study of financial accounting topics. Prerequisite: accounting 4311 (Advanced Accounting).

5322. ACCOUNTING FOR MANAGEMENT PLANNING AND CONTROL (3-0) 3 hours credit—A study of 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. Extensive use is made of computer facilities. (Students who have credit for accounting 3314 or equivalent can not enroll in accounting 5322.) Prerequisite: accounting 5302 or equivalent.

5323. CORPORATE MODELING (3-0) 3 hours credit—An aggregative approach to modeling corporate activities with emphasis on financial modeling. Problem definition, design choices, and validation problems are considered. Computer models will be developed during the semester. Prerequisite: accounting 3314 or accounting 5322, and consent of instructor.

5324. ADVANCED STUDIES IN PLANNING AND CONTROL (3-0) 3 hours credit—Representative topics include inter-industry studies of planning and control, PERT/Cost systems, corporate financial models and planning and control. The emphasis of the course and topics will vary. Prerequisite: accounting 3314 (Accounting in Managerial Planning and Control) or 5322.

5327. CONTEMPORARY ISSUES IN ACCOUNTING THE-ORY (3-0) 3 hours credit—This course is designed to familiarize the student with the significant problems currently facing the accounting profession, to examine in depth the various solutions proposed by accounting scholars and others, and to strengthen and mature the student's understanding of today's critical issues in accounting theory. Prerequisite: accounting 3312 (Intermediate Accounting).

5329. INFORMATION SYSTEM ANALYSIS (3-0) 3 hours credit — Studies in the structure, functions, and objectives of accounting and related information systems. Both theoretical and implementive aspects of systems are explored. Special consideration is given to the impact of system structure on individual and group motivation. Prerequisite: six hours of accounting.

5330. INTERNATIONAL ACCOUNTING AND FINANCIAL REPORTING (3-0) 3 hours credit — Primary emphasis in this course is on comparative and analytical study and research in the problems of obtaining, interpreting, and using financial information in international business. Consideration will also be given to reporting and controlling foreign operations, international auditing standards and practices, the role of accounting in economic development and other dimensions of international

accounting as time permits. Prerequisite: accounting 5302 or nine hours of undergraduate accounting.

5150, 5250, 5350. ACCOUNTING INTERNSHIP Variable credit of one, two or three hours—Part or full-time work of an accounting nature. A paper is required. May be repeated to earn a maximum of three hours credit. Prerequisite: consent of departmental coordinator.

5391, 5691. RESEARCH COLLOQUIUM 3 or 6 hours credit—Provides the vehicle for presentation of research by the candidate and an arena for his or her examination by faculty and other candidates. The research colloquium may with appropriate permission be used as a partial substitute for the traditional type of thesis work.

5192, 5292, 5392. SELECTED TOPICS IN ACCOUNTING 1, 2, or 3 hours credit—In depth study of selected topics in accounting. This course may be repeated when topics vary. Prerequisite: consent of instructor.

5398, 5698, 5998. THESIS Variable credit of three, six, or nine hours. Prerequisite: permission of Graduate Advisor.

ADMINISTRATION PROGRAM

See Interdepartmental and Intercampus Programs, p. 194

Department of
AEROSPACE ENGINEERING (AE)

Areas of Study	*Degrees*
Aerospace Engineering	M.S.
Engineering: Undifferentiated (See Interdepartmental and Intercampus Programs, p. 201)	PH.D.

Master's Degree Plan: Thesis only

Chairman: Donald D. Seath
306C Engineering 273-2603

Graduate Advisor: Fred R. Payne
301B Engineering 273-2604

Graduate Faculty:
Professors Dalley, Fairchild, Gaines, Payne, and Seath
Associate Professor Stanovsky
Assistant Professor Wilson

OBJECTIVE

The overall objective of the aerospace graduate program 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 him 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 flight mechanics
   b. Stability and control
   c. Theoretical or applied aerodynamics
   d. Turbulence
   e. Aerospace propulsion
   f. Aeroacoustics
   g. Viscous fluid mechanics
   h. Hydro- and aero-physics of fluid pollution
   i. Structural mechanics
   j. Vibrations and dynamics
   k. Gas dynamics and MHD power generation
   l. V/STOL aerodynamics and dynamics

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.

DEGREE REQUIREMENTS

Students wishing to pursue the Master's Degree in Aerospace Engineering should have the Bachelor of Science degree in Aerospace Engineering (or equivalent) from an accredited school. Doctoral candidates must also demonstrate the equivalent of the Master's degree level of competency prior to formal admission to doctoral level studies. Students with degrees in other disciplines may be required to take undergraduate courses which are deemed by the graduate faculty to be appropriate prerequisites for a proposed program of graduate study. All students will be expected to have some proficiency 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 (Aerospace Engineering 5101) a minimum of three times (see course description). The final enrollment shall require an oral presentation of thesis/dissertation results. All candidates are encouraged to ob-

tain an approved program of work early (in the second full *Aerospace*
semester or after 12 hours are completed.) *Engineering*

5101. GRADUATE SEMINAR (1-0) 1 hour credit—May be
repeated as often as required. Enrollment is mandatory for first
semester graduate students and for students enrolled in aero-
space engineering thesis (5398, 5698, 5998) or dissertation (6399,
6699, 6999) courses. Purpose is to acquaint peers and faculty
with research in progress at UT Arlington. During the total
enrollments in this course, the student is expected to present
two seminars: Ideally, the first to be when his problem area has
been well-defined and the second as a "dry-run" for his oral
defense. This course may be graded on a pass-fail (P-F) basis.

5301. ADVANCED AERODYNAMICS (3-0) 3 hours credit—
This course may be repeated for credit as topics change. Topics
include the following: hypersonic aerodynamics, transonic aero-
dynamics, unsteady aerodynamics and optimum aerodynamic
shapes.

5302. ADVANCED FLIGHT MECHANICS (3-0) 3 hours credit
—Topics covered are basic dynamics of vehicles, the role of en-
vironment in the control of space and aerospace vehicles, flight
trajectory analysis and optimization. This course may be re-
peated for credit as topics change. Prerequisite: permission of
department.

5303. AERODYNAMICS OF WINGS AND BODIES (3-0) 3
hours credit—This course is the application of classical potential
theory to the analysis of the aerodynamics of wings and bodies.
A knowledge of complex variable theory is assumed.

5304. V/STOL AERODYNAMICS (3-0) 3 hours credit—Basic
aerodynamics and dynamics are used to develop the important
characteristics of rotary wing aircraft. Simple momentum, blade
element, combined momentum-blade element, vortex theories are
utilized to study the aerodynamics of the rotor in hovering and
forward flight.

5305. BOUNDARY LAYER THEORY I (3-0) 3 hours credit—
This course contains fundamental laws of motion for a viscous
fluid and laminar boundary layer theory from an advanced
viewpoint. Some aspects of incompressible turbulent boundary
layers are introduced. Prerequisite: a course in fluid mechanics.

5306. BOUNDARY LAYER THEORY II (3-0) 3 hours credit
—This course contains a study of transition phenomena and tur-
bulent boundary layers from an advanced viewpoint. The influ-
ence of compressibility on boundary layer characteristics is pre-
sented. Prerequisite: aerospace engineering 5305 or approval of
instructor.

5307. APPLIED AERODYNAMICS FOR DESIGN (3-0) 3
hours credit—This course introduces non-aerospace engineering
majors to sufficient fundamentals of aerodynamics theory to crit-
ically evaluate the effect of design features on aerodynamic
performance, stability and control.

5308. ADVANCED V/STOL AERODYNAMICS (3-0) 3 hours
credit—This course assumes an introductory knowledge of rotary
wing aerodynamics. The emphasis is on the more sophisticated
aspects of V/STOL aerodynamics. Included are the effects of
rotor system dynamics and kinematics, more exact representa-
tion of induced velocity fields, and wing-rotor interferences.

5309.—ADVANCED GASDYNAMICS (3-0) 3 hours credit—Re-
view of fundamental theory of compressible flow. Introduction to
the generalized one-dimensional compressible flow theory, line-

arized two- and three- dimensional flow theory, method of characteristics, and real gas effects. Application of methods to the analysis of internal and external flow fields. Prerequisite: introductory knowledge of compressible flow theory.

5310. AEROSPACE PROPULSION SYSTEMS (3-0) 3 hours credit—Study of aerospace propulsion systems, cycle analysis, including real gas effects, development of advanced methods for design and performance analysis of major system components, study of component interactions and propulsion-airframe integration problems, optimum design of engine cycle for given mission constraints. Prerequisite: graduate standing or approval of instructor.

5311. ADVANCED ASTRONAUTICS (3-0) 3 hours credit — This course is a continuation of aerospace engineering 4302 (Astronautics). It considers the more sophisticated aspects of orbital mechanics. gyrodynamics, inertial navigation, and centers on the space vehicle as a spinning, variable mass body stabilized by passive means.

5312. ADVANCED DYNAMICS OF FLIGHT (3-0) 3 hours credit—This course may be repeated for credit as topics change. Topics to be considered are matrix-tensor analysis of flight vehicle motion, prediction of piloted vehicle flying qualities, and V/STOL stability and control analysis. This course assumes a comprehensive modern undergraduate course in stability and control.

5316. ADVANCED APPLIED AIRFOIL THEORY (3-0) 3 hours credit—This course is concerned with the application of potential flow theory and boundary layer theory to the problem of optimum design of airfoils, wings, bodies and combinations thereof.

5317. VISCOUS FLUID MECHANICS (3-0) 3 hours credit— Treated are classic "real world" flows, i.e., very slow flow (lubrication and bio-capillary), boundary-layers (airfoils, river beds), wakes (of airfoils, ships, buldings), jets (propulsive and entraining), acoustic-fluid interactions (noise pollution) and non-Newtonian flow regimes. Prerequisite: A course in fluid mechanics.

5318. INTRODUCTION TO TURBULENCE (3-0) 3 hours credit—The phenomenological approach is taken to develop the classical methods for understanding turbulent flows; for example, jet, wake. and boundary layer flows. A survey is made of modern approaches to predictive and correlative techniques. Emphasis is upon development of the student's intuition for treating natural turbulent flows. Prerequisite: approval of the instructor.

5319. HOMOGENEOUS TURBULENCE (3-0) 3 hours credit —The mathematics and intuitive foundations of turbulence are emphasized. Probability theory is used to describe homogeneous turbulent flow characteristics such as velocity co-variances and the kinetic energy spectrum. Prerequisite: approval of the instructor.

5320. NON-HOMOGENEOUS TURBULENCE (3-0) 3 hours credit—Homogeneity assumption is omitted so that theoretical results may be applied to flows of interest to the practicing engineer. The "Law of the Wall." "Eddy Viscosity," and "Mixing Length" concepts are applied to "real" turbulent flows, e.g.— over flat and curved surfaces including roughness and pressure gradients, pipe and channel flow. the lower atmosphere, and the upper ocean. Prerequisite: approval of instructor.

5321. LARGE-SCALE STRUCTURE OF TURBULENT
SHEAR FLOWS (3-0) 3 hours credit—A relaxation of usual as-

sumptions is required to study realistically the non-linearities ("Large Eddy" and "Spectral Transfer") of "real" turbulence and their implications for design of submerged vehicles. Non-Newtonian flows, fluid pollution and plasma turbulence are discussed. "Second" and "third" order approaches have been successful in predicting, from first principles, quantitatively the values and variation of the "eddy viscosity" function.

5330. FLOW STABILITY AND TRANSITION TO TURBU-LENCE (3-0) 3 hours credit—Laminar flow stability is 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 are developed for singular perturbation problems. Prerequisite: approval of instructor.

5340. EXPERIMENTAL METHODS IN TURBULENCE I (2-3) 3 hours credit (May be repeated for credit)—Techniques presented include hot-wire and hot-film anemometers, laser-Doppler and laser-interferometer, hot-thermister, "high response" pressure sensors, fluid "tracers" and other techniques. Student will participate actively in the selection, design, and execution of flow experiments. Typical data are mean and fluctuating velocities, temperatures, pressures, and correlations. Data processing include analog and digital Fourier Transform of correlations to produce the "energy density spectrum" or PSD ("Power Spectral Density"). Prerequisite: approval of instructor.

5191, 5291, 5391. ADVANCED STUDIES IN AEROSPACE ENGINEERING (Variable credit from 1 to 3 semester hours as arranged). May be repeated for credit. This course may be graded on a pass-fail (P-F) basis.

5398, 5698, 5998. THESIS Variable credit of three, six, or nine hours. Prerequisite: graduate standing in areospace engineering. Co-requisite: aerospace engineering 5101.

6197-6997. RESEARCH IN AEROSPACE ENGINEERING (Variable credit from 1-9 hours)—This course may be repeated for credit.

6399, 6699, 6999. DISSERTATION Variable credit of three, six, or nine hours. Prerequisite: admission to candidacy for the Doctor of Philosophy degree. Co-requisite: aerospace engineering 5101.

School of
ARCHITECTURE AND
ENVIRONMENTAL DESIGN

Areas of Study	*Degrees*
Architecture (ARCH)	M. ARCH.
City & Regional Planning (CIRP)	M.C.R.P.
Environmental Design (ENVD)	M.A.

Master's Degree Plans: Thesis and Thesis Substitute

Dean: Harold Box   335 Fine Arts   273-2801

Graduate Advisor: George Wright
                                335 Fine Arts   273-2801

Director of City and Regional Planning:
      Joel Goldsteen   330 Fine Arts   273-2801

Graduate Faculty:

Professors Box, Buckley, Myrick, G. Wright
Associate Professors Antoniades, Brooks, Goldsteen,
      Moreland, Spears, L. Wright
Assistant Professors Allgeier, Hamilton, Henry,
      Norris
Adjunct Assistant Professor Woodward

ARCHITECTURE (ARCH)

OBJECTIVE

The objective of the architecture program is to create an educational experience which will allow each individual to accept an active role in society with the responsibility of making sound judgments in shaping the physical environment. The Master of Architecture degree is designed as both a graduate and a professional degree affording opportunities for advanced studies, specialization and research in architecture, and for studies in related environmental design disciplines.

Graduates of four-year architectural programs enter a two-year course of study leading to the first professional degree in Architecture. Graduates of four-year programs in disciplines other than architecture enter a three-year course of study leading to the first professional degree in Architecture. Graduates of five-year Bachelor of Architecture programs enter a one-year

course of study designated to meet the interest and development-   *Architecture*
al needs of the individual student.

The School of Architecture and Environmental Design is a member of the Association of Collegiate Schools of Architecture. The professional Master of Architecture degree is accredited by the National Architectural Accrediting Board.

MASTER OF ARCHITECTURE (M. ARCH)

A bachelor's degree from an accredited college or university is required for admission. The applicant must meet the general requirements of the Graduate School and submit a portfolio of work for evaluation by the department. A personal interview is recommended and letters of reference are required.

PROGRAM I: For applicants who hold a Bachelor of Science in Architecture degree from an accredited college or university.

A minimum of 48 approved semester hours, plus 12 hours approved practicum or an option of 12 approved elective semester hours for a total of 60 credit hours is required. Program requirements include a six-hour thesis or approved substitute to include three additional credit hours. The student taking thesis substitute will have 63 credit hour total requirement.

The core curriculum of 39 semester hours required for this program of study is Architecture 5307 (or 5308 or 5309), 5311, 5312 5317, 5320, 5324, 5641, 5642, and 5397 with a thesis 5698 or its equivalent.

Architecture 5307 or 5308, Architecture 5317, and Architecture 5641 must be completed by the end of the first two semesters attended by the graduate student unless otherwise permitted by the Graduate Advisor.

The remaining 21 semester hours must be taken in an area of concentration designed by the student and approved and directed by the Graduate Advisor. Students taking the 12-hour practicum, (Architecture 5681 and Architecture 5682), will be given credit for these courses on two bases: (1) Part credit earned for part-time practical experience and/or research in an approved architect's office with an approved program during the period of enrollment; and (2) full credit during one semester up to 12 credit hours for full-time employment and/or research in an approved architect's office. All other students will earn the remaining required hours in their area of concentration from courses approved by the Graduate Advisor.

All students must demonstrate proficiency in working drawings by either: (1) presenting evi-

dence of similar experience gained in an architect's office or (2) passing ARCH 4345 and 4346 or a similar course as an undergraduate or graduate student.

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

Students in this program of study complete a Basic Course Series in architecture theory and practice. The basic architecture theory and practice requirements are: two semesters of architectural history; two semesters of architectural structures; two semesters of construction materials; three semesters of architectural design; and a demonstrated ability to communicate in the media available to the architect. Some of these courses may be waived by the faculty for students who demonstrate ability that warrants advanced standing. A special program of basic courses will be arranged to fit the needs of each student and will include at least the previously listed Basic Course Series. Completion of the Basic Course Series may be accomplished in one year with entry in the fall semester and continuance in the summer session following the first two semesters. Otherwise, the program will normally take 1½ years. The student's program following the successful completion of that series will conform to the requirements of Program I and will usually require an additional two years.

PROGRAM III: For applicants who hold a five-year professional degree in architecture (B.Arch.)

30 semester credits are required of students in Program III with thesis, while 33 hours will be required of students with a thesis substitute. (This latter program includes 12 hours of Design Studio.) 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 may provide for an area of specialization or for advanced general studies.

5301. URBAN DESIGN (3-0) 3 hours credit—A study of urban design theory, method, and implementation using contemporary and historic examples.

5302. CITY PLANNING (3-0) 3 hours credit—A study of city planning theories, methods, and practice.

5303. LANDSCAPE MATERIALS AND THEORY (3-0) 3 hours credit—A study of landscape material, landscape form, and environmental design objectives.

5304. INTERIOR DESIGN (3-0) 3 hours credit—An advanced study of interior material, application and detailing.

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5305. FURNITURE DESIGN (1-6) 3 hours credit—A study of advanced concepts and designs for furniture units and systems.

5307. MODERN ARCHITECTURE (3-0) 3 hours credit—A seminar examinng the principal movements, protagonists, and examples of modern architecture, beginning with the 19th Century background and terminating with the current state of architectural theory and practice. Prerequisites: Architecture 2307 and 2308.

5308. HISTORY OF AMERICAN ARCHITECTURE (3-0) 3 hours credit—An intensive seminar of selected topics in the history of American architecture.

5309. HISTORY OF URBAN FORMS (3-0) 3 hours credit—A seminar in the evolution of urban form as manifested in selected cities of European and non-Western civilizations, culminating with urbanization in America from the 17th to the 20th Century.

5311. ENVIRONMENTAL CONTROL SYSTEMS (3-0) 3 hours credit—The study of illumination, acoustics, climate controls, mechanical, and electrical systems, and their significance in the total design.

5312. ENVIRONMENTAL CONTROL SYSTEMS (3-0) 3 hours credit — A continuation of Architecture 5311. Prerequisite: Architecture 5311

5317. COMPARATIVE STRUCTURES (3-0) 3 hours credit—A comparative analysis and design of structural systems and construction techniques, including architectural and economic determinants.

5318. ADVANCED STRUCTURES (3-0) 3 hours credit—A study of advanced structural systems, innovations in structural design, and construction techniques. Prerequisite: Architecture 5317.

5320. PROFESSIONAL PRACTICE (3-0) 3 hours credit—A survey of the administrative functions, and the ethical and legal responsibilities of the architect.

5321. DEVELOPMENT PROCESSES (3-0) 3 hours credit—A comprehensive study of the principles and institutions involved in the process of building development from concept to occupancy.

5324. CONSTRUCTION DOCUMENTS (3-0) 3 hours credit—A seminar structured to study the documents necessary for the construction of buildings.

5325. CONSTRUCTION MANAGEMENT (3-0) 3 hours credit—A seminar in the area of project management for architects.

5341. ADVANCED COMMUNICATION SKILLS (1-6) 3 hours credit—An advanced investigation into the field of architectural communications to include new techniques and processes.

5397. THESIS PROGRAM DEVELOPMENT (3-0) 3 hours credit—Individual study and research by thesis candidates for preparation of a written statement of objective, program, and desired results of thesis work under direction of the candidate's thesis advisor.

5641. DESIGN STUDIO: ARCHITECTURAL PROJECTS (3-12) 6 hours credit—A studio in programming and design development of buildings and groups of buildings. This course is required as the first graduate design course in Programs I and II.

5642. DESIGN STUDIO: ADVANCED ARCHITECTURAL PROJECTS (3-12) 6 hours credit—An advanced studio in programming and design development of buildings and groups of buildings. May be repeated for credit.

5651. DESIGN STUDIO: CITY PLANNING (3-12) 6 hours credit—A studio in the planning of complex urban networks and uses using quantitative techniques, theories, and methods for analyzing and projecting the needs for urban life.

5652. DESIGN STUDIO: URBAN DESIGN (3-12) 6 hours credit—A studio in design of complex urban networks with problems in design of the physical environment generated by these systems

5653. DESIGN STUDIO: LANDSCAPE ARCHITECTURE (3-12) 6 hours credit—A studio in uses of landscape form and material with problems in the design of exterior environments emphasizing inter-relationships with architectural forms.

5654. DESIGN STUDIO: INTERIORS (3-12) 6 hours credit—Analysis, programming, and design of complex interior spaces.

5655. DESIGN STUDIO: BUILDING SYSTEMS (3-12) 6 hours credit—An investigation of techniques of construction, structural systems, environmental systems, and circulation systems as determinants of architectural form.

5656. DESIGN STUDIO: CONSTRUCTION PROJECT (3-12) 6 hours credit—The programming, design, and construction of an actual building project.

5657. DESIGN STUDIO: COMMUNITY SERVICE PROJECTS (3-12) 6 hours credit—The programming, design, and implementation of projects responding to needs of community groups where architectural services are unavailable.

5658. DESIGN STUDIO: DEVELOPMENT PROJECTS (3-12) 6 hours credit—A studio in the design of real estate development from concept to occupancy, based on social, economic, and architectural objective models.

5691. DESIGN STUDIO: SPECIAL PROJECTS (3-12) 6 hours credit—A design studio in special projects to be announced before the beginning of the semester.

5381, 5681. PRACTICUM (0-16) Credit as arranged—An internship program which will include approved work done in an architect's office, or research projects done in an architect's office, designed to give the student practical experience leading to a broader knowledge of the profession. Placement in offices will be as approved and arranged by the department (school). May be repeated for credit.

5382, 5682. PRACTICUM (0-16) Credit as arranged—A continuation of Architecture 5681. May be taken at the same time as Architecture 5681 and may receive partial credit, depending upon the approval of the Graduate Advisor. May be repeated for credit.

5398, 5698, 5998. THESIS Variable credit of three, six, or nine hours—To be taken in final semester to assure completion of prescribed professional courses. A design problem of research in architectural, structural, or related topics may be selected for the thesis.

5191, 5291, 5391. CONFERENCE COURSE (variable credit from 1 to 3 semester hours as arranged)—Special subjects and issues as arranged with individual students and faculty members. The course may be repeated for credit.

CITY AND REGIONAL PLANNING (CIRP)

OBJECTIVE

The degree program is structured to offer graduate students study in the scope, issues and interdisciplinary relationships in city and regional planning. The principal objective of the MCRP program within the School is to equip the student with the knowledge of problem-solving techniques, practical skills, an understanding of the dynamics of change and the capability to evaluate the implications of alternative solutions. Concomitant (in this objective) is the preparation and training of competent professionals, qualified for practice in the public and private sectors. Each student's interest and academic backgrounds will vary, therefore, guiding each student in developing a program that respects personal needs and goals has been a foremost consideration. To achieve this purpose, a core curriculum has been formulated which permits a variation in the general structure of each degree program.

Practical application of theory and research are important aspects of the educational process and are facilitated through the activities of the Planning Research and Design Center. This center, established by the School of Architecture and Environmental Design, is equipped to engage planning problems at various scales with staff recruited from the faculty and student body. The center's work and charter permits the student a work/study atmosphere in which professional responsibilities in group participation can be assimilated.

MASTER OF CITY AND REGIONAL PLANNING (M.C.R.P.) DEGREE REQUIREMENTS

A bachelor's degree from an accredited college or university is required for admission. The applicant must meet the general requirements of the Graduate School and may be asked to submit a portfolio of work for evaluation by the department. A personal interview is recommended and letters of professional reference are required.

Students will accomplish a program of 60 credit hours of study. The core curriculum consists of 48 hours of intensive study of problems in city and regional planning. This may include six hours of practical field experience in an agency, center, or office, as arranged and approved by the Graduate Advisor. An additional 12 hours of electives are to be selected from many interdisciplinary courses available.

Those students who do not have prior experience in planning or similar disciplines, such as architecture and engineering, will be required as directed by the Graduate Advisor, to take certain leveling courses to acquire a sufficient knowledge or skills to accomplish studio work. Such supplemental course work will be in addition to the 60 credit hours specified for the MCRP degree and will be required only after a thorough review of each individual's background and professional objectives.

The 48-hour curriculum includes: CIRP 5301, 5302, 5320, 5321, 5322, 5323, 5641, 5642, 5698, UA 5300, 5310, 5320, and 5330.

5301. PLANNING PRINCIPLES AND PRACTICE I (3-0) 3 hours credit—A study of city planning theories, methods, and practice.

5302. PLANNING PRINCIPLES AND PRACTICE II (3-0) 3 hours credit—A continuation of 5301.

5303. ACTIVITY LOCATION AND ANALYSIS (3-0) 3 hours credit—A study of principles, theories and methods in location of employment and retail centers.

5304. HOUSING (3-0) 3 hours credit—A study of the historical demands, patterns and alternatives for the future.

5305. URBAN REDEVELOPMENT (3-0) 3 hours credit—A study of the problems and achievements of the public and private sectors in urban redevelopment.

5306. OPEN SPACE (3-0) 3 hours credit—A study of the new towns, their historical formation, current status and future potential.

5307. CENTRAL BUSINESS DISTRICTS (3-0) 3 hours credit —A study and evaluation of the historical role of the CBD and the scope of problems to be addressed in future plans of the central city.

5308. NEW TOWNS AND COMMUNITIES (3-0) 3 hours credit—A study of the new towns, their historical formation, current status and future potential.

5309. LAND ECONOMICS (3-0) 3 hours credit—An overview of the costs and profit structures of land use and development related to planning.

5310. URBAN GROWTH POLICIES (3-0) 3 hours credit—A study of the political, societal, and physical policies involved in urban growth.

5320. PLANNING RESEARCH METHODS (3-0) 3 hours credit —The methodology of planning is set forth to enable a systematic approach to problem solving, within the objective of producing optimum societal and physical relationships.

5321. LEGAL ASPECTS OF PLANNING (3-0) 3 hours credit —A study of the legal status of planning, the legal requirements to implement planning, and the necessary legal review of planning statutes and policies and their integration into active programs.

5322. LAND RESOURCE MANAGEMENT (3-0) 3 hours credit —A review of the various philosophies, concepts and methods used in land use planning, their historical references, and future applicability in exponential growth.

5323. PROFESSIONAL PLANNING PRACTICE (3-0) 3 hours credit—A study of agency and private practice of planning including the legal, ethical, and professional responsibilities of the planner.

5324. THE PLANNER AS A CHANGE AGENT (3-0) 3 hours credit—The potential of planning as an instrument of dynamic growth and societal advancement.

5381. ADVANCED STUDIES IN PLANNING COMMUNICATION SKILLS (3-0) 3 hours credit—Techniques of presentation, use of graphic tools, and recent developments of media advances.

5191, 5291, 5391. SPECIAL TOPICS IN PLANNING 1, 2, 3 hours credit—Special subjects for study as arranged with the staff.

5641. DESIGN STUDIO: CITY AND REGIONAL PLANNING *Architecture*
(3-12) 6 hours credit—A studio intended to examine and formulate graphically, through accumulation of necessary data input, specific planning projects of a city and regional scope.
5642. DESIGN STUDIO: COMMUNITY, NEIGHBORHOOD, AND PROJECT PLANNING (3-12) 6 hours credit—Further study of planning projects at the studio level but involving smaller scale developments down to the neighborhood project level.
5643. DESIGN STUDIO: SPECIAL TOPICS IN CITY AND REGIONAL PLANNING (1-15) 6 hours credit—Special projects as announced prior to the start of the semester.
5681. PRACTICUM (6-0) 6 hours credit—Students will serve as staff assistants, aides, or apprentices in area agency or private planning offices for a period determined to be equal to six credit hours. Placement in such offices will be as approved and arranged and performance will be monitored by the Graduate Advisor or instructor in charge.
5398, 5698. THESIS Variable credit of three, six, or nine hours —To be taken in final semester to assure completion of prescribed professional courses. A problem of research in planning or related topics may be selected for the thesis.

See elsewhere in this catalog for courses offered in Urban Affairs of which UA 5300, 5310, 5320, and 6330 are courses for the M.C.R.P. degree. Electives offered by Urban Affairs, Civil Engineering, and Sociology are acceptable for credit as the offerings are available.

A specialized MA with concentration in Interior Design will be offered in 1977.

ENVIRONMENTAL DESIGN (ENVD)

OBJECTIVE

The degree program is intended to offer graduate students study in areas of interdisciplinary relationships to the environment. A student will be encouraged to enter into as wide an area of environmental studies as possible. This broad varied experience will better equip him or her to make value judgments and decisions in a wide spectrum of environmental concerns.

To achieve this purpose, students may study planning, architecture, design, interior design, and other such disciplines as available through the school and the University. The objective will always be to equate societal goals and the many problems facing the built environment.

DEGREE REQUIREMENTS

The applicant must meet the general requirements of the Graduate School. Three letters of professional recommendation are required and a personal interview is recommended.

For the degree with thesis, 30 credit hours of study (including thesis) are required. With a thesis substitute, 33 hours are required. Students without either of the above requirements will take 36 credit hours. **67**

Biology   Required courses include: ENVD 5301, 5303 and 5698 (or substitutes). Students without any previous experience in the environmental design disciplines may be required to take additional courses prior to entering the course of study in order to acquire skills in graphic communication and other related material as determined by the School.

Electives may be selected from the third and fourth year studies in architecture and in graduate studies in architecture as approved by the Graduate Advisor. Also, courses selected from the CIRP program, Urban Affairs, Civil Engineering, Sociology, Business Administration, etc., which assist the student in formulating a well balanced curriculum. See elsewhere in the catalog for descriptions of these courses.

5301. ENVIRONMENTAL DESIGN (3-0) 3 hours credit—A seminar surveying the inter-relationships of physical design and related aspects of civilization.

5303. ENVIRONMENTAL DESIGN DECISION MAKING (3-0) 3 hours credit—A study of the processes of decision making in shaping the built environment.

5391. SPECIAL TOPICS IN ENVIRONMENTAL DESIGN (3-0) 3 hours credit—As announced before the start of the semester to include particular items of interest in such areas as energy conservation, problems of land development, and their impact upon the environment.

5698. THESIS 6 hours credit—A special independent study done under the direction of a thesis committee in an area of interest to the student and with societal significance.

Department of
BIOLOGY (BIOL)

Area of Study   *Degree*

Biology   **M.A.**

Master's Degree Plans: Thesis and Non-Thesis

Chairman: William C. McDonald

301 Life Science   273-2871

Graduate Advisor: Louis H. Bragg

451 Life Science   273-2871

Graduate Faculty:

Professors Arnott, Hall, Hellier, Kennerly, McCrady, McDonald, Meacham, Pyburn

Associate Professors Boley, Bragg, Butler, Eller, Frye, Neill

Assistant Professors Clark, Hopkins, McMahon, Sharp, Tuttle, Whitmore

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The program leading to the degree of Master of Arts in biology is designed 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.

DEGREE REQUIREMENTS

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 Advanced Test in biology. Competency in a foreign language is also required and may be demonstrated by credit in an approved language at the sophomore level or by successful completion of an examination administered by the Foreign Language Department.

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.

The non-thesis plan is designed to meet the needs of those students in non-research oriented fields.

5101. SPECIAL TOPICS IN BIOLOGY (1-0) 1 hour credit— A seminar offering which deals with significant biological research. May be repeated for credit. Prerequisite: permission of staff. This course will be graded on a pass-fail (P-F) basis.

5210. EVOLUTION (2-0) 2 hours credit—A study of the origin of living systems and the mechanism of their evolution. Prerequisite: permission of instructor.

5211. HISTORY OF BIOLOGY (2-0) 2 hours credit—Trends of thought in the biological sciences with emphasis on notable contributors. Those philosophical systems dealing with biological concepts in western civilization are stressed. Prerequisite: permission of instructor.

5289. LABORATORY IN DEVELOPMENTAL GENETICS (0-6) 2 hours credit—Individual problems in developmental regulation to be done under faculty supervision. Prerequisite: biology 5303 or concurrent enrollment. $4 lab fee.

5302. MICROBIAL GENETICS (3-0) 3 hours credit—Consideration of the physical, chemical, and functional nature of the genetic processes in micro-organisms. Prerequisites: biology 2451 and 3347 or their equivalents.

5303. DEVELOPMENTAL GENETICS (3-0) 3 hours credit— Discussion of regulatory mechanisms associated with cyto-differentiation and morphogenesis. Prerequisites: biology 3446 and 3315, or consent of instructor.

5312. CELLULAR IMMUNOLOGY (3-0) 3 hours credit—Current concepts regarding the cells, metabolic processes and control mechanisms associated with the development and expression of cell-mediated immunity. Prerequisite: permission of the instructor.

5320. BIOGEOGRAPHY (3-0) 3 hours credit — The role of natural and artificial transport, population pressure and limiting **69**

agencies are examined in the light of the patterns of distribution of living organisms. Prerequisite: permission of instructor.

5338. ADVANCED VERTEBRATE PHYSIOLOGY (3-0) 3 hours credit—Specific physiological processes of vertebrate organ-systems will be studied in depth from a biochemical to organismal level of organization. Each topic will be considered in light of current literature. A background in basic physiological and biochemical principles is strongly recommended. Prerequisite: consent of instructor

5339. PHYSIOLOGICAL ECOLOGY (3-0) 3 hours credit—A survey of the physiological adaptations of animals to their environments. Emphasis will be placed on physiological variation and acclimation and on the evolution of physiological processes. Prerequisite: permission of the instructor.

5340. ANIMAL ECOLOGY (2-3) 3 hours credit—A study of the interrelationships of the environment and animal populations with emphasis on adaptive mechanisms, limiting factors and population phenomena. Prerequisite: permission of instructor. $2 lab fee.

5341. PLANT ECOLOGY (2-3) 3 hours credit—Development and structure of plant communities; interactions of environmental factors and of organisms within a community; literature in plant ecology. Prerequisite: permission of instructor. $2 lab fee.

5342. ICHTHYOLOGY (2-3) 3 hours credit — Classification, anatomy, physiology and natural history of fishes. Prerequisite: permission of instructor. $4 lab fee.

5343. HERPETOLOGY (2-3) 3 hours credit—Systematics, speciation and adaptive mechanisms of reptiles and amphibians. Prerequisite: permission of instructor. $4 lab fee.

5344. MAMMALOGY (2-3) 3 hours credit—Taxonomy, population dynamics, distribution and evolution of mammals. The laboratory includes preparation and identification of specimens and the practice of field techniques. Prerequisite: permission of instructor. $4 lab fee.

5345. ORNITHOLOGY (2-3) 3 hours credit—Anatomy, physiology, identification, population dynamics and ethology of birds. The laboratory includes field identification, preparation of specimens, and field study techniques. A weekend field trip is required. Prerequisite: permission of instructor.

5346. BIOLOGY OF THE MOLLUSCA (2-3) 3 hours credit— A survey of the classification, evolution, ecology, physiology and ethology within the phylum Mollusca. Emphasis will be placed on the adaptive radiation of the major subgroups and the evolution of structure-function relationships within the phylum. The laboratory will involve the study of living and preserved specimens and the study of molluscs in natural Texas environments. $4 lab fee.

5347. PHYCOLOGY (2-3) 3 hours credit—A study of marine, terrestrial, and fresh-water algae. Lecture topics will include group characteristics, evolution, and taxonomy. Field and laboratory work will emphasize classification, ecology, culturing, and collecting. Prerequisite: biology 3345 or its equivalent or permission of instructor. $2 lab fee.

5348. AQUATIC MICROBIOLOGY (2-3) 3 hours credit — A consideration of the microorganisms occurring in aquatic environments and their activities under polluted and unpolluted conditions. Prerequisite: permission of instructor. $2 lab fee.

5352. BIOLOGICAL ELECTRON MICROSCOPY (2-3) 3 hours credit — This course deals with the theory and practice of specimen preparation and electron microscopy of biological specimens. Prerequisite: permission of the instructor. **$4 lab fee.**

5354. MEDICAL MYCOLOGY (2-3) 3 hours credit—Study of the structure, reproductive cycles, and the phylogeny of representative fungi that are pathogenic in men and other animals. Methods and techniques used in studying these fungi and common contaminants will be covered. Superficial fungi will be investigated in the laboratory while the fungi causing superficial, subcutaneous, and systematic infections will be discussed in theory. Prerequisite: biology 4346 and permission of instructor. **$4 lab fee.**

5355. PROTOZOOLOGY (2-3) 3 hours credit—This course explores life forms, life styles, and life processes among unicellular animals, with attention given to the various structural and physiological adaptations characterizing selected members of this diverse group. The laboratory consists of collection, identification, and study of representative species and of individual laboratory projects. Prerequisites: 18 hours of laboratory biology, including 2451. **$4 lab fee.**

5359. ADVANCED GENETICS (2-3) 3 hours credit—In this course lectures and student seminars are used to present modern interpretations of linkage and crossing-over, chromosomal aberrations, gene mutations, extranuclear inheritance, and behavioral genetics of eukaryotes. Laboratory experimentation with Drosophila includes population studies, mutation induction, and characterization of unknown mutants. In addition, the computer as a tool in the solution of genetics problems is demonstrated. Prerequisite: permission of the instructor. **$4 lab fee.**

5365. INSECT PHYSIOLOGY (2-3) 3 hours credit—A presentation of the basic physiological processes of insects and the neural and endocrine control of these processes. The laboratory will consist of selected experiments to demonstrate fundamental aspects of physiology such as respiration, digestion and reproduction. **$4 lab fee.**

5291, 5391. INDIVIDUAL PROBLEMS IN BIOLOGY 2 or 3 hours credit—Individual research projects supervised by a staff member. Prerequisite: permission of staff.

5193-5693. RESEARCH IN BIOLOGY 1-6 hours credit—This is a conference course in which the student undertakes intensive investigation of topics under the supervision of a staff member. Prerequisite: permission of instructor.

5446. GENERAL PHYSIOLOGY (3-3) 4 hours credit—This is a study of functional mechanisms as they pertain to transport and transformation of energy in living systems. Characteristics of excitable tissues are studied including mechanisms of muscle contraction and impulse propagation. Prerequisite: permission of instructor. **$8 lab fee.**

5451. ACAROLOGY (3-3) 4 hours credit — The taxonomy of mites and their near relatives, with particular emphasis on identification and biology. The laboratory deals with collection and processing of specimens as well as preparation of a collection. Prerequisite: permission of instructor. **$4 lab fee.**

5455. MICROBIAL ECOLOGY (2-6) 4 hours credit—An advanced treatment of concepts involving interrelationships between micro-organisms and their environment in light of current literature. Lectures and seminars will focus on the roles of micro-organisms in the major nutrient cycles. Field and laboratory

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Biology work will include sampling procedures, techniques to measure microbial activities *in situ* and in the laboratory, and individual projects. Prerequisites: Biochemistry, Biology 2451, 4354, 4440, 4446, or permission of the instructor. **$8 lab fee.**

5398, 5698, 5998.   THESIS Variable credit of three, six, or nine hours—Prerequisite: permission of staff.

The following courses may be taken for graduate credit subject to approval by the student's committee and the limitations stated in the general requirements for the Master of Arts degree.

4312. INTRODUCTION TO VIROLOGY
4315. GENERAL ENDOCRINOLOGY
4340. PLANT PHYSIOLOGY
4342. BACTERIAL ECOLOGY
4344. NATURAL HISTORY OF THE VERTEBRATES
4348. AQUATIC BIOLOGY
4357. RESEARCH METHODS IN CELL BIOLOGY
4359. BIOLOGICAL ULTRASTRUCTURE
4440. BACTERIAL PHYSIOLOGY
4443. COMPARATIVE INVERTEBRATE PHYSIOLOGY
4680. FIELD BIOLOGY

BIOMEDICAL ENGINEERING
Program

See Interdepartmental and Intercampus Programs, p. 196

Department of
BUSINESS ADMINISTRATION
(BUSA)

Areas of Study	*Degrees*
Business Administration	M.B.A.
Administration (See Interdepartmental and Intercampus Programs, p. 194)	PH.D.

Master's Degree Plan: Thesis Substitute only

Chairman: Edwin A. Gerloff   306 Business   273-2901

Graduate Advisor: Albert S. Lewie, Jr.
317 Business   273-3705

Graduate Faculty:

Professors Dickinson, Schkade, Stanley, Wofford

Associate Professors Cantwell, Edgar, Gates, Gerloff, Green, Helm, Kindel, Lucas, McDaniel, Pinney, Trivoli

Assistant Professors Alexander, Baker, Calabro, Garland, Gray, Lewie, McWilliams, Milliman, Price, Secrest

OBJECTIVE

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.

The MBA program offers the graduate student an opportunity to complete his or her education in business administration at a fully accredited college of business administration. The MBA program is fully accredited by the American Assembly of Collegiate Schools of Business.

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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 course work. These graduate courses are an integral part of the MBA program.

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 mathematics deficiency will be required to complete business administration 5302.

BACKGROUND CATEGORY II: A student with varying amounts of work in business may have the requirement waived for those Foundation Program courses for which he has completed equivalent college work.

FOUNDATION PROGRAM

Credit for these courses will not be given in the Advanced MBA 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)
Decision Models and Information Systems (MASI 5311)	Finance (FINA 5311)
Behavioral Science in Management (MANA 5311)	Managmnt (MANA 5312)

ADVANCED MBA PROGRAM

The Advanced MBA Program consists of 36 hours of course work to be selected by the student and approved by the Graduate Advisor. However, in no case is a student's program to exceed 60 hours and in those few cases where it is deemed advisable for

the student to take the entire Foundation Program, he or she *Business* will be allowed to waive six hours of electives in the advanced *Administration* program.

Required MBA Courses: The following advanced MBA courses are required of all students—business administration 5333; 5391; and either 5330 or 5337. The Research Colloquium (business administration 5391) is taken in the MBA Program as the thesis substitute.

Concentration Areas: A concentration of not more than 12 semester hours may be taken in one of the following curriculum areas: accounting, economics, finance, management, management science, marketing. A student who wishes to take a program of courses in a wider range of areas may choose not to take a concentration.

Elective Areas: 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. Any course beyond the foundation courses may be completed for advanced elective credit. The courses are listed under the appropriate areas of business administration, finance, management, management science, and marketing. Only course numbers and titles for approved accounting and economics elective courses are listed under the appropriate MBA program classification. Complete course descriptions may be located under the accounting and economics departmental listing.

For the graduate student wishing to emphasize international business administration, a group of courses is listed following the marketing course descriptions. Selection of these courses does not prevent a choice of concentration areas.

ACCOUNTING (ACCT)

5301. ACCOUNTING ANALYSIS I—Foundation Course
5302. ACCOUNTING ANALYSIS II—Foundation Course

Advancd Elective Credit may be received for the following courses:

5310. INTRODUCTION TO BUSINESS TAXATION
5311. FINANCIAL ACCOUNTING I
5312. FINANCIAL ACCOUNTING II
5313. ACCOUNTING THEORY
5315. TAX PLANNING AND RESEARCH
5318. STUDIES IN AUDITING
5320. GOVERNMENTAL AND INSTITUTIONAL ACCOUNT-ING
5321. CASES IN FINANCIAL ACCOUNTING
5322. ACCOUNTING FOR MANAGEMENT PLANNING AND CONTROL
5323. CORPORATE MODELING
5324. ADVANCED STUDIES IN PLANNING AND CON-TROL
5327. CONTEMPORARY ISSUES IN ACCOUNTING THEORY
5329. INFORMATION SYSTEM ANALYSIS
5330. INTERNATIONAL ACCOUNTING AND FINANCIAL REPORTING
5392. SELECTED TOPICS IN ACCOUNTING   75

BUSINESS ADMINISTRATION (BUSA)

5301. STATISTICS (3-0) 3 hours credit — An 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, regression theory and application, and Bayesian inference. Prerequisite: business administration 5302 or equivalent.

5302. MATHEMATICS FOR MANAGEMENT SCIENCES (3-0) 3 hours credit—A study of the quantitative techniques of use in the functional courses and operations research. Topics include matrix algebra, linear systems, differential and integral calculus, and differential equations. This course may not be counted as an MBA Foundation Program course nor as an elective.

5330. LEGAL ENVIRONMENT OF BUSINESS (3-0) 3 hours credit—A 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. The legal framework for business in serving diverse interests of investors, creditors, the sovereign, the general public, and others is studied along with modern social legislation affecting business.

5331. LAW OF INTERNATIONAL BUSINESS (3-0) 3 hours credit—This course deals with the 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) 3 hours credit—This course focuses on the 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, enterpreneurial simulation and testing and selected case presentations by student teams. Prerequisite: permission of the instructor and Graduate Advisor.

5333. BUSINESS POLICY (3-0) 3 hours credit—This course provides an integration of the master's of business administration curriculum into a cohesive whole. The several elements of business administration are treated by use of business policy cases and decision simulation methods. Prerequisite: permission of the Graduate Advisor.

5337. BUSINESS AND SOCIETY (3-0) 3 hours credit—An examination of the organizations of industry and commerce, government, labor, and other institutions within our society. Consideration is given to the legal environment of the business enterprise.

5150, 5250, 5350. BUSINESS INTERNSHIP (variable credit from 1 to 3 hours)—Faculty supervised part-time work performed in a participating business or government organization is combined with an academic paper. May be repeated for credit up to a maximum of 3 hours. Prerequisite: consent of instructor and Graduate Advisor.

5391. RESEARCH COLLOQUIUM 3 hours credit—Provides the vehicle for presentation of research by the candidate and an arena for his examination by faculty and other candidates. The Research Colloquium will be used as a substitute for the traditional type of thesis work. Prerequisite: permission of Graduate Advisor.

5309.   ECONOMIC ANALYSIS I—Foundation course
5311.   ECONOMIC ANALSIS II—Foundation course

Advanced elective credit may be received for the following courses:

5301.   ECONOMIC DEVELOPMENT
5304.   ADVANCED PUBLIC FINANCE
5306.   STATISTICAL METHODS IN ECONOMICS
5310.   MICROECONOMIC THEORY
5312.   MACROECONOMIC THEORY
5313.   MANAGERIAL ECONOMICS
5321.   INTERNATIONAL ECONOMICS
5324.   MONETARY AND FISCAL ECONOMICS
5327.   INTERNATIONAL FINANCE
5330.   ADVANCED LABOR ECONOMICS
5331.   URBAN ECONOMICS
5391.   RESEARCH AND SELECTED TOPICS IN ECONOMICS

FINANCE (FINA)

5311.   BUSINESS FINANCIAL MANAGEMENT (3-0) 3 hours credit—This is a study of providing the organization with funds necessary for its operation and of achieving effective utilization of funds. Primary emphasis is on financal decision-making within organizations, and techniques of financal analysis and forecasting. Subject matter is developed to focus attention on the variable factors involved in financial decisions and methods of analyzing and evaluating these factors. Prerequisite: accounting 5301 and economics 5309 or equivalents.

5320.   SEMINAR IN CENTRAL BANKING (3-0) 3 hours credit—Emphasis is placed on the development of the Federal Reserve System and the purposes and functions which justify its existence. Contemporary evidence of the incidence of monetary policy is analyzed, and the effects of the Fed's policies on business and financial institutions, the attractiveness of investment alternatives, capital markets, and related areas are examined. Prerequisite: finance 5311 or equivalent.

5321.   REAL ESTATE INVESTMENT (3-0) 3 hours credit—An introduction to analytical techniques, sources of financing, and other factors related to real estate investment. The course stresses current developments and topics. Prerequisite: finance 5311 or equivalent.

5322.   ADVANCED BUSINESS FINANCIAL PROBLEMS (3-0) 3 hours credit — Analysis of financial problems of business concerns, presented in case materials. Types of problems considered are: determination of capital needs, choosing among alternative capital investments, planning methods of financing new capital expenditures, and planning recapitalizations, mergers, and reorganizations. Prerequisite: finance 5311 or equivalent.

5323.   INVESTMENT MANAGEMENT PROBLEMS (3-0) 3 hours credit—Application of principles and techniques of investment management in solving investment problems of individuals and financial institutions. Types of problems considered are: apportionment of investment funds among alternative types of securities in planning portfolios, analysis of risk exposure in particular securities, valuation of securities, timing of security acqui- **77**

sitions, and shifting funds among classes of securities held in portfolios. Prerequisite: finance 5311 or equivalent.

5324. SEMINAR IN FINANCIAL THEORIES (3-0) 3 hours credit—Intensive research in selected areas of business finance, investment analysis and management, financial markets, commercial banking, and non-bank financial institutions. Prerequisite: finance 5311 or equivalent.

5325. MANAGEMENT OF FINANCIAL INSTITUTIONS (3-0) 3 hours credit—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: finance 5311 or equivalent.

5326. COMMERCIAL BANKING (3-0) 3 hours credit—To present an overview of the management process and the operations in many areas of the modern commercial bank, this course is divided into five segments: banking environment; basic banking considerations; asset management; liability management; and other bank policy areas. Emphasis will also be placed on the economic significance of the industry and on its contribution to business development. Prerequisite: finance 5311 or equivalent.

5331. MULTINATIONAL FINANCIAL MANAGEMENT (3-0) 3 hours credit—The course examines ways in which financial decision-making processes are altered by operation in a multinational environment. The effects of devaluation expectations, foreign exchange and investment controls, multiple tax systems, and nationally segmented capital markets on both working capital management and investment decisions are examined. Also, the course includes case materials related to actual decisions by multinational firms. Prerequisite: finance 5311 or equivalent.

5192, 5292, 5392. SELECTED TOPICS IN FINANCE (1, 2, or 3 hours credit)—In depth study of selected topics in finance. This course may be repeated when topics vary. Prerequisite: consent of instructor and Graduate Advisor.

MANAGEMENT (MANA)

5311. BEHAVIORAL SCIENCES IN MANAGEMENT (3-0) 3 hours credit—An examination of the managerial uses of concepts and findings from the disciplines of sociology, psychology, and cultural anthropology. Consideration is given to concepts of individual behavior including motivation, perception, and personality; interpersonal behavior; communications; and small group behavior.

5312. MANAGEMENT (3-0) 3 hours credit—This course is designed as a basic exploration of management concepts and organizational theory. The student is exposed to significant systems and environments of the organization that materially affect the decision-making process under conditions of uncertainty and factors that influence the determination of administrative policy.

5320. ORGANIZATIONAL BEHAVIOR (3-0) 3 hours credit— This course provides a systematic study of behavioral problems in the complex organization. The course analyzes the interaction of environmental and internal factors in their effects upon organizational behavior. The course is placed within the context of the organization process. Prerequisite: management 5312 or equivalent.

5321. ADVANCED MANAGEMENT THEORY (3-0) 3 hours credit—This course is designed to provide the foundation for an in-depth knowledge of the management process. The course will relate the empirical findings and theoretical hypotheses concerned with goal setting, planning, and control to functions of management in a profit-related organization. Prerequisite: management 5312 or equivalent.

5324. GROUP AND INTERGROUP RELATIONSHIPS (3-0) 3 hours credit—This course analyzes the operation of groups in the organization. Effects on productivity and morale of such work group attributes as cohesiveness, group norms, group pressures, and leadership are examined. The effects of the group in individual behavior is considered. Intergroup problems involving union-management relations, interdepartmental conflicts, and international relations are analyzed. Prerequisite: business administration 5312 or equivalent.

5325. INDUSTRIAL RELATIONS (3-0) 3 hours credit — 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. Non-union employee relationships are also considered. Prerequisite: management 5312 or equivalent.

5326. ORGANIZATIONAL INNOVATION AND CHANGE (3-0) 3 hours credit—The purpose of this course is to examine the change process in business, provide a basis for a critical analysis of factors involved in the change process, and set forth the present research in the area to allow appropriate strategy and tactics to be developed. Prerequisite: management 5312 or equivalent.

5327. SEMINAR IN MANAGEMENT (3-0) 3 hours credit—Independent research by the student with emphasis upon depth of penetration into the chosen topic. Prerequisite: management 5312 or equivalent.

5328. OPERATIONS MANAGEMENT (3-0) 3 hours credit — An analysis of managerial decisions in the production function with consideration of the planning and design of systems and processes. Prerequisite: business administration 5301 and 5302 or equivalents and management 5312 or equivalent.

5329. METHODS OF ORGANIZATIONAL RESEARCH (3-0) 3 hours credit—This course is designed to acquaint students with experimental methodology and its application to organizational problems. It is intended to provide students with specific skills in research design, data collection, test construction and an awareness of experimental methods as applied to organizational problems. It is also intended to provide a basis to evaluate future readings and research in the area.

5330. ARBITRATION AND DISPUTE SETTLEMENT (3-0) 3 hours credit—A study of the 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 will be given to the nature of conflict and conflict resolution generally, including constitutionalism and due process in government as well as private institutions, and the role of such specialized agencies as the FMCS and AAA National Center for Disputes Settlement. The economic implications of arbitration and its impact upon the public is considered. Prerequisite: management 5312 or equivalent.

5331. MANAGEMENT OF INTERNATIONAL OPERATIONS (3-0) 3 hours credit—This course focuses on the managerial im-

plications of conducting business in foreign countries. It provides a framework for analyzing and dealing with the management of foreign and multinational organizations as influenced by cultural, political, and economic constraints. Prerequisite: management 5312 or equivalent.

5333. MANAGEMENT OF TECHNOLOGY (3-0) 3 hours credit —The course deals with the problems of managing research and development or other similar technologies which involve one-of-a-kind products and substantial numbers of professional skills. The course is designed to explore what is known about the management of professionals and professional enterprises. It uses the available evidence from a large variety of fields. The course will be conducted as a seminar. Prerequisite: management 5312 or equivalent or consent of instructor.

5340. PERSONNEL — HUMAN RESOURCE MANAGEMENT (3-0) 3 hours credit—This course is designed to provide the student with an understanding of modern human resources management from both theoretical and practical viewpoints and from the perspective of the operating manager as well as the personnel specialist. 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: management 5312 or equivalent.

5192, 5292, 5392. SELECTED TOPICS IN MANAGEMENT (1, 2, or 3 hours credit)—In depth study of selected topics in management. This course may be repeated when topics vary. Prerequisite: consent of instructor and Graduate Advisor.

MANAGEMENT SCIENCE (MASI)

5311. DECISION MODELS AND INFORMATION SYSTEMS (3-0) 3 hours credit—The study of system concepts, analysis of systems operations, and the formulation of system models considering the acquisition of data, the processing of information, and the utilization of algorithms and decision models in information systems for the administration of operations. Prerequisite: business administration 5302 or equivalent or concurrent enrollment.

5321. INTRODUCTION TO MANAGEMENT SCIENCES (3-0) 3 hours credit — An 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. Prerequisite: business administration 5301 and 5302 or equivalents.

5323. APPLIED DECISION THEORY (3-0) 3 hours credit—A thorough 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. The course will include a treatment of subjective probability, utility theory, risk analysis, and the value of information. Prerequisite: business administration 5301 and 5302, or equivalents.

5325. ADVANCED STATISTICAL METHODS IN BUSINESS ADMINISTRATION (3-0) 3 hours credit — The study of advanced topics in regression, correlation, experimental design, sampling methods, and other statistical methods with emphasis on the application of these topics to problems in the administra-

tion of operations. Prerequisite: business administration 5301 or equivalent.

5326. SIMULATION AND BUSINESS MODELS (3-0) 3 hours credit—A study of the theory and practices in the simulation of stochastic and mathematical models of business and industrial processes. An application of mathematical methods to problems of resource allocation, economic analysis, inventory systems, management planning models, queuing systems. Investigation of mathematical and statistical methods such as Monte Carlo simulation, process generators, and other simulation techniques. Emphasis will be placed on the formulation, construction and simulation of realistic business problems. Prerequisite: management science 5321.

5327. APPLIED MATHEMATICAL PROGRAMMING (3-0) 3 hours credit—A study of optimization techniques including linear, quadratic, non-linear, dynamic integer, and geometric programming. Emphasis will be on problem identification, technique association, and soluton formulation. Applications of game theory will also be investigated. Prerequisite: management science 5321.

5328. GENERAL SYSTEM MODELS AND ANALYSIS (3-0) 3 hours credit — The study of concepts of the general system theory, isomorphic models and contributions from the various disciplines for the analyses of systems and the optimal design of system models. Prerequisite: business administration 5302 or equivalent.

5192, 5292, 5392. SELECTED TOPICS IN MANAGEMENT SCIENCE (1, 2, or 3 hours credit)—In depth study of selected topics in management science. This course may be repeated when topics vary. Prerequisite: consent of instructor and Graduate Advisor.

MARKETING (MARK)

5311. MARKETING (3-0) 3 hours credit—A survey of all the activities involved in marketing. Emphasis is placed on developing a managerial point of view in planning and evaluating marketing decisions of the firm. Decisions with respect to products, price, channel, and promotional variables are analyzed, and questions relating to cost efficiency, demand and regulations are appraised.

5320. BEHAVIORAL SCIENCE IN MARKETING (3-0) 3 hours credit—This course employs the case method to acquaint a student with the importance of sociological and psychological applications in marketing analysis. Cases used cover a wide range of marketing problems including product decisions, promotional decisions, pricing decisions, and distribution channel decisions. The emphasis is on applications rather than technique, the students being assumed to have sufficient knowledge of behavioral science techniques from the outset. Prerequisite: marketing 5311 and management 5311 or equivalent.

5323. MARKETING STRATEGY (3-0) 3 hours credit—A case course designed to give the student an opportunity to utilize the material and analytical tools that he has acquired. Case studies are used which require a realistic diagnosis of company problems, development of alternative courses of action, and the formulation of specific recommendations. Prerequisite: marketing 5311 or equivalent.

5324. SEMINAR: CONTEMPORARY MARKETING PROBLEMS (3-0) 3 hours credit —Emphasis is placed on projects

based on a wide range of marketing developments and trends. Each student is required to write and present a research paper dealing in depth with marketing topics of current or potential interests. Prerequisite: marketing 5311 or equivalent.

5325. PHYSICAL DISTRIBUTION MANAGEMENT (3-0) 3 hours credit—A study of distribution systems for firms engaged in marketing and/or manufacturing. Analyzes the logic components of transportation, warehousing, inventory control, communications, and location theory. Explores the problems in and the development of national policy toward macro- and micro-distribution. Suggests concepts in total physical distribution system design. Prerequisite: marketing 5311 or equivalent.

5326. PROMOTIONAL SYSTEMS MANAGEMENT (3-0) 3 hours credit—The planning, organizing, directing, and controlling of the promotional mix is presented and analyzed. Social, psychological, and communications theory is blended with applications to promotional case studies. Thus, it is designed to bring together the tools of management and interdisciplinary theory with practical applications. Prerequisite: marketing 5311 or equivalent.

5327. RESEARCH FOR MARKETING DECISIONS (3-0) 3 hours credit—Course provides an overview of information needs of the marketing decision-maker. Primary emphasis is placed upon the methods and techniques that may be employed for the collection and analysis of primary data. Major topics considered include design of research projects, generating primary data, questionnaire design, samplings for survey research, experimental design, controlling data collection, and data analysis. Prerequisite: marketing 5311 and business administration 5301 or equivalents.

5328. PRODUCT MANAGEMENT (3-0) 3 hours credit—Course deals with the management of the firms 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 managers role, the new product planning department, and others. Emphasis is placed 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: marketing 5311 or equivalent.

5329. SALES, SALES MANAGEMENT (3-0) 3 hours credit—While this course examines the unique characteristics of both the industrial and consumer markets from the personal selling viewpoint, its major emphasis is upon industrial selling. It covers personal selling fundamentals as well as vital sales management topics. Role playing and case analysis among other techniques are utilized. Prerequisite: marketing 5311 or equivalent.

5331. INTERNATIONAL MARKETING (3-0) 3 hours credit—The course deals with the management of marketing in international business. Subjects include marketing research, pricing, promotion, and distribution in the international environment. Marketing problems arising from various degrees of foreign involvement (exports, licensing, foreign subsidiaries) are examined. Prerequisite: marketing 5311 or equivalent.

5192, 5292, 5392. SELECTED TOPICS IN MARKETING (1, 2, or 3 hours credit)—In depth study of selected topics in marketing. This course may be repeated when topics vary. Prerequisite: consent of instructor and Graduate Advisor.

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 course work in international business administration may consider an international-related research topic for Business Administration 5391, 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.

ACCOUNTING 5330. INTERNATIONAL ACCOUNTING AND FINANCIAL REPORTING
BUSINESS ADMINISTRATION 5331. LAW OF INTERNATIONAL BUSINESS
ECONOMICS 5321. INTERNATIONAL ECONOMICS
ECONOMICS 5327. INTERNATIONAL FINANCE
FINANCE 5331. MULTINATIONAL FINANCIAL MANAGEMENT
MANAGEMENT 5331. MANAGEMENT OF INTERNATIONAL OPERATIONS
MARKETING 5331. INTERNATIONAL MARKETING

Department of
CHEMISTRY (CHEM)

Area of Study   *Degree*
   Chemistry   M.A.

Master's Degree Plans: Thesis and Thesis Substitute

Chairman: Donald R. Martin
                          201 Science Hall   273-3171

Graduate Advisor: Daniel M. Blake
                          201 Science Hall   273-3171

Graduate Faculty:
   Professors Baker, Francis, Girardot, Martin, Pomerantz
   Associate Professors Armstrong, Bellion, Blake, Cogdell, Ternay, Willoughby
   Assistant Professor Brown
   Adjunct Professors Battista, Dowben, Wiggans

OBJECTIVE

The objectives of the Chemistry Department's program leading to the Master of Arts degree include (a) developing the in-   **83**

dividual'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. The areas of specialization are analytical chemistry, biochemistry, inorganic chemistry, organic chemistry, and physical chemistry.

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.

Master's Degree With Thesis—A minimum of 18 hours in chemistry from courses listed in the *Graduate Catalog* will be required. Six hours may be senior 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 (Chemistry 5391 or 5691 *or* Chemistry 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.

5101. SEMINAR IN CHEMISTRY (1-0) 1 hour credit—Two semesters of registration required of all graduate students. This course 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. Course objectives include 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. This course will be graded on a pass-fail basis (P-F).

5301. PHYSICAL CHEMISTRY (3-0) 3 hours credit—A survey course which includes topics from thermodynamics, statistical thermodynamics, quantum chemistry, and molecular spectroscopy. Prerequisite: chemistry 3322 or equivalent.

5303. SELECTED TOPICS IN ADVANCED PHYSICAL CHEMISTRY (3-0) 3 hours credit—May be repeated for credit when topics vary. Prerequisite: chemistry 5301, or equivalent with permission of instructor.

5305. ORGANIC CHEMISTRY (3-0) 3 hours credit—A presentation of the effects of structure, substituents, and experimental conditions upon reaction mechanisms. Reactions covered include nucleophilic and electrophilic substitution, elimination and addition, as well as rearrangements. Use is made of stereochemistry, kinetics, product identification, and bonding theory in elaborating mechanisms. Prerequisite: chemistry 2254 and 3322 or equivalent.

5307. SELECTED TOPICS IN ADVANCED ORGANIC CHEMISTRY (3-0) 3 hours credit—May be repeated for credit when topics vary. Prerequisite: chemistry 5305, or equivalent with permission of instructor.

5311. ANALYTICAL CHEMISTRY (3-0) 3 hours credit—A survey of analytical chemistry including sampling theory and practice, separation mechanisms, and basic analytical methodology. Prerequisite: chemistry 4461 or equivalent.

5313. SELECTED TOPICS IN ADVANCED ANALYTICAL CHEMISTRY (3-0) 3 hours credit—May be repeated for credit when topics vary. Prerequisite: chemistry 5311, or equivalent with permission of instructor.

5315. INORGANIC CHEMISTRY (3-0) 3 hours credit—A 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.

5317. SELECTED TOPICS IN ADVANCED INORGANIC CHEMISTRY (3-0) 3 hours credit—May be repeated for credit when topics vary. Prerequisite: chemistry 5315, or equivalent with permission of instructor.

5321. BIOCHEMISTRY (3-0) 3 hours credit—This course covers aspects of intermediary metabolism and metabolic regulation. Topics are selected from: amino acid, nucleotide, phospholipid, steroid, porphyrin and mucopolysaccharide biosynthesis, biochemistry of muscle, vision and the regulation of glycogen, carbohydrate and fat metabolism. Prerequisite: chemistry 4312 or equivalent and/or permission of the instructor.

5323. SELECTED TOPICS IN BIOCHEMISTRY (3-0) 3 hours credit—Prerequisite: chemistry 5321, or equivalent with permission of instructor.

5191-5691. READINGS IN CHEMISTRY (variable credit from one to six hours as arranged)—A conference course which may be repeated for credit, with credit granted according to work performed. Prerequisite: permission of instructor.

5192-5692. RESEARCH IN CHEMISTRY (variable credit from one to six hours as arranged)—A conference course with laboratory with credit granted according to work performed. May be repeated for credit. Prerequisite: permission of instructor.

5380. TEACHING CHEMISTRY (3-0) 3 hours credit—Registration is required of all graduate students who are in their first semester as teaching assistants. This course may not be counted for credit toward the degree requirements. This course will be graded on a pass-fail (P-F) basis.

5398, 5698, 5998. THESIS Variable credit of three, six, or nine hours—Prerequisite: permission of instructor.

A limited number of the following courses may be applicable toward the graduate program if approved in advance by the Graduate Advisor.

3321. PHYSICAL CHEMISTRY
3322. PHYSICAL CHEMISTRY
4182. LABORATORY TECHNIQUES IN BIOCHEMISTRY
4216. PROPERTIES AND REACTIONS OF INORGANIC SYSTEMS
4301. ANALYTICAL CHEMISTRY
4311. GENERAL BIOCHEMISTRY
4312. GENERAL BIOCHEMISTRY
4315. PHYSICAL INORGANIC CHEMISTRY
4321. PHYSICAL ORGANIC CHEMISTRY
4331. PHYSICAL CHEMISTRY
4346. ADVANCED SYNTHETIC METHODS
4461. INSTRUMENTAL ANALYSIS

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Department of
CIVIL ENGINEERING (CE)

Areas of Study	*Degrees*
Civil Engineering	M.S.
Engineering: Undifferentiated (See Interdepartmental and Intercampus Programs, p. 201)	PH.D.

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

Chairman: Noel J. Everard
> 435-B Engineering 273-2202

Graduate Advisor: Tseng Huang
> 435-J Engineering 273-3665

Graduate Faculty:

Professors Everard, Haynes, Huang, Nedderman
Associate Professors Poor, Qasim, Smith, Yuan
Assistant Professors Clark, Fajardo, Hung, Matthys, Petry, Spindler
Adjunct Professor Santry
Adjunct Associate Professors Armstrong, Hadawi
Adjunct Assistant Professors Chiang, Thomson

OBJECTIVE

Graduate study in civil engineering is a continuation of professional development beyond the baccalaureate degree with emphasis in a specialization in civil engineering.

The M.S. program is designed to strengthen and broaden the knowledge of the fundamentals and the state-of-art in the specialization areas. The Ph.D. program prepares those who seek high capability in carrying out research and development in their areas of specialization.

The student, with the assistance of a faculty advisor, may plan a program in the following fields of specialization within civil engineering.

1. Geotechnical (Soil Mechanics and Foundations)
2. Sanitary and Environmental
3. Structures
4. Transportation (Traffic, Highways, Transit)
5. Urban Planning
6. Water Resources (Hydraulics-Hydrology)

DEGREE REQUIREMENTS

Students wishing to major in civil engineering should have the Bachelor of Science degree in civil engineering from an accredited school. Students with degrees in other disciplines may qualify for graduate study in civil engineering after the completion of a faculty approved program of undergraduate courses. These courses are specified in the "Handbook for Graduate Studies in Civil Engineering" which is available in the department. Students are encouraged to take the thesis or non-thesis degree plan, although the thesis substitute plan is available.

5301. COMPUTER METHODS IN CIVIL ENGINEERING (3-0) 3 hours credit—This is a course in computer programming using the Fortran IV language. Problems are taken from all phases of civil engineering. Students will write programs, and will use existing programs to solve civil engineering problems. Prerequisite: consent of the Graduate Advisor.

5305. BRIDGE DESIGN (3-0) 3 hours credit—This course covers theory and design procedures related to the analysis and design-synthesis of bridges and guideways for vehicles. Concrete, steel and timber structures are included, using the AASHTO Code. Construction practices and procedures are discussed. Prerequisites: civil engineering 3444 (Structural Analysis), civil engineering 4347 (Reinforced Concrete Design) and civil engineering 4348 (Structural Design in Metals).

5306. PLAIN CONCRETE (3-0) 3 hours credit—Theories used in the design of concrete, factors affecting the properties, and behavior of material and of test specimens are considered. Behavior of plain concrete under different types of environment and loading, such as long-time, repeated, and tri-axial, is emphasized. The studies involve critical reviews of experimental and analytical investigations. Prerequisite: civil engineering 4347 (Reinforced Concrete Design).

5307. STRUCTURAL TIMBER DESIGN (3-0) 3 hours credit—This is a course in the design of structural timber including the following topics: grades 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: civil engineering 3444.

5308. MASONRY STRUCTURES (3-0) 3 hours credit—This is a course in the design of masonry structures. Topics covered include masonry unit types and grades, mortar types, reinforcing and connectors, and beam, column, arch, bearing wall design. Structural behavior and standard construction practices are included. Both plain and reinforced (clay and concrete) masonry are studied. Building codes and recommended practice documents are discussed. Prerequisite: civil engineering 3444 (Structural Analysis).

5309. CONCRETE SHELL STRUCTURES (3-0) 3 hours credit—This course covers the general theory of thin shells including membrane theory for domes of double curvature such as hyperbolic and elliptic paraboloids, cylindrical shells and folded plates. Analysis and design are included. Prerequisite: civil engineering 4347 (Reinforced Concrete Design).

5310. NUMERICAL METHODS IN STRUCTURAL DESIGN (3-0) 3 hours credit—Suitable numerical and approximate methods used in the design of structures are included. Problems of

static response, stability and free vibration are discussed. Prerequisite: computer science 1201 (Introduction to Computer Science) or civil engineering 5301 and civil engineering 3444 (Structural Analysis).

5311. PLASTIC STEEL DESIGN (3-0) 3 hours credit—Plastic analysis and design of continuous beams, single-story frames, and multistory steel structures are considered as well as current column theories. Prerequisite: civil engineering 4348 (Structural Design in Metals).

5312. CONCRETE DESIGN I (3-0) 3 hours credit—This course deals with structural components such as beams, columns, slabs, footings and walls using the ultimate strength method. Building code requirements for reinforced concrete are explained and applied. Flat slabs, flat plates and other two-way systems are studied. Yield line theory, torsion, and shear-friction are also studied. Prerequisite: civil engineering 4347 (Reinforced Concrete Design).

5313. STRUCTURE-SOIL INTERACTION (3-0) 3 hours credit—Methods of analysis of structure-soil interaction behavior are considered. Numerical techniques are included. Physical problems reviewed include beams, slabs, flexible retaining walls, and laterally loaded piles acting on and being acted on by elastic and inelastic soils. Prerequisite: civil engineering 4321 (Foundation Engineering).

5314. EARTH STRUCTURES (3-0) 3 hours credit—A study is made of the states of stress and analysis techniques associated with cuts, fills and retaining structures. Stress changes due to water flow through soil are studied along with numerical techniques. Prerequisite: civil engineering 4321 (Foundation Engineering) or instructor approval.

5315. FOUNDATION ANALYSIS AND DESIGN (3-0) 3 hours credit—Bearing capacity and earth pressure theories are discussed as well as the settlement characteristics of various types of soils. Included is the performance of footings, rafts, flexible slab-on-grade and piles founded on or in silts, low activity clays, active silts and clays, and stratified soils. Prerequisite: civil engineering 4321 (Foundation Engineering) or instructor approval.

5316. WATER SUPPLY AND TREATMENT PLANT DESIGN (3-0) 3 hours credit—This course covers theory and design of community water supply systems. Design of treatment facilities, equipment, and distribution network, and cost estimates are covered. Prerequisite: civil engineering 3314 (Water Supply and Waste Treatment).

5317. WASTEWATER TREATMENT PLANT DESIGN (3-0) 3 hours credit—This course covers effluent quality standards, and theory and design of wastewater treatment plants. Design and layout of wastewater treatment systems using manufacturers' catalogs, and cost estimates are covered.

5318. ANALYSIS OF RECEIVING WATERS (3-0) 3 hours credit—The ecological response of lakes, reservoirs, streams, and estuaries from municipal and industrial waste loadings and surface runoffs are covered. Mathematical models for water quality prediction and planning are examined and developed.

5319. ENVIRONMENTAL ENGINEERING (3-0) 3 hours credit—Engineering and administrative functions in the control of environmental pollution, control legislation, and current status of science and technology of environmental improvements are discussed.

5320. SOLID WASTE MANAGEMENT (3-0) 3 hours credit—
This course will cover the technical aspects of current practices and new developments in the management of solid waste facilities. The emphasis will be placed on the engineering aspects of solid waste collection, transfer, disposal and recovery, and reuse.

5324. SURFACE-WATER HYDROLOGY (3-0) 3 hours credit
—This course encompasses the study of the hydrologic cycle, elements of hydrometeorology, infiltration and soil moisture, runoff, rainfall-runoff relationships and the effects of these factors with regard to utilization and conservation of water resources.

5325. GROUND-WATER HYDROLOGY (3-0) 3 hours credit—
This course will consider the occurrence and movement of ground water from a geologic viewpoint as preparation for the application of general hydrologic equations to such problems as safe yield, hydraulics of wells, well design, and artificial recharge.

5326. ADVANCED HYDROLOGY (3-0) 3 hours credit—Elements affecting the runoff hydrograph, generation of the runoff hydrograph, flood flow characteristics, determination of the design flood, and flood damage alleviation methods will be studied. Other hydrologic principles will be developed as required to support the topics named and statistical and computer methods introduced wherever appropriate. Prerequisite: civil engineering 5324, and 6307 and three hours of Statistics-Probability.

5327. ENVIRONMENTAL IMPACT ANALYSIS (3-0) 3 hours credit—This course covers various elements of environmental impact statements and environmental impact assessment resulting from the requirements of the National Environmental Policy Act. Analytical tools and techniques and their applications on the environmental impact measurement of engineering projects both beneficial and adverse are discussed.

5328. AIR POLLUTION CONTROL (3-0) 3 hours credit—Theory and application of methods and equipment for control of pollution caused by airborne materials are covered.

5329. ENVIRONMENTAL POLLUTION SURVEY (3-0) 3 hours credit—This is a survey course. The nature and effects of pollution as it relates to air, water, and soil; and the current status of the science and technology of environmental improvements and anti-pollution legislation are discussed. Credit will not be given to sanitary and environmental engineering majors.

5330. CHARACTERISTICS OF TRAFFIC (3-0) 3 hours credit
—The fundamental elements of traffic—the driver, the vehicle, and the roadway—are considered and then extended into studies of streams of traffic flow. Emphasis is placed on speed, volume, and density relationships and methods of measuring each. Capacity and levels of service are introduced along with some basic theories of traffic flow. Parking and parking terminal concepts are included as well as accident studies. Prerequisite: civil engineering 4302 (Highway or Transportation Engineering).

5331. TRAFFIC ENGINEERING OPERATIONS (3-0) 3 hours credit — Methods of traffic regulation and control optimization are considered. Topics such as traffic intersection design and control are included as well as the operation of traffic signal network systems. Techniques of conducting traffic engineering studies are introduced along with a study of traffic engineering functions and administration. Analysis and design techniques involving capacity and the level of service concept are included. Prerequisite: civil engineering 4302 (Highway or Transportation Engineering).

5332. HIGHWAY DESIGN (3-0) 3 hours credit—This course emphasizes 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. The design of maneuver areas, channelization ramps, intersections, and interchanges is also included. Prerequisite: civil engineering 4302 (Highway or Transportation Engineering).

5334. URBAN ENGINEERING (3-0) 3 hours credit—This is a service course intended principally for other than civil engineering majors on the influence and relative importance of engineered structures on urban development. The topics covered will include the engineering factors important to consider in land-use planning, utility location, waste disposal, drainage, public health, and recreation.

5335. MASS TRANSIT TECHNOLOGY (3-0) 3 hours credit— The engineering principles and requirements of various types of transit systems as well as the states of development of the several established transit types will be included in the course. Examination of new or emerging transit configurations and possible future innovations will be included. Considerations of environmental consequences and measures of effectiveness of transit systems will be introduced as well as several methods of conducting transit studies.

5336. CITY MANAGEMENT (3-0) 3 hours credit—This course is a study of the functions of the city manager, the administration of municipal affairs, the forms of city government, the organization of city departments, city finances, public utilities, emergency service, parks and recreation.

5337. URBAN TRANSPORTATION PLANNING (3-0) 3 hours credit — The theory and application of comprehensive urban transportation planning technology are included in this course. The 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, and special problems in the operation of transportation systems, are covered. Prerequisite: civil engineering 4302 (Highway or Transportation Engineering) or permission of instructor.

5338. URBAN PLANNING THEORY AND STUDIES (3-0) 3 hours credit — The course covers the relationship of physical planning to the general theory and process of planning, real estate, economics and normative theory of urban organization, urban land use planning and forecasting, and urban landscape. Site engineering and transportation geography related to aesthetic values, the relationship of environmental engineering and urban ecological patterns, application of engineering processes to the social system, housing, and the total cultural milieu are also included. Prerequisite: civil engineering 4302 or permission of instructor.

5339. METROPOLITAN PLANNING AND ADMINISTRATION (3-0) 3 hours credit—The history of planning controls in the United States, organization and structure of local and regional planning administration, theory and functions of management and principles of organization, are covered in this course. The engineering systems approach related to problems in population growth, social stratification, and governmental fragmentation problems are studied. Principles of municipal public works administration and capital improvements programming, and planning and engineering techniques related to contemporary

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political science in urban America are also included. Prerequisite: civil engineering 4302 or permission of instructor.

5344. RADIOLOGICAL HEALTH ENGINEERING (3-0) 3 hours credit—Included are sources, effects, measurement, health hazard and control of environmental radiation. Disposal of radioactive wastes, and legal spects of radiation controls are also discussed.

5345. ADVANCED METHODS IN SANITARY ENGINEERING (2-3) 3 hours credit — This course includes the standard laboratory techniques used to characterize wastes and introduces advanced sanitary engineering theories and practices. Current research topics and methods are included.

5350. FLEXIBLE PAVEMENT DESIGN (2-3) 3 hours credit —This course involves a study of the loads on pavements, stress analysis in flexible pavement systems, and design practices. Certain laboratory procedures involved in the design of flexible pavements are included. Prerequisite: civil engineering 4302 (Highway or Transportation Engineering).

5354. PHYSICAL AND CHEMICAL TREATMENT PROCESSES (2-3) 3 hours credit—The physical and chemical operations and processes used in water and wastewater treatment, air pollution control, and solid waste disposal are presented. Topics include mixing, equalization, gravity separation, flotation, filtration, adsorption, heat transfer, gas transfer and disinfection. Laboratory scale models are used to determine design parameters.

5355. BIOLOGICAL TREATMENT PROCESSES (2-3) 3 hours credit—The principles of evaluation and control of aerobic and anaerobic biological treatment processes are included. Topics include oxidation ponds, activated sludge, trickling filters, and sludge digestion. Laboratory scale models are used to determine biodegradability, operation and performance of treatment processes.

5356. CHEMICAL ANALYSIS IN ENVIRONMENTAL ENGINEERING (2-3) 3 hours credit—Basic physical and chemical principles applicable to environmental and sanitary engineering are presented. Nature and effects of pollutants as they relate to air, water, and soil, and instrumental methods of analysis and separation are included.

5357. BIOLOGICAL ASPECTS OF ENVIRONMENTAL POLLUTION (2-3) 3 hours credit—Biological and microbiological principles applicable to environmental and sanitary engineering are included. Bacteriological examinations of water and wastewater are presented in the laboratory.

5361. ADVANCED SOIL TESTING (2-4) 3 hours credit—Soil testing techniques utilized during research, determination of stabilization mix designs, and development of complete soil parameters are considered. Testing accomplished includes specialized consolidation, direct and triaxial shear, soil stabilization and selected chemical and mineralogical techniques. Prerequisite: civil engineering 4322 and civil engineering 6336 and 6337.

5362. AIR PHOTO INTERPRETATION OF LAND MASSES (2-3) 3 hours credit—Applications of photogrammetry, aerial photo interpretation, and remote sensing techniques to determination of land mass, soil and rock types are considered. Emphasis will be placed on use of air photo interpretation, geologic maps, soil maps in combination to ascertain engineering soil and land mass properties.

Civil Engineering

5191, 5291, 5391. ADVANCED STUDIES IN CIVIL ENGI-NEERING (Variable credit from 1 to 3 semester hours as arranged)—Each of these courses is designed for individual studies of advanced topics under the supervision of a professor or professors. Graded on a pass-fail (P-F) basis.

5392. SELECTED TOPICS IN CIVIL ENGINEERING (3-0) 3 hours credit—This organized course will cover topics of current interest in the field of civil engineering. The subject title will be listed in the schedule booklet. May be repeated for credit when topic changes.

5395. SPECIAL PROJECT IN CIVIL ENGINEERING (3-0) 3 hours credit. Special project in research under direction of the student's major professor and his committee in the thesis-substitute degree plan. The student must register for this course during the semester of graduation.

5398, 5698, 5998. THESIS Variable credit of three, six, or nine hours—Research and preparation pertaining to the master's thesis. Prerequisite: graduate standing in civil engineering.

6301. TRAFFIC MODELING (3-0) 3 hours credit—Methods are developed for simulating traffic operating on streets and intersections. Statistics, car-following and queueing behavior, and programming techniques are utilized in the formulation of the simulation models. Simulated traffic studies are made using the developed models. Prerequisite: computer science 1201 (Introduction to Computer Science), mathematics 3310 (Statistical Analysis), or the equivalent of these courses.

6302. HIGHWAY CAPACITY (3-0) 3 hours credit — Rational methods for the determination of highway and street capacities are considered. Emphasis is given to street intersection capacities, ramp and weaving section capacities, and freeway capacities. The level of service concept is utilized and factors affecting the level of service as well as the capacity are considered.

6303. RIGID PAVEMENT DESIGN (3-0) 3 hours credit—The theory of rigid pavement design is covered in this course along with current design practices and methods of construction.

6304. HYDROMETEOROLOGY (3-0) 3 hours credit—Among topics to be covered are these: general meteorology and climatology, atmospheric variables, cloud and precipitation physics, techniques of precipitation analysis, probable maximum precipitation, rainfall frequency and weather modification.

6305. WATER RESOURCES PLANNING (3-0) 3 hours credit —Historical and present concepts in water development. Systems approach to development of water resources. Current problems and policies with regard to water resources allocation and administration. General principles and procedures of water resource planning within a regional, multi-purpose context with economic considerations.

6306. DAM APPURTENANCES AND THEIR DESIGN (3-0) 3 hours credit—Hydraulic principles used in the design of appurtenances associated with retarding structures such as dams and diversion works are included. Prerequisite: civil engineering 5347 and 6307.

6307. OPEN CHANNEL FLOW (3-0) 3 hours credit—Steady flow in open channels. Basic principles, velocity formulas, backwater curves, flow through transitions, obstructions, and bends.

6308. APPLIED SOIL MECHANICS (3-0) 3 hours credit—The engineering report as concerns subsurface investigations is discussed as well as the design of subsurface investigations. Case histories involving project in various physiographic provinces are

discussed showing the reasonng for the types of foundations recommended. The students will be placed in the position of the soils engineer for the last $\frac{1}{3}$ to $\frac{1}{2}$ of the course and engineering reports will be written on several projects. Prerequisite: civil engineering 5315, civil engineering 6336 and civil engineering 6337.

6310. SOIL DYNAMICS (3-0) 3 hours credit—Vibrations of simple oscillators, wave propagation in elastic media, dynamically loaded foundations, blast and earthquake resistant design of foundations.

6311. ROCK MECHANICS (3-0) 3 hours credit—Elements of elasticity, rock properties and behavior. Theories of failure for brittle, jointed and anisotropic rocks, theory of in-situ and laboratory testing.

6312. THEORY OF STRUCTURES I (3-0) 3 hours credit — This is a course in the analysis of statically indeterminate elastic structures and will cover the following topics: 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. Credit will not be given for both civil engineering 6312 and civil engineering 4310. Prerequisite: civil engineering 3444 (Structural Analysis).

6313. THEORY OF STRUCTURES II (3-0) 3 hours credit—A continuation of Theory of Structures I, this course presents a 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 are emphasized. Prerequisite: civil engineering 6312 or consent of instructor.

6314. MOMENT AND SHEAR DISTRIBUTION (3-0) 3 hours credit—This course presents theoretical methods for obtaining stiffness coefficients, carry-over factors and fixed-end moments for continuous beam columns and beams and frames with elastic supports. Modified moment distribution methods are utilized to obtain solutions to complex problems. Prerequisite: civil engineering 3444 (Structural Analysis).

6316. FINITE ELEMENT METHOD FOR STRUCTURES (3-0) 3 hours credit—This course presents the finite element method for analyzing complex structures. Topics include structural stiffness, finite elements of a continuum, plane stress and strain, axi-symmetric stress analysis, element shape functions, and various applications. Prerequisite: civil engineering 6317.

6317. MATRIX METHODS FOR STRUCTURES (3-0) 3 hours credit—This course covers the stiffness and flexibility methods of structural analysis by using matrix algebra. Credit will not be granted for both civil engineering 4308 and 6317. Prerequisite: civil engineering 3444 (Structural Analysis).

6318. BEHAVIOR OF STRUCTURES UNDER DYNAMIC LOADS (3-0) 3 hours credit—This course includes the following topics: 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: civil engineering 4310 or 6312.

6321. PLATE STRUCTURES (3-0) 3 hours credit—This course presents a study of plates and slabs considering various materials. Methods of analysis and design are emphasized after theoretical concepts are fully developed. Flat plates and folded plates are considered using various support conditions. Prerequisite: civil engineering 4310 or 6312.

6322. PRESTRESSED CONCRETE (3-0) 3 hours credit—This course includes 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 are included in the topics discussed. Prerequisite: civil engineering 4347 (Reinforced Concrete Design).

6323. PRINCIPLES OF ENVIRONMENTAL HEALTH ENGINEERING (3-0) 3 hours credit—This course is concerned with man and his environment and presents engineering methods of controlling communicable disease vectors, epidemiology, and a survey of public health engineering.

6324. INDUSTRIAL HYGIENE AND TOXICOLOGY (3-0) 3 hours credit—Industrial health hazards and methods of controlling them will be studied. The course includes a survey of health hazards in industry, the toxicity of industrial gases, vapors, and dusts, and methods of eliminating hazards.

6325. AIR POLLUTION (3-0) 3 hours credit—The types and sources of atmospheric pollutants, their effects and techniques used to predict the dispersion of pollutants, are included in this course.

6326. INDUSTRIAL WASTE TREATMENT (3-0) 3 hours credit—This course presents the specialized physical, chemical, and biological treatment schemes required to treat specific industrial wastes.

6327. HIGHWAY PLANNING, ECONOMICS AND FINANCE (3-0) 3 hours credit—This course is a study of the nature of highway transport, needs studies, planning surveys, classification and administration, forecasting and programming, the basis of economic analysis and feasibility studies, vehicle operating costs, apportionment formulas and other considerations of finance. The functioning of highways as a regional system will be stressed. Prerequisite: civil engineering 4302 (Transportation Engineering).

6328. PLANNING AND DESIGN OF AIRPORTS (3-0) 3 hours credit—This course is a study of the growth and demand of air transport, air traffic control systems, airport site selection and configuration, geometric design of runways and taxiways, terminal areas, lighting, structural design of pavements and drainage problems. The design of heliports and special short take-off facilities are also considered. Prerequisite: civil engineering 4302.

6329. WATER WAVE MECHANICS (3-0) 3 hours credit — Selected topics in surface and wave motion are introduced. Linear solutions to the partial differential equations of surface motions for deep and shallow waves in bodies of water are included. Waves in constrained flows, numerical solution methods, wave forces and flood routing may be included.

6330. ESTUARINE HYDRAULICS (3-0) 3 hours credit—The course will cover selected topics including physics of mass transfer in estuaries, deposition problems, wave physics and design parameters for off-shore structures, and protective works. Ecological ramifications will also be discussed and historical failures and successes may be reviewed.

6331. STEEL DESIGN (3-0) 3 hours credit—This course will include the following topics as applied to steel members: 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

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for compression members. Prerequisite: civil engineering 4348 *Civil* (Structural Design in Metals).

6332. CONCRETE DESIGN II (3-0) 3 hours credit—This course deals with structural systems such as continuous beams, arches, continuous frames, box girders, vierendeel trusses, shear walls with columns, caissons and mat foundations. Computer methods of analysis and design are utilized to study building and bridge structures. Beam methods for long shells are discussed. Prerequisite: civil engineering 5312. ,

6334. ADVANCED HYDRAULIC ENGINEERING I (3-0) 3 hours credit—Included are advanced concepts concerning water transmission via free and confined systems which lead to design problems for steady and unsteady flow. Transients and surges are studied. Topics of current interest are included. (Credit can be earned for only one of civil engineering 6334 or civil engineering 5347; the latter is described in the Graduate Catalog 1974-75).

6335. ADVANCED HYDRAULIC ENGINEERING II (3-0) 3 hours credit—Additional topics not covered in civil engineering 6334 are covered. Prerequisite: civil engineering 6334.

6336. THEORETICAL SOIL MECHANICS I (3-0) 3 hours credit—Concepts of stress strain and theories of stress distribution in soils, settlement and contact pressure concepts including theory of consolidation and time dependent behavior of soils, and soil strength limitations and engineering applications of these parameters to both cohesive and non-cohesive soils are studied.

6337. THEORETICAL SOIL MECHANICS II (3-0) 3 hours credit—Physicochemical properties and behavior of expansive clay soils are studied along with theories of plastic equilibrium including Rankine and Coulomb surcharge loading, and shearing resistance and strength. Behavioral patterns and application to engineering problems are considered.

6338. SEEPAGE ANALYSIS AND EARTH DAMS (3-0) 3 hours credit—Permeability and flow through a porous media are studied. Included are the parameters of earth dam design including site selection, stability analysis, construction problems and instrumentation. Seepage analysis through and below various structures are considered, along with corrective techniques for limiting flow.

6339. SUB-SURFACE CONSTRUCTION (3-0) 3 hours credit—Concepts of construction of walls and cut-offs in slurry filled trenches are investigated. Included are stability of fluid trenches, supporting action of fluids, control of stabilizing fluids, excavating systems, concrete requirements, and analysis and design considerations. Applications to specific engineering problems, including isolation of structures to vibration problems are discussed. Design and construction aspects of bulkheads, caissons, tunnelling and other deep foundation structures are considered along with the effect of different soil properties.

6197-6997. RESEARCH IN CIVIL ENGINEERING (variable credit as arranged)—This course may be repeated for credit.

6399, 6699, 6999. DISSERTATION Variable credit of three, six, or nine hours—Preparation pertaining to the doctoral dissertation. Prerequisite: admission to candidacy for the doctor of philosophy degree.

A limited number of the following courses may be applicable toward the graduate degree if approved in advance by the graduate advisor.

COMPUTER SCIENCE
Program (CS)

Areas of Study	*Degrees*
Computer Science	M.S.
Engineering: Undifferentiated (See Interdepartmental and Intercampus Programs, p. 201)	PH.D.

Master's Degree Plans: Thesis and Non-Thesis

Graduate Advisor: Roger S. Walker

106 Engineering   273-3785

Graduate Faculty:

Professors Barker, Lawrence

Associate Professors Cannon, Pierce, Walker

Assistant Professors Schember, Sparr, Underwood, Ward, Wilson

OBJECTIVE

The graduate program in Computer Science is multidisciplinary and designed to fill the special educational needs currently existing in the computer profession. The program leads to the degree of Master of Science in Computer Science and is available to students with a wide variety of undergraduate backgrounds. Course work is offered both during the day and evening hours to accommodate the working professional.

DEGREE REQUIREMENTS

Students with degrees from any discipline may qualify for graduate study in computer science; however, if an entering graduate student has an inadequate background in computer science, appropriate deficiency and/or foundation courses must be taken.

All entering students must take or have had the equivalent of the following foundation courses: C.S. 5313 Algorithmic Languages, C.S. 5319 Assembly Language and Information Structures, and C.S. 5320 Systems Programming.

Four core courses must be taken by all candidates for the degree. Three of the courses must be: C.S. 5301 Advanced Information Structures, C.S. 5303 Design of Operating Systems, and C.S. 5306 Information Retrieval I. The fourth course must be selected from one of the following: C.S. 5304 Compiler Theory I, C.S. 5307 Computer Organization I, or C.S. 5311 Advanced Operating Systems.

At least 18 hours, including thesis, must be in computer science. A maximum of 3 hours of foundation courses in computer science and a maximum of nine hours of foundation courses in a minor area can be counted toward the minimum course work requirements. The degree can be interdisciplinary in nature and thus the remaining courses may be in any area related to computer science, subject to the approval by the Computer Science Graduate Studies Committee.

In addition, a student will be required to demonstrate proficiency in the usage of two approved (high level) programming languages. (This requirement may be satisfied by making a grade of B or better in C.S. 5313.)

A student pursuing a Master of Science in Computer Science may specialize in one of three areas:

I. **Application of Computers in Other Disciplines**—This program is available to students from any discipline. Students will be given a level of competence in computer science sufficient to enable them to best utilize the computer in applications within their own disciplines. Some possible options within this area of study are business information systems, numerical analysis, and math sciences.

II. **System and Compiler Theory**—This area of specialization involves the study of operating systems design, compiler design, and systems software associated with real-time systems, data management systems, and artificial intelligence.

III. **Computer Hardware/Software Design**—With the advent of the microprocessor, computer systems have evolved to become a tightly interwoven system of both hardware and computer software. In order to achieve the full capability of modern systems, graduates must be able to work creatively in both hardware design and computer programming.

5301. ADVANCED INFORMATION STRUCTURES (3-0) 3 hours credit—Linear lists, strings, arrays, and orthogonal lists. Representation of trees and graphs. Storage systems and structures, and storage allocation and collection. Multilinked structures. Symbol tables and searching techniques. Sorting (ordering) techniques. Formal specification of data structures. Prereq-

uisite: computer science 4306 or 5319 and corequisite computer science 5313.

5302. COMPUTER GRAPHICS (3-0) 3 hours credit — This course studies the input/output devices and programming techniques suitable for the visual representation of data and images. Prerequisite: computer science 5301 or concurrent.

5303. DESIGN OF OPERATING SYSTEMS (3-0) 3 hours credit—A study of the hardware and software techniques used in constructing operating systems for large multiprogram batch and timesharing computer systems. Techniques studied include memory management, processor scheduling, concurrent processes, job scheduling, I/O device management, and Information Management. Prerequisite: computer science 5320.

5304. COMPILER THEORY I (3-0) 3 hours credit—Review of program language structures, translation, loading, execution, and storage allocation. Compilation of simple expressions and statements. Organization of a compiler including compile-time and run-time symbol tables, lexical scan, syntax scan, object code generation, error diagnostics, and overall design. Introduction to formal language descriptions (e.g. Backus normal form, Polish notation, etc.) Prerequisite: computer science 5320.

5305. COMPILER THEORY II (3-0) 3 hours credit—Definitions of additional language types and their processors (e.g. (m,n.) bounded context, LL(k), LR(k), etc.). The techniques and use of a translator writing system such as XPL will be presented. More extensive treatments of code generation and optimization techniques will be discussed. Prerequisite: computer science 5304.

5306. INFORMATION RETRIEVAL I (3-0) 3 hours credit— File organization and processing including file structures, retrieval and update processing, security and integrity of information. Data-base system concepts including data description and manipulation languages, survey of existing systems and applications. Systems analysis and management information systems will be introduced. Emphasis will be on systems design aspects. Prerequisite: computer science 5301.

5307. COMPUTER ORGANIZATION I (3-0) 3 hours credit— Basic digital circuits, Boolean algebra and combinational logic, data representation and transfer, and digital arithmetic. Digital storage and accessing, control functions, input-output facilities, system organization and reliability. Prerequisite: computer science 3341 or 5319.

5308. COMPUTER ORGANIZATION II (3-0) 3 hours credit— Continuation of computer science 5307. Topics include various large scale computer organizations, microprogramming, microprocessors, and the uses of microprocessos in various computer organizations. Prerequisite: computer science 5303 and 5307.

5309. ADVANCED COMPUTATIONAL METHODS FOR ENGINEERS AND SCIENTISTS I (3-0) 3 hours credit—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. Prerequisite: computer science 1201 (Fundamentals) or 2306 (Computer Programming and Applications) or equivalent and graduate standing in engineering or science.

5310. ADVANCED COMPUTATIONAL METHODS FOR ENGINEERS AND SCIENTISTS II (3-0) 3 hours credit—A continuation of computer science 5309. Topics in matrix operations,

iterative procedures, quadrature, solution of differential equations, boundary value determination and simulation of physical processes will be studied in context of computer applications. Prerequisite: computer science 5309 or 4301 and consent of instructor.

5311. ADVANCED OPERATING SYSTEMS (3-0) 3 hours credit—This course goes into the structures of batch processing and time-sharing systems, their components, operating characteristics, user services and limitations. Implementation techniques for parallel processing of input-output and interrupt handling. Structure of multiprogramming systems on multiprocessor hardware configurations. Details on addressing techniques, core management, file system design and management, system accounting, and other user related services. System updating, documentation, and operation. Prerequisite: computer science 5303 and a basic knowledge of probability and statistics.

5312. DATA PROCESSING MANAGEMENT (3-0) 3 hours credit—This course presents a comprehensive study of problems associated with management of data processing and computer facilities. Particular emphasis is placed on problems of cost effectiveness, machine configuration, personnel, security, systems planning, and facilities requirements. Prerequisite: computer science 5320 or concurrent.

5313. ALGORITHMIC LANGUAGES (3-0) 3 hours credit—A survey of the use of higher level programming languages to solve common computational problems including scientific, string, list and data processing applications. Languages surveyed will be selected from PL/1, APL, FORTRAN, SNOBOL4 and others. Prerequisite: computer science 1201 or 2302 or 2306 or equivalent and computer science 5319 or concurrent.

5315. COMPUTER NETWORKS AND COMMUNICATIONS SYSTEMS (3-0) 3 hours credit—Study of the hardware and software requirements for network computing facilities. Prerequisite' computer science 5303.

5316. INFORMATION PROCESSING SYSTEMS (3-0) 3 hours credit—A study of data processing systems including project definitions, systems design, project coordination, implementation and documentation. Also includes a study of implementing a Management Information System (MIS). Intended to develop systems analysts and project leaders. Prerequisite: computer science 4306 (Information Structures) or 5319.

5317. APPLICATION OF DIGITAL COMPUTERS TO ENGINEERING PROBLEMS (2-3) 3 hours credit—The analysis of engineering problems from the viewpoint of their expedient computation. Students will acquire a working knowledge of high speed digital computer through the laboratory sessions. Emphasis is placed on those problems which have become accessible by high speed computers. Prerequisite: computer science 4301 or 5309, or mathematics 3345.

5318. COMPUTER APPLICATIONS IN THE SOCIAL SCIENCES (3-0) 3 hours credit—This course is intended to provide the graduate student in the social and behavioral sciences with programming and decision-making techniques which might be needed to support their research. In addition to exercises in programming, there will be applications to statistical problems, authenticity of authorship, computer assisted instruction, and computer simulation of cognitive processes.

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5319. ASSEMBLY LANGUAGE AND INFORMATION STRUCTURES (3-0) 3 hours credit—An accelerated course for students desiring to do graduate work in computer science, but who have only an introduction to computers. Topics include symbolic programming languages, their application to both numeric and non-numeric problems, and a study of information representation and computer processing techniques. Prerequisite: An introductory programming course such as computer science 2302, 2306, or 3301.

5320. SYSTEMS PROGRAMMING (3-0) 3 hours credit—An accelerated course for students desiring to do graduate work in computer science but who have had only an introduction to computers. Topics include operating systems, compiler structures, and assembler/macroassembler features. Prerequisite: computer science 5319 and computer science 5313 or concurrent.

5321. COMPUTERIZED IMAGE MANIPULATION (3-0) 3 hours credit—A study of the representation of alphanumeric characters, graphic shapes and continuously toned images on suitable output devices such as plotter, printer or cathode-ray tube. Prerequisite: computer science 5302.

5322. COMPUTER SIMULATION TECHNIQUES (3-0) 3 hours credit—A study of computer simulation, Monte Carlo modeling, and selected simulation programming languages. Special emphasis will be given to simulations of computer systems. Prerequisites: computer science 1201 (Fundamentals) or 2306 (Computer Programming and Applications), 5320 or equivalent, and a basic knowledge of probability and statistics.

5323. CONTINUOUS SYSTEM MODELING (3-0) 3 hours credit—This course includes a brief survey of languages suitable for digital representation of continuous models. Exercises and projects will be assigned for application to physical systems. Prerequisite: computer science 5322.

5325. DESIGN OF HYBRID COMPUTING SYSTEMS (3-0) 3 hours credit—An introduction to the design and programming of analog/hybrid computing elements in hybrid linked systems. I/O structure of digital process for hybrid applications. Advanced hybrid concepts. Hybrid considerations for real time simulation. Prerequisite: computer science 5307.

5326. LIST PROCESSING AND SYMBOL MANIPULATION (3-0) 3 hours credit—A study of the various list and string manipulation languages is made. Applications are presented in a variety of areas. The design of a list-processing system is considered. Prerequisite: computer science 4302 (Algorithmic Languages) or equivalent and 5301.

5327. MATHEMATICAL THEORY OF COMPUTATION (3-0) 3 hours credit—Semantics and syntax of programming languages, formal systems of proving equivalence of programs, computability and unsolvability, computer proof procedures, and related topics in mathematical logic. Prerequisite: computer science 5304.

5328. INFORMATION PROCESSING (3-0) 3 hours credit— A discussion of basic theoretical methods of information processing is presented. Trade-offs between digital and analog approaches for implementing the methods are emphasized. Topics include methods of signal representation, data conversion, decision making, filtering, digital error problems and machine interaction. Prerequisite: computer science 5307 and a basic knowledge of probability and statistics.

5329. INFORMATION RETRIEVAL II (3-0) 3 hours credit— Advanced file organization including relational data bases, data compression, reorganization and fact retrieval. Document retrieval including classification, content analysis, clustering and performance measures for retrieval systems. Mathematical and statistical models of retrieval. Prerequisite: computer science 5306.

5330. THE COMPUTER AND NATURAL LANGUAGE (3-0) 3 hours credit—This course is for students of literature, linguistics, and computer science interested in using the computer as a research tool in processing natural language. The course consists of a survey of computer applications in processing natural language, an introduction to programming the computer to manipulate natural language, and exploration of appropriate programming languages and useful programming techniques. This course is also listed as English 5330 and Linguistics 5330. Credit will be granted for one of the courses only.

5331. ARTIFICIAL INTELLIGENCE (3-0) 3 hours credit—A survey of the methods and concepts of artificial intelligence. Prerequisite: college calculus, probability, computer science 5301 and advanced programming ability.

5332. THEORETICAL ASPECTS OF INFORMATION SYSTEMS I (3-0) 3 hours credit—Introduction to some basic problems of general systems theory, and the development of a systems algebra for information systems based on matrices and related structures. Discussion, in general terms, of the design and functioning of information systems and the meaning and value of information in a system. Prerequisite: computer science 4306 or 5301 and mathematics 3330 or equivalent.

5333. THEORETICAL ASPECTS OF INFORMATION SYSTEMS II (3-0) 3 hours credit—Application of the systems algebra to specific problems in information theory, including the grouping of processes, consolidation of files, the design of systems, organization of files, and some data processing problems. Prerequisite: computer science 5332.

5398 or 5698. THESIS Variable credit of three or six hours. Prerequisite: graduate standing in computer science.

6192, 6292, 6392. SELECTED TOPICS IN ADVANCED COMPUTER SCIENCE (Variable credit from 1 to 3 hours)—May be repeated for credit when the topics vary. Prerequisite: graduate standing and consent of the instructor.

6197 to 6997. RESEARCH IN COMPUTER SCIENCE Variable credit from one to nine semester hours as approved. Individually supervised research projects. Prerequisite: graduate standing in computer science and approval of Graduate Advisor.

6399, 6699, 6999. DISSERTATION Variable credit of three, six, or nine hours—Preparation pertaining to the doctoral dissertation in computer science and engineering. Prerequisite: admission to candidacy for the doctor of philosophy degree.

CRIMINAL JUSTICE
Programs Division (CRJU)

Area of Study	*Degree*
Criminal Justice	M.A.

The degree is offered as a M.A. in Urban Affairs with Criminal Justice option.

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

Division Director: Mary G. Almore
551 University Hall   273-3071

Graduate Advisor: John R. Price
545 University Hall   273-3075

Graduate Faculty:

Associate Professors Almore, Butcher, Stevens

Assistant Professors Hadar, Price

OBJECTIVES

The Institute of Urban Studies graduate program contains courses designed for advanced education in criminal justice. Students will receive coverage of the total criminal justice system with specific courses oriented to special areas of interest. The program is multi-disciplinary and draws heavily from political science, sociology, law, psychology, public administration, and business administration. Faculty members have diverse backgrounds normally covering several of these areas of study with practical experience in and advanced study of the criminal justice process.

The program is designed for both the practitioner and the student expecting to pursue further study at the doctoral level. A range of courses in administration is offered with supporting courses in special areas of study. Psychological, sociological, and behavioral courses emphasize the human and behavioral environment of criminal justice agencies and provide instruction in the most advanced methods of group and personal communication skills. Current research and innovative techniques for utilizing modern technology serve as the basis for the entire program.

DEGREE REQUIREMENTS

Degree plan selection must be approved by the division.

Thesis: This option is recommended for students who have work experience which is at least equivalent to an internship and/or who intend to pursue further academic study.

Internship: Students with no prior work experience in a criminal justice agency should ordinarily expect to select the internship option. Students who are employed in a criminal justice agency may not utilize their present jobs as internships unless they were employed for fewer than six months prior to enrolling for internship credit.

Non-Thesis: This option will be available only to students who will have completed one year's experience in a criminal justice agency prior to completion of all coursework. Students enrolled in this option must complete at least six semester hours of research and statistics courses at the graduate level.

Each student's coursework will be selected by the student with the advice of his Graduate Advisor and must include one research course and certain specified core courses in Urban Affairs and Criminal Justice. The degree program must ensure full coverage of the criminal justice system while at the same time allowing the student to emphasize areas of special interest. The core courses will be selected to provide a firm interdisciplinary basis for graduate study.

Progress evaluation examinations will be required of all students. These examinations will cover the student's graduate program of study and will be administered by a committee of the graduate faculty.

5305. CRIME AND THE URBAN COMMUNITY (3-0) 3 hours credit—An analysis of the interaction between crime and society considering the concepts of social control, law, deviance, crime and the criminal as these relate to social change, bureaucratization and the political and social ideologies.

5306. THE NATURE OF CRIME (3-0) 3 hours credit—Surveys available data and theories relating to the scope and nature of the crime problem, to the characteristics of offenders, and to factors that are correlated with crime and which increase the probability of criminal careers. Special attention is given to social institutions that play significant roles in the amelioration of the crime problem as it exists in the United States and other cultures. In dealing with individual offenders, the course will emphasize environmental and personality factors that influence criminal behavior, and trace such behavior over time. Attempts to arrive at meaningful and useful classifications of both the individual offender and collective criminal behavior will be undertaken.

5307. DEVIANT BEHAVIOR (3-0) 3 hours credit— Analysis of the psychological and sociological factors involved in delinquent and criminal behavior. Crime and criminal behavior is viewed as one of the many forms of deviation from political, moral and conduct norms of the majority culture. Studies the parallel genesis of crime and other prevalent forms of deviance. Studies the forces that produce conformity and indirectly promote deviation.

5308. ANALYSIS OF PERSONALITY (3-0) 3 hours credit— Examination of personality and the factors leading to growth and development. Emphasizes the problems of personality development relevant to criminal justice agency organization and function. Focuses on operational problems stemming from inadequate personality growth, individual needs, perceived personal insecurity, immaturity, and anxiety.

5309. PUBLIC ORGANIZATIONAL THEORY (3-0) 3 hours credit—Analysis, evaluation, and application of organizational theory to public organizations with an emphasis on criminal justice organizations. Classical organization theory, systems theory and behavioral theory will be emphasized with special reference to the organizational process, personnel mobilization, behavioral change, motivation, and human relations.

5315. THE ADMINISTRATION OF JUSTICE (3-0) 3 hours credit—Analysis of the administrative practices and procedures of criminal justice agencies. Emphasis is placed on the administrative structures of various components of the criminal justice process and the functioning and interrelationships of these units within the total criminal justice system. Topics to be covered will include police administration, judicial administration, and parole, probation, and corrections administration. Students will be expected to select one area of administration for special study.

5319. ADVANCED LAW ENFORCEMENT PRINCIPLES AND PRACTICE (3-0) 3 hours credit—Analyzes the problems, practices, and philosophies of law enforcement in contemporary society. Students shall be expected to give special attention to particular areas such as personnel selection, police-community relations, crisis intervention, patrol innovations.

5325. THE POLITICAL BASIS OF THE CRIMINAL JUSTICE SYSTEM (3-0) 3 hours credit—Examination of political relationships between the components of the criminal justice system, between these agencies and external influence centers, and between these agencies and private influential organizations. Interorganizational relations, political support, legislative relations, administrative relations, and community support will be examined. Emphasis will be placed on the political setting of criminal justice agencies and the nature of effective patterns of behavior in the political process.

5326. CONSTITUTIONAL ISSUES, INDIVIDUAL RIGHTS, AND JUDICIAL BEHAVIOR (3-0) 3 hours credit—Analysis of national and state constitutional issues in regard to protection of individual rights, criminal justice agencies constraints imposed by constitutional guarantees, impact on the criminal justice process, and judicial behavior. Court decisions are examined for their relevance to criminal justice agency operations and for their influence in changing social attitudes and organizational processes.

5327. JUVENILE DELINQUENCY, YOUTH CRIME, AND THE YOUTH CULTURE (3-0) 3 hours credit — Examines the meaning of the concept of juvenile delinquency, the relationship between social attitudes and definitions of law violations, the various forms of delinquency, the youth culture and youth attitudes, and juvenile rights. Emphasis is placed on effective means for official interaction with various subcultures within the youth population and the patterns of behavior necessary for positive attitude development.

5328. DEVELOPMENT OF INTERPERSONAL SKILLS (3-0) 3 hours credit—Provides methods and techniques for facilitating understanding between and among individuals. The purpose of the course will be to increase coping behavior in emotional situations to facilitate understanding of possible solutions. Students will learn how to react in traumatic situations and how to act as stabilizing forces. Verbal and non-verbal communication will be thoroughly examined, in order to demonstrate the impact of personal interaction.

5329. CRIMINAL JUSTICE INFORMATION SYSTEMS (3-0) 3 hours credit—This course emphasizes current and anticipated developments in the area of computerized criminal justice information systems. Current systems at the national, state, regional, and local levels throughout the United States are examined. The course focuses on the system design, purpose, utilization, file content and structure, and security and access limitations.

5335. THE JUDICIAL PROCESS (3-0) 3 hours credit—Examination of the structure and operations of the courts with special attention to the recruitment and activities of the defense bar, prosecuting attorneys, and judges. Principles of court management will also be conveyed. (This course was formerly criminal justice 5317; credit will not be granted for 5317 and 5335.)

5336. INTRAMURAL CORRECTIONS (3-0) 3 hours credit—Analysis of the development of institutional corrections for both adults and juveniles with special attention to contemporary problems and programs such as indeterminant sentencing, work-study release, institutional design and halfway house programs.

5337. EXTRAMURAL CORRECTIONS (3-0) 3 hours credit—Analysis of the development of other than institutional corrections for both adults and juveniles with special attention to contemporary problems and programs including probation, parole, pre-adjudication counseling, day care facilities and working with other community agencies.

5338. CRIMINAL JUSTICE RESEARCH AND METHODS (3-0) 3 hours credit—Examination of criminal justice research and methodology. Emphasis will be placed on significance and importance of research topics, methodological adequacy, theoretical contributions, problems in the conduct of criminal justice research, public policy implications, and problems of implementation. The course will cover data collection techniques, construction of interview schedules and questionnaires, observation techniques, and data processing and analysis.

5339. STATISTICS AND STATISTICAL TECHNIQUES IN CRIMINAL JUSTICE RESEARCH (3-0) 3 hours credit—An introduction to statistical techniques appropriate for use in criminal justice research. Descriptive statistics; scales of measurement; measures of central tendency, variability, and association. Introduction to statistical inference including sampling distribution and tests of significance. Analysis and evaluation of current criminal justice statistical reporting systems.

5395. SPECIAL TOPICS IN CRIMINAL JUSTICE (3-0) 3 hours credit — This course will deal with different topics each semester. The seminar may be repeated for credit as the topic changes.

5396. CONFERENCE COURSE IN CRIMINAL JUSTICE (3-0) 3 hours credit—Reading and research in a specialized area of urban affairs under the direction of a member of the graduate faculty.

5397, 5697, 5997. INTERNSHIP REPORT Variable credit of three, six, or nine hours—Under special conditions, a student may elect an internship report in lieu of the thesis requirement. The report on the internship will meet the same standards of scholarship and writing applied to the traditional thesis.

5398, 5698, 5998. THESIS Variable credit of three, six, or nine hours—A thesis conforming to University and departmental requirements may be prepared by graduate students in criminal justice.

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Department of
ECONOMICS (ECON)

Area of Study	*Degree*
Economics	M.A.

Master's Degree Plan: Thesis only

Chairman: S. T. Keim, Jr.   414-C Business   273-3061

Graduate Advisor: G. B. Duwaji
                    419 Business   273-3061

Graduate Faculty:

Professors Carney, Holland, Keim, McCrea,
   Mullendore, Nelson
Associate Professors Duwaji, Hayashi, McCall,
   Ziegler

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 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 are automatically admitted 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.

A minimum of 30 semester hours, including credit for the thesis, is required. The thesis is normally six hours credit, but may be extended to nine hours credit with permission of the Graduate Advisor in economics. The total may include up to 12

hours in supporting subjects within or outside the department. *Economics*
Nine hours of the total course work may be from the following
advanced undergraduate courses: economics 4304, 4325, account-
ing 4311, 4313, business administration 4322, finance 4313, 4314,
4315, marketing 4311. 4322. Not more than six hours of such
courses may be in either the major or the supporting area. A
minimum of 18 hours, including the thesis, shall be taken in
economics, including a core of economics 5306, 5310, and 5312.
Enrollment in courses, other than this core, will be with the
approval of the Graduate Advisor in economics.

5301. ECONOMIC DEVELOPMENT (3-0) 3 hours credit —
Analysis of selected problems in the economic growth of countries
at various stages of maturity. Prerequisite: permission of Grad-
uate Advisor in economics.

5302. NATURAL RESOURCE ECONOMICS (3-0)—Economio
analysis of natural resouce problems with special emphasis on
the rate of use, the preservation of natural environments, and
the limits to growth. Prerequisite: economics 3310 or equivalent
or industrial engineering 3312.

5304. ADVANCED PUBLIC FINANCE (3-0) 3 hours credit—
Application of welfare theory to government budget policy in
terms of resource allocation and income distribution; economic
effects of particular taxes. Prerequisite: permission of Graduate
Advisor in economics.

5306. STATISTICAL METHODS IN ECONOMICS (3-0) 3
hours credit—This course deals primarily with the application
of statistics to economics. Subject matter includes index num-
bers, the analysis of economic time series, the measurement of
economic aggregates, and the application of regression and cor-
relation analysis to economic problems.

5308. ECONOMIC HISTORY OF THE UNITED STATES
(3-0) 3 hours credit—An analysis of the development of the
major economic institutions accompanying the industrial growth
of the U. S. economy in the 19th and 20th Centuries. Prereq-
uisite: permission of Graduate Advisor in economics.

5309. ECONOMIC ANALYSIS I (3-0) 3 hours credit—This is
an accelerated course in fundamental economic analysis for stu-
dents enrolled in graduate programs other than the Master of
Arts in economics. The basic analytical concepts of price theory
and their application to managerial decisions are developed. The
course includes the theory of consumer behavior, theory of the
firm, and market structure. This course cannot be counted for
credit toward the M.A. economics degree.

5310. MICROECONOMIC THEORY (3-0) 3 hours credit —
Theories of consumer choice and of the firm; marginal produc-
tivity and functional distribution; general equilibrium of produc-
tion, consumption, and exchange.

5311. ECONOMIC ANALYSIS II (3-0) 3 hours credit — This
is an accelerated course in fundamental economics for students
enrolled in graduate programs other than the Master of Arts
in economics. The ideas of economics — related to aggregate
production, income, the under-utilization or over-utilization of
resources, and the operation of the monetary system — are de-
veloped carefully. This course cannot be counted for credit to-
ward the M.A. economics degree.

5312. MACROECONOMIC THEORY (3-0) 3 hours credit — A 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) 3 hours credit—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: economics 3310 or 5309 and permission of Graduate Advisor.

5314. INDUSTRIAL ORGANIZATION (3-0) 3 hours credit— The structure and competitive behavior of industrial markets in the United States enterprise economy; the determinants of market structure; theory of industrial pricing; product differentiation policies of industrial firms and market structure; performance of industrial markets in achieving economic goals of efficiency in allocation and use of resources, technological progress, full employment, and equity in income distribution; public policy towards structure, behavior, and economic performance of industrial markets. Prerequisite: Economics 3310 or equivalent and six additional hours of advanced economics and permission of Graduate Advisor.

5316. MATHEMATICAL ECONOMICS (3-0) 3 hours credit— Mathematical methods useful in economics; differential calculus; determinants and matrices. Prerequisite: permission of Graduate Advisor in economics.

5321. INTERNATIONAL ECONOMICS (3-0) 3 hours credit— International trade and policy issues; balance-of-payments and adjustment processes; international monetary arrangements; contemporary problems in international economics. Prerequisite: permission of Graduate Advisor in economics.

5324. MONETARY AND FISCAL ECONOMICS (3-0) 3 hours credit — Analysis of the effects of central bank policy and government spending and taxation on income and employment; public debt management. Prerequisite: permission of Graduate Advisor in economics.

5326. HISTORY OF ECONOMIC THOUGHT (3-0) 3 hours credit — Traces the development of economic ideas and systems of thought from earliest times to the founding of political economy as a distinct discipline, with emphasis upon the classical school, marginalism, socialism, institutionalism, and the Keynesian analysis. The various schools of thought are set against the social and political events of their times. Prerequisite: permission of Graduate Advisor in economics.

5327. INTERNATIONAL FINANCE (3-0) 3 hours credit—This course examines the nature and uses of the various instruments of international payment, the effects of foreign investment, the nature and functions of international financial institutions, and the current international payments system, with emphasis on recent developments. Prerequisite: permission of Graduate Advisor.

5329. ARBITRATION AND DISPUTE SETTLEMENT (3-0)— This course is a study of the theory and practice of dispute settlement, with special attention to the role of voluntary/compulsory arbitration in the settlement of private and public labor/management disputes over contract negotiation and interpretation. Attention is also given to the nature of conflict resolution generally, including constitutionalism and due process in government as well as private organizations. Particular focus will be upon the economic/productivity implications of alternative

modes of dispute resolution. Prerequisite: economics 4330 and *Economics* permission of Graduate Advisor.

5330. ADVANCED LABOR ECONOMICS (3-0) 3 hours credit — An analysis of the major forces influencing the supply of and the demand for labor and the economic rationale governing the determination of factor income. This course was formerly economics 5335; credit will not be granted for both 5335 and 5330. Prerequisite: permission of Graduate Advisor in economics.

5331. URBAN ECONOMICS (3-0) 3 hours credit—An analysis of urban problems and goals with special attention given to those factors that influence the economic development of urban communities and the quality of urban life. Attention is given to policy formulation as a means for urban problem solving. Prerequisite: consent of instructor and permission of Graduate Advisor.

5336. ECONOMETRICS (3-0) 3 hours credit — Adaption of mathematical and statistical methods to analysis of economic problems; estimation problems in time-series, e. g., autocorrelation, least square bias and colinearity; contemporary econometric work. Prerequisite: permission of Graduate Advisor in economics.

5338. SEMINAR (3-0) 3 hours credit — Topics covered to vary from semester to semester. Prerequisite: permission of Graduate Advisor in economics.

5340. ADVANCED MANPOWER ECONOMICS (3-0) 3 credit hours—The development of human resources, including the role of education, labor market institutions, manpower programs and manpower policy. Prerequisite: consent of Graduate Advisor.

5350. ECONOMIC FOUNDATIONS FOR THE SOCIAL SCIENCES — I (3-0) 3 hours credit—This is an accelerated course in microeconomic analysis designed for those who are seeking master's degrees in other social sciences. The course emphasizes the application of microeconomic theory to the study of current social problems, i.e., pollution, poverty, energy systems, etc. This course is not acceptable for credit in the M.A. in economics or the M.B.A. programs. Prerequisite: consent of the instructor.

5351. ECONOMIC FOUNDATIONS FOR THE SOCIAL SCIENCES — I (3-0) 3 credit hours—This is an accelerated course in macroeconomic analysis designed for those seeking master's degrees in other social sciences. The course emphasizes the application of macroeconomic theory to the solution of aggregate problems of the economic system, i.e., unemployment, inflation, growth, etc. This course is not acceptable for credit in the M.A. in economics or the M.B.A. programs. Prerequisite: consent of the instructor.

5191, 5291, 5391. RESEARCH AND SPECIAL TOPICS IN ECONOMICS (Variable credit as arranged).

5398, 5698, or 5998. THESIS 3, 6 or 9 hours credit. Prerequisite: permission of Graduate Advisor in economics.

Department of EDUCATION (EDUC)

Chairman: Jon W. Wiles   304 Carlisle   273-2591

Graduate Faculty:
Professor Mohn
Associate Professors Buckner, Crow, Wiles
Assistant Professors Beach, Brooks, Leffingwell

OBJECTIVE

The graduate course offerings in education are provided to support other graduate programs and meet expressed needs of students. The courses are designed to synthesize the theory and the application of professional skills. No program leading toward a graduate degree in education exists at the present time.

5301. SOCIO-CULTURAL FOUNDATIONS OF EDUCATION (3-0) 3 hours credit—An examination of historical and current socio-cultural conditions which influence education. Emphasis is given to literature that discusses the problems of socialization, acculturation, assimilation, education opportunity, and the social, cultural, historical, and philosophical forces that shape educational policies and programs. Prerequisite: permission of instructor.

5320. ADVANCED EDUCATIONAL TESTS AND MEASUREMENTS (3-0) 3 hours credit—An analysis of educational testing comprises the core of the course. Experience with selected standardized tests is required; i.e., students will be responsible for test administration, interpretation, and application of appropriate techniques. Prerequisite: permission of instructor.

5325. DIAGNOSIS AND REMEDIATION OF READING DIS-ABILITES (3-0) 3 hours credit—This course covers the proficient administration of a battery of diagnostic tests related to analyzing reading difficulties. Emphasis is given to interpreting test results, writing diagnostic reports, and designing individual remediation programs. Prerequisite: education 4325 and permission of instructor.

5390. SELECTED TOPICS IN EDUCATION (3-0) 3 hours credit—An examination of different topics each semester with a focus on such subjects as the gifted student, the education of minorities, the open concept school, or other selected topics concerning the teaching-learning process. This seminar may be repeated for credit as the topic changes. Prerequisite: permission of instructor.

Department of
ELECTRICAL ENGINEERING (EE)

Areas of Study	*Degrees*
Electrical Engineering	**M.S.**
Engineering: Undifferentiated (See Interdepartmental and Intercampus Programs, p. 201)	**PH.D.**

Master's Degree Plans: Thesis and Non-Thesis

Chairman: Floyd L. Cash   317A Engineering   273-2671

Graduate Advisor: Charles W. Jiles
317H Engineering   273-2671

Graduate Faculty:

Professors Cash, Chen, Crumb, Jiles, Rao, Salis, Spradlin

Associate Professors Cannon, Fitzer, Potvin, Smith

Assistant Professor Dillon

OBJECTIVE

The course offerings provide the student with an opportunity to broaden as well as to intensify his 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. Analysis and Synthesis of Circuits, Networks and Systems
2. Electromagnetic Fields and Related Topics
3. Electronics—Solid State Theory, Device and System Theory
4. Power Systems—Efficient Operation and Planning in Generation, Transmission, and Distribution
5. Information Transmission and Communication Systems
6. Digital Logic and Systems
7. Interdisciplinary Programs in Materials Science, Direct Energy Conversion, Stability and Control/Automatic Controls, and Bioengineering.

The program is designed to satisfy the needs of students pursuing masters and doctoral degrees and to provide for the student seeking to increase his knowledge in areas of electrical engineering related to his engineering profession. **111**

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 disciplines may qualify for graduate study in electrical engineering after completion of a faculty-approved program of undergraduate courses.

Masters level students will ordinarily be expected to complete the requirements for the master's degree with thesis. In some cases, with express written approval of the department, the master's degree without thesis will be allowed. Consult the department Graduate Advisor for details.

The electrical engineering faculty has established a core curriculum for the Master of Science degree. The four courses in the core curriculum are marked with an asterisk. Students admitted to the program beginning in Fall Semester, 1974 must take electrical engineering 5313 and at least one of the other three core courses.

5302. PRINCIPLES OF COMPUTER-AIDED DESIGN (3-0) 3 hours credit—Mathematical theory and numerical techniques of problem-oriented languages and automated design. Prerequisite: electrical engineering 4321 (Computer-Aided Design I).

5303. SEMICONDUCTOR ELECTRONICS I (3-0) 3 hours credit—The physics, modelling, and design of bipolar semiconductor devices and circuits.

5312. PROPAGATION OF ELECTROMAGNETIC WAVES (3-0) 3 hours credit—Diffraction, reflection and refraction of electromagnetic waves at plane and spherical boundaries; propagation in ionized media. Prerequisite: electrical engineering 3214 or equivalent.

*5313. ADVANCED ENGINEERING ANALYSIS (3-0) 3 hours credit—A problem course dealing with selected analytical methods not normally included in undergraduate electrical engineering curricula.

5314. NON-LINEAR SYSTEMS ANALYSIS (3-0) 3 hours credit — Introduction to analytical and topological methods of non-linear analysis, including phase plane, limit cycles, describing functions, sub-harmonic oscillations, etc.

*5315. LINEAR SYSTEMS ENGINEERING (3-0) 3 hours credit—An introductory course in the mathematical foundations of systems engineering. Both continuous and discrete data systems are considered.

5316. STATISTICAL DESIGN OF LINEAR SERVOMECHANISMS (3-0) 3 hours credit—Analysis and synthesis techniques applicable to feedback control systems in which portions of the system and/or its input signals are nondeterministic. Prerequisite: electrical engineering 4314 or equivalent.

5317. DISCRETE DATA SYSTEMS (3-0) 3 hours credit—The analysis of non-continuous dynamic systems described by difference equations, Z-transform theory, and including applications of signal flow graph theory. Prerequisite: electrical engineering 4314 or equivalent.

5318. NETWORK SYNTHESIS II (3-0) 3 hours credit — A continuation of passive network driving point and transfer function synthesis, extending the introductory material of electrical

engineering 4317. Prerequisite: electrical engineering 4317 and mathematics 4322 (Complex Variables).

5319. NETWORK SYNTHESIS III (3-0) 3 hours credit—A continuation of passive network synthesis, with emphasis on transfer function synthesis. Related topics such as predistortion, single and double terminations, and low-pass to band-pass transformations are included. Prerequisite: electrical engineering 5318 or equivalent.

5320. MODERN CONTROL THEORY (3-0) 3 hours credit—Linear algebra, Euclidean spaces, properties of sets, vector functions, function space and related mathematical notions. The concept of system state, finding the state representation for dynamical systems, definition of the control problem, and the concepts of controllability and observability. Conditions for optimality, the variational approach to the control problem, the maximum principle of Pontryagin, and the Hamilton-Jacobi equation. Prerequisite: electrical engineering 4314 or equivalent.

5321. MODERN CONTROL DESIGN TECHNIQUES (3-0) 3 hours credit—Minimum time problems, minimum fuel problems, minimum energy problems and the derivation of necessary conditions. The design of time optimal and fuel optimal systems, and the design of optimal linear systems with quadratic criteria. Prerequisite: electrical engineering 5320.

5322. RANDOM SIGNALS AND NOISE (3-0) 3 hours credit—Probability, random variables, stochastic processes in physical systems, signal detection, design of optimum filters are included.

5323. STATISTICAL DETECTION AND ESTIMATION THEORY (3-0) 3 hours credit—Statistical detection or decision theory and estimation theory as applied to modern communications systems, radar/sonar systems, stochastic control theory, and data processing systems. Prerequisite: electrical engineering 5322.

5324. DIGITAL COMPUTER DESIGN (3-0) 3 hours credit—Organization and design of digital computer systems and subsystems. Prerequisite: electrical engineering 5328.

5326. ADVANCED COMMUNICATION THEORY (3-0) 3 hours credit—Continuation of study of communications problems and techniques, with emphasis shifting to specific areas such as radar detection, space communications, etc. Prerequisite: electrical engineering 5322, 5323.

5327. INFORMATION THEORY AND CODING (3-0) 3 hours credit—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: electrical engineering 5322.

5328. LOGIC CIRCUITS II (3-0) 3 hours credit—Advanced combinatorial and sequential digital system design. Prerequisite: electrical engineering 4336 or 5442.

5329. DIGITAL SIGNAL PROCESSING (3-0) 3 hours credit—Study of discrete linear systems; design and analysis of digital filters; high speed convolution and correlation with applications to digital filtering and linear filtering. Prerequisite: electrical engineering 5334 or consent of instructor.

5330. APPLICATIONS OF OPTIMIZATION THEORY (3-0) 3 hours credit—Various search techniques for obtaining numerical solutions to the two-point boundary value problem are developed. Linear (simplex), nonlinear, and dynamic programming methods are applied. Prerequisite: electrical engineering 5320 or equivalent.

5331. DIGITAL IMAGE PROCESSING (3-0) 3 hours credit—This course deals with image processing as applied to image coding, image restoration, image data extraction, image enhancement and image analysis. Application of orthogonal transforms and other techniques in image processing are emphasized. Prerequisite: electrical engineering 5334 or consent of instructor.

*5332. ELECTROMAGNETIC THEORY (3-0) 3 hours credit—This course is an advanced study of electromagnetic theory, its content, methods, and applications. Topics include boundary value problems, propagation in bounded structures, forces in quasi-static systems, scattering and diffraction.

*5333. ADVANCED ELECTRONICS (3-0) 3 hours credit—This course is an advanced study of electronic devices, modeling, and analysis techniques. Topics include large and small signal device characterization, quiescent point problem, linear systems design, and nonlinear systems analysis.

5334. DISCRETE ORTHOGONAL TRANSFORMS AND THEIR APPLICATIONS (3-0) 3 hours credit—Development of discrete orthogonal transforms such as DFT, BIFORE, Complex BIFORE, and Chirp Z-Transforms, and the application of such transforms in signal processing. Also, the development of efficient algorithms for fast computation of transforms will be discussed. Prerequisite: graduate standing and consent of instructor.

5335. MICROWAVE SYSTEMS ENGINEERING (3-0) 3 hours credit—Study of the relationships between system parameters and system performance in pulsed, C-W, doppler and monopulse radars.

5337. INFORMATION TRANSMISSION BY DISCRETE ORTHOGONAL FUNCTIONS (3-0) 3 hours credit—This course covers information transmission by discrete orthogonal functions, sequency filters for time and space signals, direct and carrier transmission of signals, and application of orthogonal functions to statistical problems. Prerequisite: graduate standing and consent of instructor.

5339. SEMICONDUCTOR ELECTRONICS II (3-0) 3 hours credit—The physics, modelling, and design of MOS semiconductor devices.

5340. INTEGRATED CIRCUIT TECHNOLOGY (1-5) 3 hours credit—The fundamentals of integrated circuit processing. Prerequisites: electrical engineering 5303 and 5339 or concurrent.

5360. POWER SYSTEM LOAD FLOW ANALYSIS (3-0) 3 hours credit—Solution of large sparse matrix equations and application of load flow study to power system planning and operation. Prerequisite: electrical engineering 4333.

5361. POWER SYSTEM DYNAMICS (3-0) 3 hours credit—Theory of advanced synchronous machines, steady-state stability, transient stability and dynamic stability of a power system. Prerequisite: electrical engineering 4333.

5362. POWER SYSTEM OPERATIONS (3-0) 3 hours credit—Economic and security methods in power system operation. Prerequisite: electrical engineering 4333.

5363. SHORT CIRCUIT ANALYSIS AND PROTECTION OF AN ELECTRICAL POWER SYSTEM (3-0) 3 hours credit—Power system short circuit calculations with symmetrical component models and bus impedance matrix representation. Application of system protection to faulted power system components. Prerequisite: electrical engineering 4333 and knowledge of fundamentals of power system protection.

5364. INDUSTRIAL POWER SYSTEMS (3-0) 3 hours credit—Primary and secondary distribution systems, power systems for commercial buildings, modernization and expansion of existing power systems, system grounding, selection of system voltages, power factor improvement and system protection.

5365. D.C. TRANSMISSION (3-0) 3 hours credit—Analysis and application of D.C. transmission links in A.C. power systems. Operation of A.C.-D.C. converters.

5366. APPLICATION OF STOCHASTIC METHODS FOR POWER SYSTEM ANALYSIS (3-0) 3 hours credit—Application of statistical techniques to evaluate integrity of power system networks. Planning and operation of power systems for maximum reliability.

5367. SELECTED TOPICS IN POWER SYSTEM ENGINEERING (3-0) 3 hours credit—Includes a wide variety of topics in generation, transmission, and distribution.

5390. ELECTRICAL ENGINEERING GRADUATE SEMINAR (3-0) 3 hours credit—Topics covered by this seminar may vary from semester to semester. This course may be repeated for credit. Prerequisite: graduate standing or consent of the department. This course will be graded on a pass-fail (P-F) basis.

5392. SELECTED TOPICS IN ELECTRICAL ENGINEERING (3-0) 3 hours credit—The material covered may vary from semester to semester. Topics included will be from one of the following fields:

1. Electronics
2. Power Systems Analysis
3. Information Theory
4. Plasma Engineering
5. Servomechanisms and Controls
6. Electromagnetic Theory and Practices
7. Engineering Analysis

This course may be repeated for credit if different topics are covered for each registration.

5442. LOGIC CIRCUITS I (3-3) 4 hours credit—Introduction to combinatorial and sequential systems design. Prerequisite: graduate standing. Credit will not be given for both electrical engineering 5442 and 4336.

5445. SYNTHESIS OF LINEAR SERVOMECHANISMS (3-3) 4 hours credit — An extension of the introductory material in electrical engineering 4314, with emphasis on compensation techniques and a-c carrier systems. Laboratory included. Prerequisite: electrical engineering 4314 or equivalent. $5 lab fee.

5452. ELECTROMAGNETIC RADIATION (3-3) 4 hours credit—The theory of electromagnetic radiation at microwave frequencies. $5 lab fee.

5191, 5291, 5391. RESEARCH IN ELECTRICAL ENGINEERING (Variable credit from 1 to 3 semester hours as arranged) — Individually approved research projects leading to preparation and submission of a master's thesis in electrical engineering.

5193. MASTER'S COMPREHENSIVE EXAMINATION (1-0) 1 hour credit—Directed study, consultation and comprehensive examination over course work, leading to the non-thesis Master of Science degree in electrical engineering. This course will be graded on a pass-fail (P-F) basis. Required of all non-thesis M.S. students in the semester when they plan to graduate.

5398, 5698, 5998. THESIS Variable credit of three, six, or nine hours. Prerequisite: graduate standing in electrical engineering. 115

6197, 6297, 6397, 6697, 6997. RESEARCH IN ELECTRICAL ENGINEERING (1, 2, 3, 6 or 9 hours credit)—Individually approved research projects leading to a doctoral dissertation in the area of electrical engineering.

6399, 6699, 6999. DISSERTATION Variable credit of three, six, or nine hours—Preparation and submission of a doctoral dissertation in an area of electrical engineering. Prerequisite: admission to candidacy for the Ph.D. in engineering.

A limited number of the following courses may be applicable toward the graduate program if approved in advance by the Graduate Advisor.

4304. ELECTRICAL MACHINERY
4305. PRINCIPLES OF DIRECT ENERGY CONVERSION
4312. ELECTROMAGNETIC FIELDS
4314. SERVOMECHANISMS AND CONTROLS
4317. INTRODUCTION TO NETWORK SYNTHESIS
4321. COMPUTER AIDED DESIGN
4326. MICROWAVES
4327. THEORY AND DESIGN OF ANTENNAS
4330. INFORMATION TRANSMISSION
4331. EFFECTS OF NOISE IN COMMUNICATION SYSTEMS
4332. ELECTRONIC DEVICES
4333. INTRODUCTION TO THREE-PHASE POWER SYSTEMS
4336. DIGITAL CIRCUITS
4337. COMPUTING CIRCUITS
4339. DESIGN OF ELECTRONIC CIRCUITS

> **NOTE:** For course offerings in **computer software, see** Computer Science section.

ENGINEERING: UNDIFFEREN-TIATED

See Interdepartmental and Intercampus Programs,
p 201

ENGINEERING MECHANICS Program

Department of
ENGLISH (ENGL)

Areas of Study	*Degrees*
English	M.A.
Humanities (See Interdepartmental and Intercampus Programs, p.206)	M.A., PH.D.
Teaching (See Interdepartmental and Intercampus Programs, p.206)	M.A.T.

Master's Degree Plan: Thesis only

Chairman: Emory D. Estes

203 Carlisle Hall   273-2692

Graduate Advisor: Simone F. Turbeville

202 Carlisle Hall   273-2701

Graduate Faculty:

Professors Eichelberger, Estes, Fortenberry, Garner, Goyne, Green, Kauffman, Kendall, Littlefield, McDowell, Turner, Whaling

Associate Professors Beaudry, Burns, Frank, Golladay, Lacy, Lewis, Moffett, Richardson, Roemer, Rogers, Sewell, Swadley, Turbeville, Zacha

Assistant Professors Reddick, Ryan

OBJECTIVE

Study toward the master's degree in English at The University of Texas at Arlington aims at professional competency in literature and language. In literature the student is directed toward sound critical judgment of English and American writings in context. He is trained in the techniques of research, teaching, and writing as preparation for a career suited to his personal inclinations. In language he is schooled in historical and contemporary approaches to the development and description of English. The aims are an understanding of linguistic phenomena and the application of this knowledge to teaching at various levels and to using the language precisely, appropriately, and imaginatively. Sufficient variety in course offerings alows the student to direct his degree plan toward a terminal Master of Arts degree or toward further graduate study.

For the Master of Arts degree in English, a minimum of 30 semester hours is required: a minimum registration of six hours for the thesis and a minimum of 24 hours of course work at the 5000 or 6000 level. Advanced undergraduate courses are not acceptable for graduate credit.

The course work of the master's candidate will be approved in advance by the Graduate Advisor, who should be consulted on all problems related to the student's program. Three regular counseling sessions will be scheduled each year, in December, April, and August. Notification of specific time and place will be sent to all students who have been accepted in the graduate program.

Each student will select his thesis topic in consultation with the supervising professor. Before the student registers for thesis, the names of the readers, the title of the thesis, a prospectus, and bibliography of major sources must be approved by the Graduate Studies Committee.

With the prior permission of the Graduate Advisor, the master's candidate may submit six hours of course work in appropriate graduate minor field outside the Department of English.

Graduate standing is prerequisite for the courses listed below. Any course may be repeated for credit as often as its 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.

5301. MEDIEVAL ENGLISH LITERATURE (3-0) 3 hours credit—English literature of the period before 1500. Subject matter may include Old English poetry, Anglo-Latin prose, William Langland, the alliterative revival, romances, Malory, and Chaucer

5302. TUDOR AND JACOBEAN LITERATURE (3-0) 3 hours credit—English literature from the reigns of Henry VII through James I. Subject matter may change according to the chosen emphasis on major figures such as Spenser; development of one or more genres, excluding drama; representative works; or significant themes and ideas.

5303. SEVENTEENTH CENTURY ENGLISH LITERATURE (3-0) 3 hours credit—Poetry and prose of the 17th Century. The subject matter may include a detailed study of Milton or a comprehensive study of writers and motifs of the period.

5304. EIGHTEENTH CENTURY ENGLISH LITERATURE (3-0) 3 hours credit—Age of Enlightenment, Reason, Satire, Neoclassicism. Subject matter varies from an intensive study of the entire period to highly concentrated work in a particular genre or in one or more major authors (Dryden, Pope, and Swift; Defoe and Fielding; Johnson and Boswell).

5305. THE ROMANTIC PERIOD IN ENGLISH LITERATURE (3-0) 3 hours credit—Thorough study of the works of one or more of the major romantic poets (Blake, Wordsworth, Coleridge, Byron, Shelley, Keats), supplemented by readings in the general literature and criticism of the period.

5306. ENGLISH LITERATURE OF THE VICTORIAN AGE (1830-1890) (3-0) 3 hours credit—Ideas, themes, and forms in such writers as Carlyle, Arnold, Mill, Tennyson, Browning, and Clough, with attention to the Victorians as descendents of romanticism and precursors of modernism.

5307. TWENTIETH CENTURY ENGLISH POETRY (3-0) 3 *English* hours credit—A study of the major poetry or non-fiction prose of this century. Emphasis may vary from a concentration on certain writers such as Yeats and Eliot to significant movements or themes.

5308. SHAKESPEARE (3-0) 3 hours credit—A study of representative works of Shakespeare. Emphasis 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) 3 hours credit—A study of 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) 3 hours credit—A study of British fiction in which subject matter may vary according to the following organizations: (1) historical periods, (2) a major figure or figures, (3) development of themes or types.

5311. WORLD LITERATURE WRITTEN IN ENGLISH (3-0) 3 hours credit—English-language literature outside England and the United States: works by writers from African nations, Australia, Canada, India, New Zealand, the West Indies, and other areas significant for English-language writing.

5315. PRINCIPLES OF LITERARY CRITICISM (3-0) 3 hours credit.

5320. SELECTED READINGS IN AMERICAN LITERATURE BEFORE 1800 (3-0) 3 hours credit—A survey designed to establish the diversity of our early literature. Readings will include Indian oral literature, travel accounts, Puritan writings, diaries, autobiography (Franklin), poetry, drama, and fiction. The cultural context of the works is stressed.

5321. AMERICAN LITERATURE TO 1861 (3-0) 3 hours credit —Literature of the colonial period and the formative years of the republic may be surveyed briefly, but emphasis is on significant, representative literary contribution after 1800. Focal attention may be given to major writers individually or in selected groups, New England transcendentalism, the romantic temper, poetry.

5322. AMERICAN LITERATURE 1860-1910 (3-0) 3 hours credit—Focus is on significant, representative literature of the period. Among the specific offerings may be these: the work of Twain, Howells, James (in combination or separately); the lesser realists; regional literature; the social novel; the naturalistic temper; utopian fiction; poetry.

5323. AMERICAN LITERATURE SINCE 1910 (3-0) 3 hours credit—A study of modern American literature, this course may center on genre, major writers individually or in selected groups, thematic patterns.

5330. THE COMPUTER AND NATURAL LANGUAGE (3-0) 3 hours credit—This course is also listed as linguistics 5330 and computer science 5330. Credit will be granted for one of the courses only.

5331. HISTORY OF THE ENGLISH LANGUAGE (3-0) 3 hours credit—A study of the internal history of our language, this course presents a chronological treatment of the phonological, morphological, and syntactical development from prehistoric times to the present.

5333. APPLIED ENGLISH LINGUISTICS (3-0) 3 hours credit —Designed for the professional teacher of English, this course places transformational-generative grammar into the context of earlier forms of language study and then presents a relatively detailed grammar of English.

5335. FUNDAMENTALS OF BIBLIOGRAPHY (3-0) 3 hours credit.

5337. SEMINAR IN BASIC SECONDARY SCHOOL AND COLLEGE ENGLISH TEACHING (3-0) 3 hours credit.

5340. LITERARY CRITICISM (3-0) 3 hours credit—The course will alternate between a historical-theoretical approach and a practical emphasis on its subject matter. Development of principles of literary criticism from ancient through modern times, or application of those approaches to literary criticism that have proved most fruitful for 20th Century scholars.

5341. THE CLASSICAL INFLUENCE (3-0) 3 hours credit— A comprehensive study of classical works and English literary works. A study in genres, themes, transmission, iconology, and influences.

5342. COMPARATIVE MEDIEVAL LITERATURE (3-0) 3 hours credit—A comparative study of western Medieval literature. A study in genres, themes, iconology, and movements.

5343. COMPARATIVE RENAISSANCE LITERATURE (3-0) 3 hours credit—A comparative study of western literature from the Stilnovisti to Donne. A study in genres, iconology, themes, movements, and the interrelation of the arts.

5344. COMPARATIVE LITERATURE OF THE BAROQUE AGE (3-0) 3 hours credit—A comparative study of western literature in the 17th Century. A study in genres, motifs, iconology, themes, movements, and the interrelation of the arts.

5345. COMPARATIVE LITERATURE OF THE EIGHTEENTH CENTURY (3-0) 3 hours credit—A study of major — and interdependent — western literary traditions during the century of literary ferment that includes the Age of Reason and gives rise to that of Romanticism. Emphasizes, though not exclusively, the literatures of France, England, and Germany.

5346. COMPARATIVE NINETEENTH CENTURY LITERATURE (3-0) 3 hours credit—A comparative study of western literature in the 20th Century. A study in genres, movements, themes, and iconology.

5347. COMPARATIVE TWENTIETH CENTURY LITERATURE (3-0) 3 hours credit—A comparative study of western literature in the 20th Century. A study in movements, themes, genres, and iconology.

5348. COMPARATIVE LITERATURE: THE INFLUENCE OF ORIENTAL AND SOUTH ASIAN LITERATURE (3-0) 3 hours credit—A study of selected classics from China, Japan, and India; an investigation of the influence of Oriental and South Asian works in the West, particularly on 19th and 20th Century writers.

5388. SEMINAR IN INTERMEDIATE COLLEGE ENGLISH TEACHING (3-0) 3 hours credit.

5389. ISSUES IN TEACHING COMPOSITION (3-0) 3 hours credit—The first half of the semester is a seminar for investigating problems of and approaches to teaching composition; the second half is spent in internship.

5390. ISSUES IN TEACHING LITERATURE (3-0) 3 hours *English* credit—The first half of the semester is a seminar for investigating problems of and approaches to teaching literature; the second half is spent in internship.

5391. GRADUATE READINGS IN LITERATURE (3-0) 3 hours credit. May be taken only with the permission of the instructor and after consultation with the Graduate Advisor.

5398, 5698, 5998. THESIS Variable credit of three, six, or nine hours—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.

6400. SEMINAR IN OLD ENGLISH LITERATURE (4-0) 4 hours credit.

6309. SEMINAR IN SEVENTEENTH-CENTURY ENGLISH LITERATURE (3-0) 3 hours credit.

6310. SEMINAR IN WORLD LITERATURE (3-0) 3 hours credit.

6326. SEMINAR IN TWENTIETH-CENTURY AMERICAN LITERATURE (3-0) 3 hours credit.

6331. DESCRIPTIVE BIBLIOGRAPHY (3-0) 3 hours credit.

6336. SEMINAR IN UNIVERSITY-LEVEL ENGLISH PEDAGOGY (3-0) 3 hours credit.

6391. GRADUATE READINGS IN LITERATURE (3-0) 3 hours credit—May be taken only with the permission of the instructor and after consultation with the Graduate Advisor.

Department of FOREIGN LANGUAGES AND LINGUISTICS

Areas of Study	*Degrees*
Foreign Language (FORL)	M.A.
Linguistics (LING)	M.A.
Humanities (See Interdepartmental and Intercampus Programs, p.206)	M.A., PH.D.
Teaching (See Interdepartmental and Intercampus Programs, p.206)	M.A.T.

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

Chairman: Virgil L. Poulter

           221A Hammond Hall 273-3161

Graduate Advisor: Ted E. Frank

           221E Hammond Hall 273-3161

Graduate Faculty:

    Professors Adams, Jett, Longacre, Monostory, Stuart

    Associate Professors Acker, Frank, Gibson, Keilstrup, Poulter, Sanchez, Steinecke

    Assistant Professors Nogueira-Martins, Studerus, Vina, Williams

    Adjunct Professors Mayers, Merrifield, Rensch

    Adjunct Associate Professors Greenlee, Hale, Huttar, Peck, Robbins, Thomas

    Adjunct Assistant Professors Burquest, Lee

OBJECTIVES

Foreign Languages (French, German, Spanish)

Graduate programs in foreign languages are designed to enhance the student's competence in the language and literature of his major language field. The specific objectives are to prepare the student for a career in teaching or in any area in private or public life in which the knowledge of a foreign language is essential, and to help him to develop the techniques of independent research necessary for work beyond the master's level.

Courses are available in French, German, Portuguese, Russian, Spanish, and linguistics. The program will permit Master of Arts degrees in French, Spanish, and German.

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, and some other areas.

DEGREE REQUIREMENTS

In addition to the Graduate School requirements for Master's degree programs, the following requirements apply to foreign language and linguistics students:

Thesis: There will be an oral defense of the thesis. A written comprehensive examination may be given at the discretion of the student's committee.

Thesis Substitute: There will be an oral examination on the research paper and a written comprehensive examination on the course work and appropriate reading list.

Non-thesis: There will be a comprehensive written examination on the course work and an appropriate reading list.

A minor is optional for degrees in foreign languages and linguistics. A maximum of one-quarter of the total number of course hours may be taken in an approved minor field outside the Department of Foreign Languages and Linguistics or in an approved language, literature, or linguistics area within the department.

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. In addition to requirements outlined elsewhere, the department may in some circumstances require that the candidate take the Modern Language Association Cooperative Test.

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 course work at the second year level or by an appropriate examination.

Linguistics

Candidates upon admission or early in the graduate program must present the following prerequisite undergraduate courses (or pass appropriate examinations): introduction to descriptive linguistics, the equivalent of four semesters (undergraduate) of one non-Indo-European language, introductory courses in articulatory phonetics, phonology, grammar, and a problems course in grammatical analysis. **123**

THE INTERNATIONAL LINGUISTICS CENTER
(THE SUMMER INSTITUTE OF LINGUISTICS)

The International Linguistic Center in Dallas (near Duncan-ville) and The University of Texas at Arlington offer coopera-tively a program in linguistic training and research. This pro-gram leads to the M.A. degree at UT Arlington with a major or minor in linguistics, to the M.A., M.A.T., or Ph.D. in Humanities with a concentration in linguistics, or to an undergraduate minor in linguistics. The curricula are listed in the UT Arlington un-dergraduate and graduate catalogs. ILC requirements and pro-cedures appear in ILC catalogs, but degree requirements are those specified by UT Arlington. Participants must apply for admission to UT Arlington. Courses may be taken for credit by students who are not pursuing a degree, provided they qualify for admission.

Persons who wish to pursue the program at ILC but who are not eligible for admission to UT Arlington may register as audit-ing students by arrangement 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.

FRENCH (FREN)

Students pursuing the M.A. degree in French must take at least one course in each of: (1) History of the French Language; (2) French Literature through the Renaissance or Structure of the French Language; (3) Seventeenth-Century Literature; (4) Eighteenth-Century Literature; (5) Nineeenth Century Litera-ture; (6) Twentieth-Century Literature.

5101. TEACHING PRACTICUM I (1-0) 1 hour credit—Re-quired of all Teaching Assistants in French in their first semes-ter. This course may not be counted toward a master's degree.

5102. TEACHING PRACTICUM II (1-0) 1 hour credit—Re-quired of all Teaching Assistants in French in their second semester. This course may not be counted toward a master's degree.

5135. INTRODUCTION TO ROMANCE BIBLIOGRAPHY AND METHODS OF RESEARCH (1-0) 1 hour credit — This course is designed to aid graduate students in preparing theses or dissertations.

5190. CONFERENCE COURSE IN FRENCH LANGUAGE AND LITERATURE (1-0) 1 hour credit—This course will be graded on a pass-fail (P-F) basis. Prerequisite: permission of Graduate Advisor.

5300. HISTORY OF THE FRENCH LANGUAGE (3-0) 3 hours credit—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 repre-senting Romance, Old French, middle and Renaissance and classi-cal French at various stages in the development of the language.

5301. OLD PROVENCAL (3-0) 3 hours credit—A study of the phonology of Old Provencal followed by readings in Old Pro-vencal love lyrics.

5302. OLD FRENCH (3-0) 3 hours credit—Old French phonology, morphology and syntax followed by reading and in-depth study of the *Chanson de Roland.*

5303. READINGS IN OLD FRENCH (3-0) 3 hours credit — Course may include works by Marie de France, Chretien de Troyes, selected *Fabliaux,* Lives of Saints, and other works. Materials vary to suit needs of students.

5304. STUDIES IN FRENCH, GRAMMAR, PHONETICS, CONVERSATION I (3-0) 3 hours credit.

5305. STUDIES IN FRENCH GRAMMAR, PHONETICS, CONVERSATION II (3-0) 3 hours credit.

5307. THE TEACHING OF FRENCH (3-0) 3 hours credit— An advanced methodology course for high school and college teachers of French.

5315. STRUCTURE OF THE FRENCH LANGUAGE (3-0) 3 hours credit—Advanced French grammar for graduate students with special emphasis on contrastive elements. The course is especially useful to teachers and future teachers of French in its treatment of difficulties in translation and special problems of grammar.

5320. STUDIES IN FRENCH LITERATURE THROUGH THE RENAISSANCE (3-0) 3 hours credit.

5321. SEVENTEENTH CENTURY (3-0) 3 hours credit—Seminar on Racine; an in-depth analysis of the major plays of the classical French playwright of the 17th Century including Andromaque, Bajazet, Phedre, Britannicus, and others.

5322. FRENCH DRAMA OF THE SEVENTEENTH CENTURY (3-0) 3 hours credit—This course stresses the works of Corneille and Racine. The following works are read and analyzed in class: Le Cid, Horace, Polyeucte, Andromaque, Phedre, and Britannicus.

5323. DEVOTIONAL, MORAL, AND EPISTOLARY LITERATURE IN THE SEVENTEENTH CENTURY (3-0) 3 hours credit—Religious revival in France at the beginning of the *Grand Siecle:* Francois de Sales and Vincent de Paul, Port-Royal, Pascal and Jansenism; the art of oratory: Bossuet, Fenelon, the quietist quarrel, Malebranche, minor religious writers, La Rochefoucauld and La Bruyere, the letters of Bussey-Rabutin, Mme. de Sevigne and Mme. de Maintenon.

5324. THE NOVEL AND THE POETRY IN THE SEVENTEENTH CENTURY (3-0) 3 hours credit—The *precieux* movement. Authors studied include: Voiture, Viau, La Ceppede, Maynard, Urfe, Scudery, Regnier and Scarron. The non-dramatic poetry of Corneille and Racine are included. Conspicuous figures such as Malherbe, Boileau, La Fontaine and Mme. de La Fayette are stressed.

5325. STUDIES IN FRENCH LITERATURE OF THE SEVENTEENTH AND EIGHTEENTH CENTURIES (3-0) 3 hours credit.

5326. THE NOVEL IN THE EIGHTEENTH CENTURY (3-0) 3 hours credit—This course deals with literary centers, tendencies in the fine arts and scientific investigations, foreign influences, the novel of manners, the realism of Marivaux and Abbe Prevost, Rousseau and Diderot as novelists, pre-romantic strains, the exotic novel, and moral analysis.

5327. VOLTAIRE (3-0) 3 hours credit—This course examines carefully a select few of the vast number of works, pamphlets, letters, essays, and poems of this great man of the century. Stu-

dents are early assigned certain areas for which they are responsible and for which they must account to the class. The philosophical and political movements of the century are stressed.

5328. TWENTIETH CENTURY (3-0) 3 hours credit—Theatre of the Absurd; a study of the most influential movement in contemporary French drama, including the works of Beckett, Ionesco, Vian, and others.

5329. MARCEL PROUST (3-0) 3 hours credit—A study of the work of France's best-known 20th Century novelist, specifically his chef d' oeuvre *A la recherche du temps perdu.*

5330. STUDIES IN FRENCH LITERATURE OF THE NINETEENTH AND TWENTIETH CENTURIES (3-0) 3 hours credit.

5331. FRENCH FOR GRADUATE STUDENTS (3-0) 3 hours credit—This course is designed for graduate students preparing for the foreign language reading examinations. The basic elements of grammar and syntax are presented with emphasis on rapid and accurate translation. This course may not be counted toward the fulfillment of the undergraduate language requirement. Graduate students majoring or minoring in French may not take this course for credit.

5332. FRENCH FOR INTERNATIONAL TRADE AND COMMERCE — I (3-0) 3 hours credit—Designed for persons interested in international business. This course provides instruction in reading, translating, and writing French commercial and industrial texts and documents through an intensive study of grammar, syntax and specialized vocabulary and phraseology. No prerequisite. This course may not be counted toward a master's degree in French.

5333. FRENCH FOR INTERNATIONAL TRADE AND COMMERCE — II (3-0) 3 hours credit—A continuation of French 5332. This course provides advanced instruction and practice in business writing, translating, and conversation. Prerequisite: French 5332 or consent of instructor. This course may not be counted toward a master's degree in French.

5335. EXISTENTIALISM (3-0) 3 hours credit—This course examines the sources of existentialism as philosophy. Individual students are assigned to prepare in depth reports on such thinkers as Kierkegaard, Nietzsche, Heidegger, Ortega y Gasset, and others.

5336. L'EXISTENTIALISME FRANCAIS (3-0) 3 hours credit—The works of Sartre, Camus, Simone de Beauvoir, and others are carefully studied and evaluated. The post-war impact of these writers on the new generation is stressed.

5337. SPIRITUAL REVIVAL IN THE TWENTIETH CENTURY POETRY, NOVEL, AND DRAMA (3-0) 3 hours credit—The origins of the renouveau in French literature: Leon Bloy, the poetry of Charles Peguy, the poetry and dramatic works of Paul Claudel, the novels and plays of Francois Mauriac, Georges Bernanos, and Julien Green.

5338. SELECTED TOPICS IN FRENCH LITERATURE (3-0) 3 hours credit.

5339. FRENCH ART CRITICISM (3-0) 3 hours credit—An interdisciplinary study of the development and of the influence of French Art Criticism in the 18th, 19th and 20th Centuries. For students of French who use original texts, and for art history students who use corresponding texts in English translation.

5391. CONFERENCE COURSE IN FRENCH LINGUISTICS AND LITERATURE 3 hours credit.

5398, 5698, 5998. THESIS Variable credit of three, six, or nine hours. This course will be graded on a pass-fail (P-F) basis. Prerequisite: permission of Graduate Advisor.

6310. SEMINAR IN FRENCH LITERATURE (3-0) 3 hours credit.

6311. SEMINAR IN FRENCH LANGUAGE (3-0) 3 hours credit.

A course may be repeated for credit when the topic changes.

GERMAN (GERM)

Students pursuing the M.A. degree in German must take German 5300, 5301, 5302, 5305 or 5306, 5317.

5101. TEACHING PRACTICUM I (1-0) 1 hour credit—Required of all Teaching Assistants in German in their first semester. This course may not be counted toward a master's degree.

5102. TEACHING PRACTICUM II (1-0) 1 hour credit—Required of all Teaching Assistants in German in their second semester. This course may not be counted toward a master's degree.

5190. CONFERENCE COURSE IN GERMAN LANGUAGE AND LITERATURE (1-0) 1 hour credit—This course will be graded on a pass-fail (P-F) basis. Prerequisite: permission of Graduate Advisor.

5300. HISTORY OF THE GERMAN LANGUAGE (3-0) 3 hours credit.

5301. HISTORY OF GERMAN LITERATURE I (3-0) 3 hours credit—From the beginnings through 1832.

5302. HISTORY OF GERMAN LITERATURE II (3-0) 3 hours credit—From 1832 to the present.

5304. TOPICS IN GERMANIC LINGUISTICS AND PHILOLOGY (3-0) 3 hours credit.

5305. MIDDLE HIGH GERMAN I (3-0) 3 hours credit— A study of the language and an introduction to the literature of Middle High German.

5306. MIDDLE HIGH GERMAN II (3-0) 3 hours credit—The Middle High German Epic. Prerequisite: German 5305.

5307. THE TEACHING OF GERMAN (3-0) 3 hours credit— An advanced methodology course for high school and colege teachers of German.

5310. STUDIES IN GERMAN GRAMMAR, PHONETICS, CONVERSATION I (3-0) 3 hours credit.

5311. STUDIES IN GERMAN GRAMMAR, PHONETICS, CONVERSATION II (3-0) 3 hours credit.

5312. STYLISTICS AND ADVANCED GERMAN GRAMMAR (3-0) 3 hours credit.

5317. METHODS IN THE STUDY OF GERMAN LITERATURE AND LINGUISTICS (Fundamentals of Scholarship) (3-0) 3 hours credit.

5318. BACKGROUND OF GERMAN CULTURE (3-0) 3 hours credit.

5320. TOPICS IN GERMAN LITERATURE (3-0) 3 hours credit.

5321. GERMAN DRAMA I (3-0) 3 hours credit—11th to 19th century.

5322. GERMAN DRAMA II (3-0) 3 hours credit—19th century.

5323. GERMAN DRAMA III (3-0) 3 hours credit—20th century.

5324. GERMAN PROSE I (3-0) 3 hours credit—14th to 19th centuries.

5325. GERMAN PROSE II (3-0) 3 hours credit—19th century.

5326. GERMAN PROSE III (3-0) 3 hours credit—20th century.

5327. GERMAN LYRIC (3-0) 3 hours credit.

5331. GERMAN FOR GRADUATE STUDENTS (3-0) 3 hours credit—This course is designed for graduate students preparing for the foreign language reading examinations. The basic elements of grammar and syntax are presented with emphasis on rapid and accurate translation. This course may not be counted toward the fulfillment of the undergraduate language require. ment. Graduate students majoring or minoring in German may not take this course for credit.

5332. GERMAN FOR INTERNATIONAL TRADE AND COMMERCE — I (3-0) 3 hours credit—Designed for persons interested in international business. This course provides instruction in reading, translating, and writing German commercial and industrial texts and documents through an intensive study of grammar, syntax, and specialized vocabulary and phraseology. No prerequisite. This course may not be counted toward a master's degree in German.

5333. GERMAN FOR INTERNATIONAL TRADE AND COMMERCE — II (3-0) 3 hours credit—A continuation of German 5332. This course provides advanced instruction and practice in business writing, translating, and conversation. This course may not be counted toward a master's degree in German.

5391. CONFERENCE COURSE IN GERMANIC LINGUISTICS AND LITERATURE 3 hours credit.

5398, 5698, 5998. THESIS Variable credit of three, six or nine hours. This course will be graded on a pass-fail (P-F) basis. Prerequisite: permission of Graduate Advisor.

6310. SEMINAR IN GERMAN LITERATURE (3-0) 3 hours credit.

6311. SEMINAR IN GERMAN LANGUAGE (3-0) 3 hours credit.

PORTUGUESE (PORT)

5332. PORTUGUESE FOR INTERNATIONAL TRADE AND COMMERCE — I (3-0) 3 hours credit—Designed for persons interested in international business. This course provides instruction in reading, translating, and writing Portuguese commercial and industrial texts and documents through an intensive study of grammar, syntax, and specialized vocabulary and phraseology. No prerequisite. This course may not be counted toward a master's degree in Portuguese.

5333. PORTUGUESE FOR INTERNATIONAL TRADE AND COMMERCE— II (3-0) 3 hours credit—A continuation of Portuguese 5332. This course provides advanced instruction and practice in business writing, translating, and conversation. Prerequisite: Portuguese 5332 or consent of instructor. This course may not be counted toward a master's degree in Portuguese.

Students pursuing the M.A. degree in Spanish and concentrating in Spanish literature must take Spanish 5300 and nine hours in Peninsular and six hours in Spanish-American Literature (or vice versa). Students pursuing the M.A. degree in Spanish and concentrating in Spanish language must take Spanish 5300 and three hours in Peninsular literature and three hours in Spanish-American literature.

5101. TEACHING PRACTICUM I (1-0) 1 hour credit—Required of all Teaching Assistants in Spanish in their first semester. This course may not be counted toward a master's degree.

5102. TEACHING PRACTICUM II (1-0) 1 hour credit—Required of all Teaching Assistants in Spanish in their second semester. This course may not be counted toward a master's degree.

5135. INTRODUCTION TO ROMANCE BIBLIOGRAPHY AND METHODS OF RESEARCH (1-0) 1 hour credit — This course is designed to aid graduate students in preparing theses or dissertations.

5190. CONFERENCE COURSE IN SPANISH LANGUAGE AND LITERATURE (1-0) 1 hour credit—This course will be graded on a pass-fail (P-F) basis. Prerequisite: permission of Graduate Advisor.

5300. HISTORY OF THE SPANISH LANGUAGE (3-0) 3 hours credit—The development of the Spanish language from its earliest forms to the present. Required for all Master of Arts degree in Spanish candidates.

5301. READINGS IN OLD SPANISH (3-0) 3 hours credit— The reading and linguistic analysis of early texts.

5304. STUDIES IN SPANISH LINGUISTICS (3-0) 3 hours credit—This course will treat a selected topic of linguistic investigation.

5307. THE TEACHING OF SPANISH (3-0) 3 hours credit— An advanced methodology course for high school and college teachers of Spanish.

5310. STUDIES IN SPANISH GRAMMAR, PHONETICS, CONVERSATION I (3-0) 3 hours credit.

5311. STUDIES IN SPANISH GRAMMAR, PHONETICS, CONVERSATION II (3-0) 3 hours credit.

5315. STRUCTURE OF THE SPANISH LANGUAGE (3-0) 3 hours credit—This course will treat phonology, morphology, or syntax. May be repeated for credit when topic varies.

5318. TOPICS IN HISPANIC LITERATURE AND CULTURE (3-0) 3 hours credit.

5320. STUDIES IN SPANISH LITERATURE THROUGH THE RENAISSANCE AND GOLDEN AGE (3-0) 3 hours credit This course covers such topics as: the drama of the Golden Age, Cervantes, the Picaresque novel, the *Celestina,* and mysticism. The course may be repeated for credit when the topic varies.

5324. SPANISH LITERATURE SINCE 1700 (3-0) 3 hours credit—This course covers such topics as: the generation of '98, selected 20th century writers, post Civil War literature, the 19th century realistic novel, modern drama, modernism, and the essay. The course may be repeated for credit when the topic varies.

5330. STUDIES IN SPANISH AMERICAN LITERATURE (3-0) 3 hours credit—This course covers such topics as Fernandez de Lizardi, modernism, contemporary short story, Jorge Luis Borges, and the contemporary novel. The course may be repeated for credit when the topic varies.

5332. SPANISH FOR INTERNATIONAL TRADE AND COMMERCE — I (3-0) 3 hours credit—Designed for persons interested in international business. This course provides instruction in reading, translating, and writing commercial and industrial texts and documents through an intensive study of grammar, syntax, and specialized vocabulary and phraseology. No prerequisite. This course may not be counted toward a master's degree in Spanish.

5333. SPANISH FOR INTERNATIONAL TRADE AND COMMERCE — II (3-0) 3 hours credit—A continuation of Spanish 5332. This course provides advanced instruction and practice in business writing, translating and conversation. Prerequisite: Spanish 5332 or consent of instructor. This course may not be counted toward a master's degree in Spanish.

5391. CONFERENCE COURSE IN SPANISH LINGUISTICS AND LITERATURE 3 hours credit.

5398, 5698, 5998. THESIS Variable credit of three, six, or nine hours. This course will be graded on a pass-fail (P-F) basis. Prerequisite: permission of Graduate Advisor.

6320. SEMINAR IN SPANISH LITERATURE (3-0) 3 hours credit.

6321. SEMINAR IN SPANISH-AMERICAN LITERATURE (3-0) 3 hours credit.

6322. SEMINAR IN SPANISH LANGUAGE (3-0) 3 hours credit.

A course may be repeated for credit when the topic changes.

LINGUISTICS (LING)

Students pursuing the M.A. degree in Linguistics must take (1) Linguistics 5320 or History of a language (French 5300, German 5300, Spanish 5300, or English 5331); (2) Linguistics 5332 or 5333; (3) Linguistics 5301; (4) Linguistics 5303.

5190. CONFERENCE COURSE IN LINGUISTICS (1-0) 1 hour credit—This course will be graded on a pass-fail (P-F) basis. Prerequisite: permission of Graduate Advisor.

5301. PHONOLOGICAL THEORY (3-0) 3 hours credit.

5302. ADVANCED ARTICULATORY PHONETICS (3-0) 3 hours credit—This is a theoretical and practical study of human speech sounds for students with a background in foreign language, speech, or linguistics. Some knowledge of phonetics is presumed.

5303. GRAMMATICAL THEORY (3-0) 3 hours credit.

5305. FIELD METHODS (3-0) 3 hours credit—To be taken concurrently with linguistics 5334.

5306. APPLIED ANALYSIS (3-0) 3 hours credit.

5307. TOPICS IN LINGUISTICS AND LANGUAGE TEACHING (3-0) 3 hours credit.

5310. ACOUSTIC PHONETICS (3-0) 3 hours credit.

5311. LINGUISTIC PRINCIPLES OF TRANSLATION (3-0) 3 *Foreign* hours credit—Includes theory of lexical structure and deep struc- *Languages* ture as related to cross-language problems. Prerequisites: linguistics 4313, 4314, 4315, 4316 or equivalent, or permission of the instructor.

5320. HISTORICAL AND COMPARATIVE LINGUISTICS (3-0) 3 hours credit.

5330. THE COMPUTER AND NATURAL LANGUAGE (3-0) 3 hours credit.

5332. SURVEY OF LINGUISTIC THEORIES (3-0) 3 hours credit.

5333. READINGS IN LINGUISTICS (3-0) 3 hours credit.

5334. ADVANCED LINGUISTIC ANALYSIS (3-0) 3 hours credit—To be taken concurrently with linguistics 5305.

5335. AREA LINGUISTICS (3-0) 3 hours credit.

5336. PRINCIPLES OF LITERACY (3-0) 3 hours credit—To be taken concurrently with linguistics 5338.

5337. TOPICS IN NEUROLINGUISTICS (3-0) 3 hours credit.

5338. READINGS AND PROBLEMS IN LITERACY (3-0) 3 hours credit—To be taken concurrently with linguistics 5336.

5340. NON-INDO EUROPEAN LANGUAGE (3-0) 3 hours credit—The theoretical study of a selected non-Indo European language based on descriptive linguistic analysis. The second half of this course, linguistics 5341, should be taken during the immediately following semester.

5341. NON-INDO EUROPEAN LANGUAGE (3-0) 3 hours credit—This is a continuation of the language selected for study under linguistics 5340. Prerequisite: linguistics 5340.

5351. LANGUAGE, MEANING, AND MATURITY (3-0) 3 hours credit—An analysis of the effect of the structure of language on thought and behavior. Evaluation and communication methodologies of general semantics, especially as applied to language teaching. Methods of improving general evaluative habits.

5391. CONFERENCE COURSE IN LINGUISTICS 3 hours credit.

5392. COMPUTER-AIDED NATURAL LANGUAGE RESEARCH 3 hours credit—Individually approved research projects involving some linguistic aspect(s) of natural language data. Prerequisite: consent of instructor and Graduate Advisor.

5601. DISCOURSE ANALYSIS OF THE GREEK TEXT (6-0) 6 hours credit—Prerequisites: two years of undergraduate level Greek and linguistics 5301, 5303, 5305, 5334 or equivalent, or permission of the instructor.

5631. LINGUISTIC WORKSHOP (6-0) 6 hours credit.

5398, 5698, 5998. THESIS Variable credit of three, six, or nine hours. Prerequisite: permission of Graduate Advisor.

6309. PROSEMINAR IN LINGUISTICS (3-0) 3 hours credit.

6310. SEMINAR IN LINGUISTICS (3-0) 3 hours credit.

6399, 6699, 6999. DISSERTATION RESEARCH Variable credit of three, six, or nine hours.

A course may be repeated for credit when the topic changes.

Students pursuing the Ph.D. degree in Humanities with a concentration in linguistics are expected to elect courses that shall include attention to the developing edge of linguistics, namely, discourse, sociolinguistics, and semantics.

5321. RUSSIAN TECHNICAL AND SCIENTIFIC TRANSLA-TION (3-0) 3 hours credit—This is an intensive service course designed primarily to prepare Ph.D. candidates and other graduate students in the functional use of the Russian language. Emphasis is placed on translating current, non-adapted Soviet publications by training the student to develop rapid translation techniques, approved short cuts, and an in-depth understanding of key grammatical concepts. Undergraduate students will be admitted only upon consent of the department.

5322. ADVANCED RUSSIAN TECHNICAL AND SCIENTIF-IC TRANSLATION (3-0) 3 hours credit—This is a continuation of Russian 5321 and is designed primarily to prepare Ph.D. candidates for the Graduate School Foreign Language Examination. Prerequisite: Russian 5321 or consent of the department.

5332. RUSSIAN FOR INTERNATIONAL TRADE AND COM-MERCE — I (3-0) 3 hours credit—Designed for persons interested in international business. This course provides instruction in reading, translating, and writing Russian commercial and industrial texts and documents through an intensive study of grammar, syntax, and specialized vocabulary and phraseology. No prerequisite. This course may not be counted toward a master's degree in Russian.

5333. RUSSIAN FOR INTERNATIONAL TRADE AND COM-MERCE — II (3-0) 3 hours credit—A continuation of 5332. This course provides advanced instruction and practice in business writing, translating, and conversation. Prerequisite: Russian 5332 or consent of instructor. This course may not be counted toward a master's degree in Russian.

Department of
GEOLOGY (GEOL)

Area of Study	*Degree*
Geology	M.S.

Master's Degree Plan: Thesis only

Chairman: Charles F. Dodge 23 Life Science 273-2987

Graduate Advisor: Burke Burkart
31 Life Science 273-2987

Graduate Faculty:
Professors Boon, Dodge, McNulty, Perkins
Associate Professors Burkart, Reaser
Assistant Professors Fischer, Frank, Kirkland, Kotila
Adjunct Professors Cooper, Dennison, Forgotson,
Hilseweck, Miller

The graduate program in geology is designed primarily to extend the basic foundation and to offer research experience in preparation for professional work or further graduate studies elsewhere. Secondarily, the design aims to provide flexible support for several other disciplines.

DEGREE REQUIREMENTS

In addition to the general requirements for the Master of Science degree, the program in geology requires reading competence of a foreign language as demonstrated by examination or by collegiate credits at the sophomore level.

5258. PETROFABRIC AND MINERAL ANALYSIS (1-3) 2 hours credit—A techniques course designed to fit individual needs; primarily centered about the use of the 5-axis universal stage and stereonet diagrams. $2 lab. fee.

5301. URBAN AND ENVIRONMENTAL GEOLOGY (3-0) 3 hours credit—This course deals with current geologic problems as related to both urban planning and development and the environment.

5302. TECTONICS (3-0) 3 hours credit—A study of regional structural features and their origin and development.

5304. ADVANCED STRUCTURAL GEOLOGY (3-0) 3 hours credit—An in-depth study of the various aspects of structural geology including rock mechanics and environments of deformation. Prerequisite: geology 3343 (Structural Geology) or consent of instructor.

5309. GEOCHEMISTRY (3-0) 3 hours credit — Quantitative study of chemical equilibrium, oxidation-reduction and pH in geologic environments. Application of thermodynamics to the study of natural geologic environments. Geochemistry of weathering, sedimentation, igneous and post-magmatic fluids. Processes controlling distribution of the elements.

5310. GEOCHEMISTRY OF SEDIMENTS (3-0) 3 hours credit—A study of geochemical controls in weathering, transport, deposition and diagenesis of sediments. Distribution of trace elements in sedimentary environments.

5311. REGIONAL STRATIGRAPHY (3-0) 3 hours credit—A chronologic study of the stratigraphic systems, their physical properties and gross facies, their depositional and paleogeographic implications, their correlation and nomenclature, and their biostratigraphy. Emphasis is on North America and Europe, but exceptional successions elsewhere are included.

5312. STRATIGRAPHY AND DEPOSITIONAL ENVIRONMENTS (3-0) 3 hours credit.

5313. MODERN CARBONATE SEDIMENTS (3-0) 3 hours credit—A study of the nature and composition of modern carbonate sediments, their genesis, environments of deposition, and the processes involved in their transport, deposition, cementation, and diagenesis.

5314. SEMINAR IN PLATE TECTONICS (3-0) 3 hours credit—Geologic, geophysical and geochemical processes in plate tectonics.

Geology   **5315. ORGANIC GEOCHEMISTRY (3-0) 3 hours credit—** 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.

5316. METALLIC ORE DEPOSITS (3-0) 3 hours credit—A detailed study of the geochemical controls, petrography and field relationships of selected types of ore deposits. Prerequisites: geology 4346 (Petrography) and 5309.

5317. QUATERNARY GEOLOGY (3-0) 3 hours credit—Study of Quaternary environments and deposits with emphasis on process.

5319. MESOZOIC STRATIGRAPHY (3-0) 3 hours credit— Regional and intercontinental problems of Mesozoic zonation and correlation; major environments and events of Mesozoic history including those related to plate tectonics theory.

5320. PALEOZOIC STRATIGRAPHY (3-0) 3 hours credit—A study of the Paleozoic stratigraphic column from depositional and regional approaches with emphasis on methods of correlation and interpretation of environments of deposition.

5325. SEMINAR IN PLATE TECTONICS IN RELATION TO PETROLEUM ACCUMULATION (3-0) 3 hours credit—Presentation of the concepts of crustal evolution by plate tectonics. Study of origins of sedimentary basins in light of these concepts.

5330. ENGINEERING GEOLOGY (3-0) 3 hours credit—Geologic principles and techniques applied to evaluation of geological hazards and construction such as dams, highways and foundations.

5341. INTRODUCTION TO MICROPALEONTOLOGY (2-3) 3 hours credit—A survey of selected taxa with emphasis upon the foraminifers. $2 lab fee.

5342. PALEOBIOLOGY (2-3) 3 hours credit—Analysis of fossils as biologic systems: the species concept, formal systematic procedures, ontogeny, population statistics, functional morphology, and speciation. $2 lab fee.

5344. SEDIMENTARY PETROGRAPHY (2-3) 3 hours credit —A study of sedimentary materials from origin through lithification, with emphasis on sedimentary environments. Prerequisite: geology 3345 (Optical Mineralogy) or equivalent. **$2 lab fee.**

5345. PALEOECOLOGY (2-3) 3 hours credit—A study of the origin of fossil assemblages, definition and environmental significance of fossil associations, interpretation of ancient communities, and reconstruction of depositional environments. **$4 lab fee.**

5346. ADVANCED MINERALOGY (2-3) 3 hours credit — A study of the classification and associations and identification of minerals using X-ray and differential thermal analysis. **$2 lab fee.**

5347. PETROLEUM GEOLOGY (2-3) 3 hours credit— A study of the origin, migration, and entrapment of hydrocarbons. $2 lab fee.

5348. MARINE GEOLOGY (3-0) 3 hours credit—A study of 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.

5349. AIR PHOTO AND MAP INTERPRETATION (2-3) 3 hours credit—This course includes the geologic analysis of se-

lected areas using vertical aerial photographs, topographic maps, Geology oblique satellite photography, and radar imagery. $2 lab fee.

5350. COMPUTER APPLICATIONS IN GEOLOGY (3-0) 3 hours credit—Analysis of geologic problems that can be treated by means of computer techniques. Presents methods of programming and includes running of actual programs involving reduction of geologic data.

5351. EARTH SCIENCE EDUCATION I (2-3) 3 hours credit —This course introduces the teacher to the physical aspects of geology and related sciences. The program emphasizes study of the fields of mineralogy and petrology, structure and geomorphology, and meteorology. Weekly field trips are designed to integrate lecture and laboratory work. This course is offered during the summer only and cannot be taken for credit toward an M.S. degree in geology. Prerequisite: permission of instructor. $2 lab fee.

5352. EARTH SCIENCE EDUCATION II (2-3) 3 hours credit —An introduction to earth history and the relationship between man and his environment. The program emphasizes astronomy, paleontology and stratigraphy, oceanography, and various aspects of environmental geology. Weekly field trips are designed to integrate lecture and laboratory work. This course is offered during the summer only and cannot be taken for credit toward an M.S. degree in geology. Prerequisite: geology 5351 or concurrent enrollment. $2 lab fee.

5353. BIOSTRATIGRAPHIC MICROPALEONTOLOGY (2-3) 3 hours credit—Use of foraminifera, ostracoda and plant microfossils in local, regional and cosmopolitan stratigraphic correlation and zonation. $2 lab fee.

5354. STRATIGRAPHIC ANALYSIS (3-0) 3 hours credit— This course covers various methods of stratigraphic analysis using lithologic, biologic and geometric parameters.

5355. CLAY MINERALOGY (2-3) 3 hours credit—Study of the crystalline structure of clay minerals, properties, and methods of identification of the clay minerals by means of X-ray diffraction and differential thermal analysis. $2 lab fee.

5356. PETROLOGY OF METAMORPHIC ROCKS (2-3) 3 hours credit—Study of the origin and development of metamorphic facies and textures. Prerequisite: geology 4346 (Petrography). $2 lab fee.

5357. PETROLOGY OF IGNEOUS ROCKS (2-3) 3 hours credit —Study of the controls on the origin of magmas and their evolution; emphasizes tectonic and chemical controls. Prerequisite: geology 4346 (Petrography).

5359. PETROLEUM RESERVOIR EVALUATION (2-3) 3 hours credit—This course deals with the evaluation of various types of petroleum reservoirs. $2 lab fee.

5360. ANALYTICAL GEOCHEMISTRY (1-6) 3 hours credit, Techniques in rock, mineral, soil and water analysis. $2 lab fee.

5361. GEOPHYSICAL EXPLORATION (2-3) 3 hours credit— Gravity, magnetic, seismic, electrical and resistivity in exploration for mineral deposits. $2 lab fee.

5362. ANALYTICAL TECHNIQUES AND INSTRUMENTATION (2-3 equivalent) 3 hours credit—Introduction to instrumental techniques of rock and mineral identification and analysis. X-ray diffraction and fluorescence, atomic absorption, differential thermal analyses, and gamma ray spectrometry are included. This course is an intensive two-week study on the UTA **135**

campus for students in the Permian Basin Graduate Center Program. Prerequisite: permission of the instructor. **$2 lab fee.**

5181, 5281, 5381. RESEARCH IN GEOLOGY 1, 2, or 3 hours credit as arranged—This is a conference course with laboratory which may be repeated. **$4 lab fee.**

5191, 5291. SPECIAL STUDIES IN GEOLOGY 1 or 2 hours credit—This course will vary in credit according to the work performed. It may be repeated for credit when the topics change.

5192, 5292, 5392. TOPICS IN GEOLOGY 1, 2 or 3 hours credit —In-depth study of selected topics in geology. This course may be repeated for credit when topics vary. Prerequisite: consent of instructor.

5398, 5698, 5998. THESIS Variable credit of three, six, or nine hours—This course entails research for and preparation of the master's thesis.

5199. TECHNICAL SESSIONS (1-0) 1 hour credit—Forum for presentation of results of graduate student and faculty research. Required each semester of all graduate students. This course will be graded on a pass-fail (P-F) basis.

Department of
HISTORY (HIST)

Areas of Study	*Degree*
History	M.A.
	Certificate
Archival administration	ARCHIVAL ADMINISTRATION

Master's Degree Plans: Thesis and Non-Thesis

Chairman: Richard G. Miller
202 University Hall   273-2861

Graduate Advisor: George Wolfskill
202 University Hall   273-2861

Graduate Faculty:

Professors Amsler, Hall, Kerr, Lackman, Landen, Smith, Wolfskill

Associate Professors Bock, Chester, Green, Knox, Lackner, Miller, Myres, Philp, Reinhartz, Rodnitzky, Tucker, West

Assistant Professors Anguizola, Baker, May, Oaks, Palmer, Prewitt, Stark, Suleski

Adjunct Professor Blair

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 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, and further graduate study.

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 or European history. All students are required to take the historiography course corresponding to their major field. In exceptional circumstances, a student may petition the History Graduate Studies Committee for an alternate field. 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 a foreign language is required. This may be demonstrated by credit in an approved language at the sophomore level or by successful completion of an examination administered by the Department of Foreign Languages and Linguistics.

No grade below a C will be counted for graduate credit in history.

The following requirements are in addition to the Graduate School requirements:

The thesis degree plan is research-oriented and is designed primarily for students intending to pursue further graduate work. A minimum of 18 hours in a major field is required. With the approval of the graduate advisor, a minor of as many as six hours of graduate and/or advanced undergraduate courses in a discipline other than history may be taken to satisfy the minimum requirement of 30 hours for the degree. As many as nine hours (six hours if an outside minor is selected) of advanced undergraduate history course work 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 a minimum of 24 hours in a major field. With the approval of the Graduate Advisor, a minor of as many as nine hours of graduate and/or advanced undergraduate courses in a discipline other than history may be taken to satisfy the minimum requirement of 36 hours for the degree. A maximum of nine hours of advanced undergraduate course work may be taken for graduate credit. In the event of failure of the examination required for the degree, the student may petition the Graduate Studies Committee for re-examination. **137**

Students desiring a certificate in archival administration as part of the Master of Arts in History degree must take an additional six-hour internship. This may be taken in conjunction with the thesis with archival training projects in the internship program tailored to the student's field of thesis research. Archival administration courses are History 5342, 5343, 5344, 5644.

NOTE: A course may be repeated for credit when the topic changes. Graduate standing is a prerequisite to all of the following courses.

5300. COLLOQUIUM IN 17TH AND 18TH CENTURY AMERICAN HISTORY (3-0) 3 hours credit.

5301. COLLOQUIUM IN 19TH CENTURY AMERICAN HISTORY (3-0) 3 hours credit.

5302. COLLOQUIUM IN 20TH CENTURY AMERICAN HISTORY (3-0) 3 hours credit.

5303. COLLOQUIUM IN URBAN HISTORY (3-0) 3 hours credit.

5304. COLLOQUIUM IN TEXAS AND THE SOUTHWEST (3-0) 3 hours credit.

5305. COLLOQUIUM IN AMERICAN SOCIAL AND INTELLECTUAL HISTORY (3-0) 3 hours credit.

5306. COLLOQUIUM IN DIPLOMATIC HISTORY (3-0) 3 hours credit.

5307. COLLOQUIUM IN AMERICAN LABOR HISTORY (3-0) 3 hours credit.

5308. COLLOQUIUM IN EUROPEAN HISTORY, PRE-1500 (3-0) 3 hours credit.

5309. COLLOQUIUM IN EUROPEAN HISTORY, POST-1500 (3-0) 3 hours credit.

5310. COLLOQUIUM IN BRITISH HISTORY (3-0) 3 hours credit.

5311. COLLOQUIUM IN LATIN AMERICAN HISTORY (3-0) 3 hours credit.

5312. COLLOQUIUM IN AFRICAN HISTORY (3-0) 3 hours credit.

5313. COLLOQUIUM IN ASIAN HISTORY (3-0) 3 hours credit.

5314. COLLOQUIUM IN RUSSIAN HISTORY (3-0) 3 hours credit.

5320. SEMINAR IN 17TH AND 18TH CENTURY AMERICAN HISTORY (3-0) 3 hours credit.

5321. SEMINAR IN 19TH CENTURY AMERICAN HISTORY (3-0) 3 hours credit.

5322. SEMINAR IN 20TH CENTURY AMERICAN HISTORY (3-0) 3 hours credit.

5323. SEMINAR IN AMERICAN POLITICS (3-0) 3 hours credit.

5324. SEMINAR IN REGIONAL HISTORY OF THE U.S. (3-0) 3 hours credit.

5325. SEMINAR IN AMERICAN SOCIAL AND INTELLECTUAL HISTORY (3-0) 3 hours credit.

5326. SEMINAR IN DIPLOMATIC HISTORY (3-0) 3 hours *History* credit.

5327. SEMINAR IN AMERICAN LABOR HISTORY (3-0) 3 hours credit.

5328. SEMINAR IN ANCIENT HISTORY (3-0) 3 hours credit.

5329. SEMINAR IN MEDIEVAL HISTORY (3-0) 3 hours credit.

5330. SEMINAR IN MODERN EUROPEAN HISTORY (3-0) 3 hours credit.

5331. SEMINAR IN BRITISH HISTORY (3-0) 3 hours credit.

5332. SEMINAR IN MIDDLE EASTERN HISTORY (3-0) 3 hours credit.

5333. SEMINAR IN AFRICAN HISTORY (3-0) 3 hours credit.

5334. SEMINAR IN LATIN AMERICAN HISTORY (3-0) 3 hours credit.

5335. SEMINAR IN ASIAN HISTORY (3-0) 3 hours credit.

5340. AMERICAN HISTORIOGRAPHY (3-0) 3 hours credit.

5341. EUROPEAN HISTORIOGRAPHY (3-0) 3 hours credit.

5342. HISTORICAL DEVELOPMENT OF ARCHIVES AND MANUSCRIPT COLLECTIONS (3-0) 3 hours credit.

5343. ARCHIVAL PROCEDURES AND TECHNIQUES (3-0) 3 hours credit.

5344, 5644. ARCHIVAL INTERNSHIP (Variable credit of three or six hours.)

5391, 5691, 5991. INDEPENDENT STUDY (Variable credit as arranged.) For graduate students whose needs are covered by no course immediately available.

5398, 5698, 5998. THESIS (Variable credit of three, six, or nine hours.)

HUMANITIES Program

See Interdepartmental and Intercampus Programs, p. 206

Department of
INDUSTRIAL ENGINEERING (IE)

Areas of Study   *Degrees*

  Industrial Engineering   M.S.
  Engineering: Undifferentiated
    (See Interdepartmental and
    Intercampus Programs, p. 201)   PH.D.

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

Chairman: G. T. Stevens, Jr.
                            214B Engineering   273-3092

Graduate Advisor: Robert D. Dryden
                            214C Engineering   273-3092

Graduate Faculty:

  Professors Meier, Stevens
  Associate Professors Corley, Dryden, Stanfel
  Assistant Professor Pape
  Adjunct Professor Matheny

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 behavorial characteristics of man in the industrial environment.

3. Operations Research and Systems Analysis—The formulation and analysis of quantitative models of engineering and management problems, and their application to complex integrated systems.

4. Management Systems and Control—Methods of resource allocation for industrial activities.

5. Computer Systems and Applications—The use of the computer in decision making for industry.

140 In addition, special programs of study may be arranged.

DEGREE REQUIREMENTS

Industrial Engineering

Students with degrees in other disciplines may qualify for graduate study in industrial engineering after the completion of prescribed deficiency courses. Entering graduate students who are not proficient in basic human factors (I.E. 5442), probability and statistics (I.E. 5317), operations research (I.E. 5323), or industrial engineering design and analysis (I.E. 5441) may be required to take the deficiency course in parentheses to provide an appropriate background for graduate study in industrial engineering.

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) Probability and Statistics: I.E. 5318
(2) Operations Research: I.E. 5301
(3) Human Factors: Either I.E. 5331 or I.E. 5343
(4) Industrial Engineering Design: Either I.E. 5310 or I.E. 5312.

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 also cover the thesis. The final examination involved in the other two options will be a written comprehensive examination similar in format to and administered concurrently with the Ph.D. diagnostic examination. Both the written M.S. comprehensive examination and the Ph.D. diagnostic examination are administered at the end of each semester. The following nine areas are covered on these examinations:

(1) administration and organization,
(2) human factors,
(3) operations research,
(4) probability and statistics,
(5) engineering economy,
(6) production and inventory control,
(7) systems engineering,
(8) industrial engineering analysis and design, and
(9) elementary mathematics.

5301. ADVANCED OPERATIONS RESEARCH (3-0) 3 hours credit—Advanced techniques in operation research are studied. Current research areas are identified. Prerequisite: industrial engineering 5323 or equivalent.

5302. ADVANCED HUMAN FACTORS I (3-0) 3 hours credit —A study and application of the principles of systems analysis, human factors and systems evaluation to man-machine systems with emphasis upon the human component as he interacts with the machine. Prerequisite: industrial engineering 4344 or 5442.

5303. TOPICS IN QUALITY CONTROL (3-0) 3 hours credit— The study of the principles and practices of industrial quality control. Includes the theory of statistical sampling and control. Prerequisite: industrial engineering 5317 or equivalent.

5304. ENGINEERING ECONOMY II (3-0) 3 hours credit—A study of probabilistic cash flow models and the use of simulation **141**

for the evaluation of capital investments. **Prerequisite: industrial** engineering 5316 and 5317 or equivalent.

5305. LINEAR PROGRAMMING AND EXTENSIONS (3-0) 3 hours credit—A study of the theory of linear programming including the simplex method, duality, sensitivity analysis, decomposition principles, the transportation problem, and integer programming.

5306. DYNAMIC OPTIMIZATION (3-0) 3 hours credit—Multistage decision problems are characterized as dynamic programming problems. Numerical approximation schemes for dynamic programming problems are discussed. The solution of variational problems is studied both from a classical and dynamic programming approach.

5307. THEORY OF QUEUES (3-0) 3 hours credit—This course is a study of the theory of queues with particular emphasis on industrial applications. Prerequisite: industrial engineering 5317 and 5323 or equivalent.

5308. ADVANCED RESEARCH METHODS (3-0) 3 hours credit—A study of statistical analysis of variance with emphasis on both data analysis and on experimental design; factorials, complete and incomplete blocks, Latin squares, and covariate analysis. Examples are taken from industrial problems. Prerequisite: industrial engineering 5318.

5309. ANALYSIS OF STOCHASTIC PROCESSES (3-0) 3 hours credit—This course provides background for probabilistic model building. Such topics as stationary and non-stationary processes, counting processes, renewal theory, Markov chains, and random walk are studied. Prerequisite: industrial engineering 5317 and 5323 or equivalent.

5310. PRODUCTION SYSTEMS DESIGN (3-0) 3 hours credit —A study of 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: industrial engineering 5441 and 5323 or equivalent.

5311. STATISTICAL METHODS FOR INDUSTRIAL DECISIONS (3-0) 3 hours credit—This course is a study of statistical decision theory with applications. Prerequisite: industrial engineering 5317 or equivalent.

5312. ADVANCED PRODUCTION AND INVENTORY CONTROL SYSTEMS (3-0) 3 hours credit—A continuation of the undergraduate course. The emphasis will be placed on mathematical model building and optimization. Prerequisite: industrial engineering 5323 or equivalent.

5313. RELIABILITY AND ADVANCED QUALITY CONTROL TOPICS (3-0) 3 hours credit—Includes advanced quantitative topics in reliability design and quality control. Management of reliability and quality control functions are also included. Prerequisite: industrial engineering 4308 or 5303.

5315. DATA PROCESSING IN OPERATIONS RESEARCH (3-0) 3 hours credit—A study of selected topics in the application of electronic computers to operations research activities.

5316. ECONOMIC DECISION MAKING (3-0) 3 hours credit —A study of the criteria used for making decisions about proposed capital investments and the implementation of selected criteria in engineering design and investment decisions. Emphasis is on model building and optimization.

5317. ENGINEERING STATISTICS I (3-0) 3 hours credit—
142 Sets and set algebra; sample spaces; combinatorics; random vari-

ables; discrete and continuous density functions; emphasis on *Industrial* binomial, Poisson, normal, and gamma distributions; statistical *Engineering* concepts; hypothesis testing; point and interval estimation. Prerequisite: mathematics 2325 (calculus).

5318. ENGINEERING STATISTICS II (3-0) 3 hours credit— The multivariate normal distribution and its related functions— Chi-square, t, and F; a matrix approach to regression analysis and analysis of variance; a survey of nonparametric statistical techniques. Prerequisite: industrial engineering 5317.

5320. INDUSTRIAL PLANNING AND FORECASTING (3-0) 3 hours credit— Analysis of the theory and practice of the managerial function of planning and forecasting in industrial operations. Long-range planning and development of organizational objectives and strategies. Resource allocation planning.

5321. INDUSTRIAL ORGANIZATION AND MANAGEMENT SYSTEMS (3-0) 3 hours credit— Traditional organization and management theory is reviewed, and the systems approach to management is presented. The managerial system is approached via decision-making processes in planning and control of organizational activities. Both computational techniques and the behavioral aspects of decision making are considered. Prerequisite: industrial engineering 5442 or both industrial engineering 3316 and 4344, or equivalent.

5322. SIMULATION AND OPTIMIZATION (3-0) 3 hours credit— The course includes a survey and applications of computer languages suitable for Monte Carlo simulation of random processes. Optimization and search techniques of functions will be introduced. Prerequisite: industrial engineering 3301 or mathematics 4311 or consent of instructor.

5323. OPERATIONS RESEARCH (3-0) 3 hours credit— An introduction for graduate students to the techniques of operations research. Prerequisite: probability and statistics, calculus.

5324. HUMAN FACTORS EVALUATION OF PRODUCTION PROCESSES (3-0) 3 hours credit— Means of determination of the adequacy of production machinery from a human engineering standpoint, the adequacy and availability of job aids, and analysis of the speed and accuracy with which required communications and technical information are transmitted and utilized in production. The consideration of production as a man-machine system. Prerequisite: industrial engineering 5331.

5325. INDUSTRIAL INFORMATION SYSTEMS (3-0) 3 hours credit— The application of electronic computers and associated input/output devices is studied. Decision processes and data evaluation are considered along with the design of systems which gather the data. Prerequisite: knowledge of a computer programming language and consent of the instructor.

5326. BIOMECHANICS (3-0) 3 hours credit— Fundamentals and objectives of biomechanics. Discussion will concern anthropometry, the link system of the body, kinematic aspects of extremity joints, biomechanical aspects of injury and prosthesis.

5330. DIGITAL PROCESS CONTROL AND MATHEMATICAL MODELING OF INDUSTRIAL SYSTEMS (3-0) 3 hours credit— This course describes the present status of automatic control in industry with emphasis on the application of digital control. Problems involved in the use of both supervisory and discrete digital control systems will be presented and the development of process control by mathematical problems will also be covered.

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5331. ERGONOMICS (3-0) 3 hours credit—A study of man in relation to his working environment. Physiological and anatomical characteristics of man. Considerations of fatigue, accidents, and other human problems in industry. Prerequisite: industrial engineering 4344 or 5442.

5332. NONLINEAR PROGRAMMING (3-0) 3 hours credit — Optimization theory for unconstrained, equality constrained, and inequality constrained problems is first developed. Specific techniques are then studied. Convex programming, geometric programming, quadratic programming, and optimum seeking methods are presented.

5333. ENGINEERING ADMINISTRATION (3-0) 3 hours credit—To provide an understanding of engineering managers' role in the overall corporate budgeting process to include operational as well as capital budgeting. Analysis of engineering operations and design part in finance from a non-financial point of view. These views are to be analyzed in terms of utility management as part of various corporate management philosophies.

5334. HUMAN FACTORS IN SYSTEMS DEVELOPMENT (3-0) 3 hours credit—A study of human engineering, staffing, training, testing, and evaluation is made in relation to systems theory. The psychological, physiological, and social factors relevant to systems planning design, analysis, and management. Methods of increasing systems effectiveness by consideration of personnel subsystems during total system development. Prerequisite: industrial engineering 4344 or equivalent and industrial engineering 5343.

5335. ADVANCED INDUSTRIAL ENGINEERING ANALYSIS (3-0) 3 hours credit—A rigorous problem-oriented course covering selected analytical techniques not normally included in undergraduate industrial engineering curricula. Prerequisite: mathematics 2325 (Calculus).

5336. INDUSTRIAL AND PRODUCT SAFETY (3-0) 3 hours credit—Methods and techniques for identifying, testing, and correcting industrial and product hazards, including product and professional liability. Prerequisite: graduate standing.

5337. SYSTEMS ANALYSIS AND DESIGN I (3-0) 3 hours credit—A rigorous treatment of analytical methods used in systems engineering. Prerequisite: industrial engineering 5317 and 5323 or equivalent.

5338. SYSTEMS ANALYSIS AND DESIGN II (3-0) 3 hours credit—The application of analytical techniques to industrial systems. Prerequisite: industrial engineering 5337.

5341. DESIGN WITH HUMAN FACTORS (2-3) 3 hours credit —A study is made of those factors that affect the design of a system at the man/machine interface. Topics include physiological limitations and capability under normal and hostile environments. Design and research projects will be undertaken. Prerequisite: industrial engineering 5343.

5342. JOB DESIGN AND STANDARDIZATION (2-3) 3 hours credit—An advanced study of work center design and methods of improving human work. Factors affecting work, such as fatigue, learning and physiological, will be considered. Prerequisite: industrial engineering 4441 or 5441.

5343. ENVIRONMENTAL BIOTECHNOLOGY (2-3) 3 hours credit—Physical, physiological, and psychological aspects of the interaction between man and thermal, atmospheric, radiant, and mechanical agents and energies in the environment. Biological

and physical requirements for engineering design and control of *Industrial* the environment; applications to design of complex systems. *Engineering* Prerequisite: industrial engineering 4344 or 5442.

5441. INDUSTRIAL ENGINEERING ANALYSIS AND DE-SIGN (3-3) 4 hours credit—Introduction and survey of the classical and current techniques of work measurement, analysis and planning. Topics in plant design will be considered along with plant location concepts. A study will also be made of production planning and control.

5442. HUMAN FACTORS AND BEHAVIOR (3-3) 4 hours credit—This course provides a background in human factors engineering and human behavior in industrial organizations. Emphasis is placed on the study of human physiological and psychological limitations in the industrial environment and on human behavior in industrial organizations, including planning and control functions.

5191, 5291, 5391. ADVANCED STUDIES IN INDUSTRIAL ENGINEERING (Variable credit from 1 to 3 semester hours as arranged) — Individually approved research projects selected from the various branches of industrial engineering. Work performed as a thesis substitute normally will be accomplished under industrial engineering 5391, with prior approval of the Industrial Engineering Committee on Graduate Studies.

5392. SELECTED TOPICS IN OPTIMIZATION (3-0) 3 hours credit—Various advanced topics in optimization will be offered under this course. The course may be repeated for credit when the content changes. Prerequisite: consent of instructor.

5398, 5698, 5998. THESIS Variable credit of three, six, or nine hours. Prerequisite: graduate standing in industrial engineering.

6197-6997. RESEARCH IN INDUSTRIAL ENGINEERING (Variable credit from 1 to 9 semester hours as approved)—Individually supervised research projects directed toward the dissertation. Prerequisite: graduate standing in industrial engineering and approval of advisor.

6301. ANALYSIS OF DECISION PROCESSES (3-0) 3 hours credit—Methods of making economic decisions under the conditions of risk and uncertainty. Prerequisite: industrial engineering 5304 or equivalent.

6399, 6699, 6999. DISSERTATION Variable credit of three, six, or nine hours. Prerequisite: Admission to candidacy for the Doctor of Philosophy degree.

A limited number of undergraduate courses may be applicable toward the graduate program if approved in advance by the Graduate Advisor.

INTERDISCIPLINARY STUDIES Program

MATERIALS SCIENCE Program

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MATHEMATICAL SCIENCES Program

See Interdepartmental and Intercampus Programs, p. 214

Department of MATHEMATICS (MATH)

Areas of Study	*Degrees*
Mathematics	M.A.
Mathematical Sciences (See Interdepartmental and Intercampus Programs, p. 214)	PH.D.

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

Chairman: V. Lakshmikantham
132J Hammond Hall 273-3591

Graduate Advisor: Michael E. Lord
127 Hammond Hall 273-3261

Graduate Faculty:

Professors Laksmikantham, Wall
Associate Professors Bernfeld, Bolen, Dyer, Eisenfeld, Harvey, Heath, Huggins, Lord, Marshall, A. R. Mitchell, R. W. Mitchell, Moore, Perryman, Sims, Tennison, Williams
Assistant Professors Beard, Gillespie, Nestell
Adjunct Professor Pervin
Adjunct Associate Professor Mishelevich

OBJECTIVE

The objective of the Mathematics Department's program at the master's level is to develop the student's ability to do independent research and prepare for more advanced study in math-

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ematics, to give advanced training to professional mathematicians, mathematics teachers, and those employed in engineering, scientific and business areas in which mathematics at this level is requisite for efficient performance.

Graduate work will be offered in algebra, complex and real variables, differential equations, functional analysis, topology, geometry, numerical analysis, logic, probability and statistics.

DEGREE REQUIREMENTS

Students choosing the thesis or thesis substitute degree plan must take mathematics 5317, 5333, either 5322 or 5324, and two sequences. Students selecting the thesis substitute plan must register for mathematics 5395 or 5695. The program for students electing the non-thesis degree plan must include (a) mathematics 5317, 5333, either 5322 or 5324, either 5312 or 5320 or 5321, and three sequences, or (b) for students interested in public school teaching, three sequences, two of which must be mathematics education sequences. Students in all three degree plans must pass a comprehensive examination. For thesis plan students, this examination is in addition to the thesis defense. Before completion of the Master's Degree, the student must have knowledge of mathematics 4335 and either mathematcis 4321 or 4331. Not more than six hours from mathematics 5391 or 5392 will be applicable toward a graduate mathematics program.

5300. MATHEMATICAL PROGRAMMING — COMPUTER PROGRAMMING AND APPLICATIONS (3-0) 3 hours credit— An introduction to computing techniques utilizing an algorithmic language such as Fortran. Applications will be from various areas of numerical analysis. Prerequisite: consent of the instructor.

5301. SET THEORY (3-0) 3 hours credit — This course deals with cardinal numbers, ordinal numbers, and equivalences of the Axiom of Choice. Prerequisite: mathematics 4321 or 4331, and 4335.

5302. COMPARATIVE MATHEMATICAL SYSTEMS (3-0) 3 hours credit—This course considers the comparative structures of mathematical systems. Emphasis will be on the system of real numbers and the algebraic operations involved in the arithmetic of real numbers. Geometric concepts will be studied and related to algebra. Prerequisite: consent of the instructor.

5304. GENERAL TOPOLOGY (3-0) 3 hours credit — This course is an introduction to the fundamentals of general topology. The topics to be studied include product spaces, the Tychonoff theorem, Tietzes Extension theorem, and metrization theorems. Prerequisite: mathematics 4304 or 4335.

5307. POINT-SET THEORY I (3-0) 3 hours credit — The foundations of topology are developed by means of careful study of the properties of certain sets of points. These properties will be derived axiomatically. Prerequisite: mathematics 3335 (Analysis I) or 4303.

5308. POINT-SET THEORY II (3-0) 3 hours credit — A continuation of mathematics 5307. Prerequisite: mathematics 5307.

5309. THEORY OF ITERATIVE PROCESSES (3-0) 3 hours credit—This course is a study of the design and characterization **147**

of general iterative processes which will afford approximate solutions to equations. Topics considered will be of special interest to the practicing numerical analyst. Prerequisite: mathematics 3335 (Analysis I) and 4338.

5310. APPROXIMATION THEORY (3-0) 3 hours credit—This course is a study of uniform approximations, best approximations, and least square approximations. Prerequisite: mathematics 4335.

5311. PROBABILITY THEORY (3-0) 3 hours credit — The course includes a systematic development of the theory of random variables as well as a discussion of the classical probability distributions by means of the method of characteristic functions. The basic limit theorems are developed. Applications of basic theory are made to Markov chains and stochastic processes. Prerequisite: mathematics 3335 (Analysis I) and 4311.

5312. MATHEMATICAL STATISTICS I (3-0) 3 hours credit —A study of the basic discrete and continuous univariate and multivariate families of distributions with emphasis on the multivariate normal, derived distribution theory, and parametric estimation theory. Prerequisite: mathematics 4335 or concurrent registration and 3313.

5313. MATHEMATICAL STATISTICS II (3-0) 3 hours credit —A study of decision theory and Bayesian methods, statistical hypotheses testing, linear models, and nonparametric methods. Prerequisite: mathematics 5312.

5314. EXPERIMENTAL DESIGNS (3-0) 3 hours credit—A study of completely randomized and randomized complete block designs with fixed and random effects, Latin Squares, factorial experiments, and analysis of covariance. Emphasis will be placed on the development of the models from underlying experimental situations and the use of the appropriate analysis of variance table. Prerequisite: mathematics 4313 or 5312.

5315. GRAPH THEORY I (3-0) 3 hours credit—This course is an introduction to the theory of simple graphs and directed graphs. Topics covered include operations on graphs, trees, blocks, partitions connectivity, traversability, and matrices associated with graphs. Applications of graph theory in various areas will be appropriately examined. Prerequisite: consent of the instructor.

5316. GRAPH THEORY II (3-0) 3 hours credit—This course is a continuation of mathematics 5315. Topics covered include colorability, planarity, and groups associated with graphs. Applications, current research results, and additional topics will be examined. Prerequisite: mathematics 5315.

5317. REAL VARIABLES I (3-0) 3 hours credit—This course includes the study of such topics as point sets, measurable sets, measureable functions, Lebesgue integral, Stieltjes integral, and indefinite Lebesgue integral. Prerequisite: mathematics 4335.

5318. REAL VARIABLES II (3-0) 3 hours credit—This is a continuation of Real Variables I with an introduction to abstract measure theory. Prerequisite: mathematics 5317.

5320. DIFFERENTIAL EQUATIONS (3-0) 3 hours credit — This course is a study of linear and non-linear systems. The asympotic behavior of solutions and the concept of stability are investigated as well as some important existence and uniqueness theorems. Prerequisite: mathematics 4335.

5321. PARTIAL DIFFERENTIAL EQUATIONS (3-0) 3 hours
credit—This course is the classification of second order partial

differential equations, characteristics, canonical forms, the Fred- *Mathematics*
holm alternative, and Green's functions. Prerequisite: mathematics 4324 or 4334 or 4335.

5322. COMPLEX VARIABLES I (3-0) 3 hours credit—Fundamental theory of analytic functions, residues, conformal mapping and applications. Prerequisite: mathematics 4334 or 4335.

5323. COMPLEX VARIABLES II (3-0) 3 hours credit—Analytic continuation. Riemann surfaces, velocity and stream functions with applications, elliptic functions. Prerequisite: mathematics 5322.

5324. APPLIED COMPLEX VARIABLES (3-0) 3 hours credit—This course is a study of applications of complex variables in potential theory, ordinary differential equations, transform theory, and asymptotic expansions. Prerequisite: mathematics 4322 or 5322.

5325. OPERATIONAL MATHEMATICS (3-0) 3 hours credit—This course will be concerned with the study of integral transformations such as the Laplace, Bilateral Laplace, and Hankel. The applications of these transforms to boundry value problems will also be investigated. Prerequisite: mathematics 3335 (Analysis I) or 4325.

5326. OPERATIONAL MATHEMATICS (3-0) 3 hours credit—This course consists of a study of Fourier Analysis: including Fourier Series, Fourier integrals, and special functions: including gamma functions, Bessel functions and other orthogonal functions. Prerequisite: mathematics 3335 (Analysis I) or 4325.

5327. FUNCTIONAL ANALYSIS I (3-0) 3 hours credit—This course is the study of basic topological and metric properties with emphasis toward normed linear spaces, closed graph theorem, theorems of uniform boundedness, Hahn-Banach theorem and their application. Prerequisite: mathematics 4335 and 4321 or 4331.

5328. FUNCTIONAL ANALYSIS II (3-0) 3 hours credit — A continuation of mathematics 5327. Prerequisite: mathematics 5327.

5329. ENGINEERING MATHEMATICS (3-0) 3 hours credit—This course is designed to acquaint the scientist and engineer with vector analysis, matrices, determinants, tensors, probability, statistics, and numerical methods. Prerequisite: mathematics 3318 (Differential Equations). (Credit is not given on an M.A. degree in mathematics.)

5331. ABSTRACT ALGEBRA I (3-0) 3 hours credit — This course will investigate groups, rings, fields and modules with emphasis on structure theorems. Prerequisite: mathematics 4321.

5332. ABSTRACT ALGEBRA II (3-0) 3 hours credit — This course will investigate linear and multilinear algebra of modules with emphasis on structure theorems. Prerequisite: mathematics 5331.

5333. LINEAR ALGEBRA AND MATRICES (3-0) 3 hours credit—A study of vector spaces, linear transformations, and matrices. Prerequisite: consent of the instructor.

5334. DIFFERENTIAL GEOMETRY (3-0) 3 hours credit — This course is an introduction to the theory of curves and surfaces in three dimensional Euclidean space. Prerequisite: mathematics 4334 or 4335.

5336. LOGIC (3-0) 3 hours credit—The concept of a normal system and propositional and functional calculi are considered. Prerequisite: mathematics 3335 or 3336.

5338. NUMERICAL ANALYSIS I (3-0) 3 hours credit—This course is a treatment of the solution of equations, interpolation and approximation, numerical differentiation and quadrature, and the solution of ordinary differential equations. Prerequisite: mathematics 3345 (Numerical Analysis and High Speed Computer Applications).

5339. NUMERICAL ANALYSIS II (3-0) 3 hours credit—This course is a rigorous treatment of numerical aspects of linear algebra and the numerical solution of boundary value problems in ordinary differential equations: also, an introduction to the numerical solution of partial differential equations. Prerequisite: mathematics 3345 (Numerical Analysis and High Speed Computer Applications).

5341. MATHEMATICS EDUCATION I (3-0) 3 hours credit—Selected materials from Euclidean geometry, non-euclidean geometry, and projective geometry designed to increase the geometric maturity of the students.

5342. MATHEMATICS EDUCATION II (3-0) 3 hours credit—Selected materials from algebra and analysis presented so as to increase both the maturity of the students and their ability to teach these subjects to secondary students.

5343. MATHEMATICS EDUCATION III (3-0) 3 hours credit—Reading and study of selected materials from the literature of the teaching of mathematics, the history of mathematics education, history of mathematics, and research in mathematics education.

5344. MATHEMATICS EDUCATION IV (3-0) 3 hours credit—Selected materials from the literature of the teaching of mathematics, education, psychology, and application of these materials to the presentation of mathematics to secondary students.

5345. MATHEMATICS EDUCATION V (3-0) 3 hours credit—Selected materials from mathematics presented so as to increase both the maturity of the students and their ability to teach mathematics to elementary students.

5346. MATHEMATICS EDUCATION VI (3-0) 3 hours credit—This course is a continuation of Math 5345. Prerequisite: mathematics 5345.

5391. SPECIAL TOPICS IN MATHEMATICS (3-0) 3 hours credit—Topics in mathematics are assigned individual students or small groups. Faculty members closely supervise the students in their research and study. In areas where there is only three hours offered, the special topics may be used by students to continue their study in the same area. Prerequisite: permission of instructor.

5392. SELECTED TOPICS IN MATHEMATICS (3-0) 3 hours credit — The material covered may vary from semester to semester depending upon need and interest of the students. This course may be repeated for credit. Prerequisite: permission of instructor.

5193-5693. MATHEMATICS CONFERENCE (variable credit from one to six hours as arranged)—A conference course which may be repeated for credit. Prerequisite: permission of Graduate Advisor.

5395, 5695. SPECIAL PROJECT Variable credit of three or six hours—This course will be graded on a pass-fail (P-F) basis. Prerequisite: permission of Graduate Advisor.

5398, 5698, 5998. THESIS Variable credit of three, six, or nine hours. Prerequisite: permission of Graduate Advisor.

6301. TOPICS IN DIFFERENTIAL EQUATIONS (3-0) 3 hours *Mathematics* credit—Various topics in differential equations will be offered. The course may be repeated for credit when the content changes.

6305. TOPICS IN NON-LINEAR ANALYSIS (3-0) 3 hours credit—Various topics in non-linear analysis will be offered. The course may be repeated for credit when the content changes.

6307. TOPICS IN MATHEMATICAL CONTROL THEORY AND DIFFERENTIAL GAMES (3-0) 3 hours credit—Various topics in mathematical control theory and differential games will be offered. The course may be repeated for credit when the content changes.

6313. TOPICS IN PROBABILITY AND STATISTICS (3-0) 3 hours credit—Various topics in probability and statistics will be offered. The course may be repeated for credit when the content changes.

6321. TOPICS IN APPLIED MATHEMATICS (3-0) 3 hours credit—Various topics in applied mathematics will be offered. The course may be repeated for credit when the content changes.

6325. TOPICS IN MATHEMATICAL ASPECTS OF COMPUTING (3-0) 3 hours credit—This course will treat those areas of mathematics with application in computing. The use of the computer to mathematics research will be considered. The course may be repeated for credit when the content changes.

6331. TOPICS IN ALGEBRA (3-0) 3 hours credit—Various topics in algebra will be offered. The course may be repeated for credit when the content changes.

6335. TOPICS IN ANALYSIS AND APPLICATIONS (3-0) 3 hours credit—Various topics in analysis and applications will be offered. The course may be repeated for credit when the content changes.

6391. SPECIAL TOPICS IN MATHEMATICS (3-0) 3 hours credit—This course is for faculty directed individual study and research. The course may be repeated for credit when the content changes.

A limited number of undergraduate mathematics courses may be applicable to a graduate program in mathematics if approved in advance by the graduate advisor. These must be chosen from the following list and shall not exceed six hours total credit.

4303. INTRODUCTION TO TOPOLOGY

4311. MATHEMATICAL PROBABILITY

4313. APPLICATIONS OF MATHEMATICAL STATISTICS

4320. ADVANCED DIFFERENTIAL EQUATIONS

4321. INTRODUCTION TO ABSTRACT ALGEBRA II

4322. INTRODUCTION TO COMPLEX VARIABLES

4323. VECTOR ANALYSIS

4324. INTRODUCTION TO PARTIAL DIFFERENTIAL EQUATIONS

4325. OPERATIONAL MATHEMATICS

4331. INTRODUCTION TO LINEAR ALGEBRA

4334. ADVANCED MULTIVARIABLE CALCULUS

4335. ANALYSIS II

4338. INTRODUCTION TO NUMERICAL ANALYSIS II

Department of
MECHANICAL ENGINEERING (ME)

Areas of Study	*Degrees*
Mechanical Engineering	M.S.
Engineering: Undifferentiated (See Interdepartmental and Intercampus Programs, p. 201)	PH.D.

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

Chairman: Henry Sebesta   335 Engineering   273-2561

Graduate Advisor: Calvin L. R. Barker
                         204D Engineering   273-2571

Graduate Faculty:

University Professor Woolf

Professors Barker, Blackwell, Files, Haji-Sheikh, Lawrence

Associate Professors Hullender, Lawley

Assistant Professors Lowery, Woods

Adjunct Assistant Professor Axe

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 course work 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 technical interests and the available facilities and course offerings. Typically, programs are classified as:

1. Heat Transfer
2. Fluid Mechanics
3. Thermodynamics
4. Mechanical Systems
5. Automatic Control and Instrumentation
6. Design
7. Manufacturing Processes

DEGREE REQUIREMENTS

Students wishing to major in mechanical engineering should have the Bachelor of Science degree in mechanical engineering from an approved school. Students with degrees in other disciplines may be required to take certain undergraduate courses depending on their particular graduate program.

Letters in parentheses at the end of the course descriptions refer to the semester in which the course will be scheduled to be offered: (F), Fall; (SP), Spring; (NS), Night Summer.

5301. TRANSPORT PROCESSES (3-0) 3 hours credit—The theory and application of the transport processes, heat, mass, and momentum, are covered in this course. May be repeated for credit as topics change. Prerequisite: mechanical engineering 3302 (Heat Transfer) and 3311 (Thermodynamics I).

5302. ADVANCED THERMODYNAMICS (3-0) 3 hours credit—Such topics as thermostatics, micro and macro thermodynamics, energetics and their applications are covered. The course may be repeated for credit as topics change. Prerequisite: mechanical engineering 3312 (Thermodynamics II).

5303. CLASSICAL METHODS OF CONTROL SYSTEMS ANALYSIS AND SYNTHESIS (3-0) 3 hours credit — This course is intended to equip the student with a detailed familiarity with the historically significant tools of the control engineer. Detailed discussion of block diagram algebra, signal flow algebra, the amplitude ratio-frequency and phase shift angle-frequency plots, the Bode diagram, the Nyquist diagram, the Nichols chart and the root locus is presented.

5304. ADVANCED MECHANICAL ENGINEERING SYSTEMS (3-0) 3 hours credit—This course is a continuation of the undergraduate mechanical engineering systems course. Topics covered in greater depth are fluid control systems, optimization methods, and methods of synthesis. This course may be repeated for credit as topics change.

5305. DYNAMIC SYSTEMS MODELING (3-0) 3 hours credit—The purpose is 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. The framework of the linear graph is used to pursue the modeling equations of mechanical, thermal, fluid, and electrical lumped parameter systems (some discussion of less frequently encountered systems is included).

5306. FLUID POWER CONTROL (3-0) 3 hours credit—Mathematical models for hydraulic and pneumatic control components and systems are synthesized including hydraulic pumps, motors and spool valves. Application of electrohydraulic and hydromechanical servomechanisms for position and velocity control are treated. Theory is supported by laboratory demonstrations and experiments. Prerequisite: mechanical engineering 3310 (F).

5307. MODERN METHODS OF CONTROL SYSTEMS ANALYSIS AND SYNTHESIS (3-0) 3 hours credit—This course is intended to equip the student with knowledge of systems applications of the state-space concept and real-time solution techniques. State-space formulations, reference trajectory, linearization, linear vector spaces, the state transition matrix and its properties; and the controllability and observability concepts are treated.

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5309. INTRODUCTION TO SYSTEMS OPTIMIZATION (3-0) 3 hours credit—The fundamental theorems of the classical calculus of variations, and of the Maximum Principle of Pontryagin are the essential content of this course. Examples from the area of mechanical engineering systems serve to demonstrate the applications.

5310. PLASMA DYNAMICS (3-0) 3 hours credit — The elements of electromagnetic field theory, kinetic theory and statistical mechanics of gases are applied to electrical conduction in ionized gases and the derivation of MHD flow equations (F).

5311. GAS DYNAMICS (3-0) 3 hours credit—The laws of mechanics and thermodynamics are applied to problems of fluid flow. One-dimensional phenomena such as shock, flow with friction, diabatic flow and subsonic and supersonic flows are treated (NS).

5312. PHYSICAL GAS DYNAMICS (3-0) 3 hours credit—The fundamentals of high-speed, high-temperature flow of a gas are presented from the molecular view. Simple kinetic theory, chemical thermodynamics, and the physical and chemical bases of rate processes are presented.

5313. FLUID DYNAMICS (3-0) 3 hours credit—Fluid Dynamics is an advanced study of the kinematics and dynamics of fluid motion, stresses in fluids and surface flow (F).

5314. MAGNETOGASDYNAMICS (3-0) 3 hours credit—Magnetogasdynamics is a continuation of mechanical engineering 5310. The MHD flow equations are applied to such areas as power generation, space propulsion, boundary layer phenomena, and control of re-entry bodies.

5316. THERMAL CONDUCTION (3-0) 3 hours credit—Thermal Conduction is a study of the 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 (F).

5317. CONVECTION HEAT TRANSFER (3-0) 3 hours credit —The 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-convention problems are solved (SP).

5318. RADIATIVE TRANSFER (3-0) 3 hours credit — The general equations of radiative transfer are derived and solved for special problems, and the elements of atomic, molecular and continuum radiation are introduced (NS).

5319. HEAT TRANSFER DESIGN (3-0) 3 hours credit—Heat transfer design is the application of fundamental principles toward the analysis and synthesis of complex thermal systems such as rocket nozzles, nuclear reactors and ablation heat shields (SP).

5320. NUCLEAR REACTOR THEORY (3-0) 3 hours credit— This course includes a study of the principles of nuclear reactions and radiations, diffusion and slowing down of neutrons, the steady state reactor, control of nuclear reactors, and radiation protection and reactor safeguards.

5321. ADVANCED CLASSICAL THERMODYNAMICS (3-0) 3 hours credit — The fundamentals of thermodynamics are reviewed. Different treatments of principles are studied, compared and formal relationships are developed and applied to chemical, magnetic, electric and elastic systems (F).

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5322. NUCLEAR POWER ENGINEERING (3-0) 3 hours credit—This course is a continuation of mechanical engineering 5320. It is concerned with reactor energy removal, reactor structural materials and moderator materials, reactor fuels, reactor shielding, and reactor systems and power costs. Prerequisite: mechanical engneering 5320.

5323. STATISTICAL THERMODYNAMICS (3-0) 3 hours credit—Statistical mechanics and kinetic theory are related to thermodynamics and Maxwell-Boltzman, Bose-Einstein and Fermi-Dirac statistics are introduced and applied (SP).

5325. COMBUSTION (3-0) 3 hours credit—Combustion is the fundamental treatment of problems involving simultaneous occurrence of chemical reaction and transfer of heat, mass, and momentum.

5326. PROPULSION (3-0) 3 hours credit—Air-breathing and rocket engines are analyzed and advanced propulsion systems including nuclear and electrical are introduced. Component and system performance calculations are stressed.

5327. NUMERICAL CONTROL OF MACHINE TOOLS (3-0) 3 hours credit—The basic elements of numerical control of metal processing systems are studied; programs for point to point and contouring machines are developed; the interactions between geometry and machinability decisions are determined.

5328. ADVANCED MANUFACTURING ANALYSIS I (3-0) 3 hours credit—Studies are made of the technical aspects of manufacturing, emphasizing process design and equipment. Prerequisite: mechanical engineering 4307 (Manufacturing Analysis) or equivalent.

5329. FORMING OF METALS (3-0) 3 hours credit—Theoretical studies are made of various metal forming processes; elastic and plastic stress-strain relations are developed; the effects of strain hardening are considered.

5330. METAL CUTTING (3-0) 3 hours credit—Metal cutting operations are studied with special emphasis on machine tool, cutting tool and work material behavior.

5331. ANALYTIC METHODS IN ENGINEERING (3-0) 3 hours credit—In this course an introduction to advanced analytic methods is given. These are applied transform and matrix methods, and the elements and engineering applications of complex variables. Prerequisite: undergraduate degree in engineering, physics, or mathematics.

5332. ENGINEERING ANALYSIS (3-0) 3 hours credit—Engineering Analysis involves the 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. MECHANICAL ENGINEERING ANALYSIS TECHNIQUES (3-0) 3 hours credit—The purpose of this course is to add depth to the students' capability in the use of general transform techniques. Topics which are treated include the Fourier, Laplace, and Z transforms as well as the computer-oriented Fast Fourier transforms. Prerequisite: undergraduate degree in engineering, physics, or mathematics.

5334. APPLICATIONS OF THE THEORY OF STATISTICS AND PROBABILITY TO MECHANICAL ENGINEERING SYSTEMS (3-0) 3 hours credit—The fundamentals of probability theory and statistics as related to conventional mechanical engineering problems are treated. These principles are then applied

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to problems in random vibrations and in the behavior of dynamic systems due to random disturbances and conditions.

5335. OPTIMAL LINEAR SYSTEMS (3-0) 3 hours credit— Optimal Linear Systems is a detailed coverage of the work to date on that type of problems. Subjects are the Kalman Regulator and others in this class, optimal parameters, non-analytic criteria and gradient techniques. Prerequisite: mechanical engineering 5309.

5336. ENGINEERING DESIGN (3-0) 3 hours credit—This course is an introduction to the philosophy of comprehensive design. The creative process and the factors that influence it are emphasized with a discussion of the attitudes and viewpoints of the designer and an investigation of techniques of analysis, synthesis, and evaluation. The major vehicle is a group semester design project requiring a written proposal, an oral progress report, and final written and oral design reports.

5337. DESIGN ANALYSIS I (3-0) 3 hours credit—Analysis methods of current and future use to the mechanical designer are introduced. Topics include applications of mechanical logic design (Boolean Algebra) and digital computer simulation for mechanical design.

5338. DESIGN ANALYSIS II (3-0) 3 hours credit—A companion to mechanical engineering 5337. Topics covered in this course include design applications of calculus of variations, and design optimization. Enrollment in mechanical engineering 5338 is not dependent upon current or prior enrollment in mechanical engineering 5337.

5339. STRUCTURAL ASPECTS OF DESIGN (3-0) 3 hours credit—Emphasis is on analytical and experimental determination of stresses in machine and structural components. A survey is made of stress-strain-strength relations, pertinent material properties and such special topics as stress corrosion, fretting corrosion, creep, hydrogen embrittlement, brinelling, corrosion fatigue, heat treating, stress relieving, inspection procedures, combined stresses, fatigue design, thermal stresses, dynamic loads.

5341. CONTROL SYSTEM COMPONENTS (2-3) 3 hours credit — Hydraulic, pneumatic, and electro-mechanical component and system characteristics are determined, and systems are simulated on analog and digital computer equipment.

5345. DESIGN PROJECT I (2-3) 3 hours credit—The student uses rational and intuitive problem-finding procedures to identify a design project, presents a project proposal, performs research, and prepares a design program. The creative aspects of design are emphasized.

5346. DESIGN PROJECT II (2-3) 3 hours credit—This course is a continuation of mechanical engineering 5345 in which a project is carried to the working prototype. Cost and production are considered.

5191, 5291, 5391. ADVANCED STUDIES IN MECHANICAL ENGINEERING (Variable credit from 1 to 3 semester hours as arranged)—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. This course will be graded on a pass-fail (P-F) basis.

5192, 5292, 5392. ADVANCED TOPICS IN HEAT TRANSFER (Variable credit from 1 to 3 semester hours)—Various special topics in heat transfer will be covered. May be repeated for

credit as topics change. This course will be graded on a pass-fail (P-F) basis.

5195, 5295, 5395. ASSIGNED TOPICS IN MECHANICAL ENGINEERING (Variable credit from 1 to 3 semester hours as arranged)—Students entering the mechanical engineering graduate program may be required to take this course in order to satisfy background requirements normally satisfied by mechanical engineering graduates of this institution. Participation in a specified organized course may be required. This course may not be used for graduate degree credit but may be repeated for credit.

5398, 5698, 5998. THESIS Variable credit of three, six, or nine hours—Prerequisite: graduate standing in mechanical engineering.

6301. NONLINEAR PROBLEMS IN ENGINEERING (3-0) 3 hours credit—This is a survey of nonlinear problems arising in mechanical engineering systems, and the methods of characterizing such typical nonlinearities as friction, backlash, and dead zone.

6302. DESIGN OF DIGITAL CONTROL CIRCUITS (3-0) 3 hours credit—The theory for synthesis and design of digital control systems with emphasis on fluid controlled switching circuits is covered in this course. Topics included are sequential machine control, synthesis of asynchronous sequential circuits, hydraulic logic components, fluidics, and timing considerations in circuit design.

6303. INDUSTRIAL APPLICATIONS OF SYSTEMS THEORY IN ANALYSIS AND CONTROL (1-6) 3 hours credit—Advanced concepts pertaining to the modeling, analysis, and design of dynamic systems is covered in one hour of lecture per week. Throughout the semester, the students are involved in the solution of advanced design and control problems supplied by industry (SP).

6314. MECHANISMS (3-0) 3 hours credit—The rational design of linkages to satisfy various design requirements is studied. Two- and three-dimensional motions are considered. Computer-aided mechanism design is used as a tool.

6315. MACHINE DYNAMICS (3-0) 3 hours credit—Design problems as influenced by the response of machine systems and their components are studied. Topics covered include study of reciprocating and rotating machinery, flexible mechanisms, mechanical impedance methods, and machine signature analysis.

6317. ADVANCED TOPICS IN HEAT TRANSFER (3-0) 3 hours credit—Includes analytical treatment of advanced radiation and convection problems using exact and approximate mathematical techniques. Prerequisites: mechanical engineering 5317 and 5318 (SP).

6327. JOINING MATERIALS OF MANUFACTURE (3-0) 3 hours credit—Studies are made of surface bonding, welding metallurgy, effect of rate of energy input on properties, residual stress and distortion, economics and process capabilities.

6331. COMPUTER METHODS IN SYSTEMS ANALYSIS (3-0) 3 hours credit—This course provides background and experience in the use and developments of Fortran-coded digital computer programs for large-scale systems analysis and synthesis. Prerequisite: mechanical engineering 5307, 5303.

6332. ESTIMATION THEORY (3-0) 3 hours credit—Means of treating measurements to obtain a best estimate of the quantities

measured are presented. The emphasis is on application to dynamic systems. Prerequisite: mechanical engineering 5303, 5307, 5334.

6333. APPLIED DIFFERENTIAL GAME THEORY (3-0) 3 hours credit—The fundamentals of differential game theory are introduced, and application in the area of systems optimization in the presence of uncertainties and two player zero-sum games are discussed. Prerequisite: mechanical engineering 5309.

6334. APPLICATION OF OPTIMIZATION TECHNIQUES (3-0) 3 hours credit—The application of dynamic programming, linear programming, and non-linear (with emphasis on geometric) programming to systems control problems is presented. Prerequisite: mechanical engineering 5309.

6336. FRICTION AND WEAR (3-0) 3 hours credit—Wear and other types of surface attrition are considered in this course with reference to surface nature and combinations, friction, absorbed gases, contaminants and surface heating.

6337. COMPUTER AIDED DESIGN (3-0) 3 hours credit—Studies are made of computer techniques to be used in the design process. Consideration is given to the mathematics and graphics of curved surfaces, curve fitting, curve smoothing, and the communication of the logical structure of problem solutions.

6338. DESIGN AND ITS ENVIRONMENT (3-0) 3 hours credit—The interactions of corporate and social elements and the designer are studied with their contributions to the comprehensive design.

6339. OPTIMIZATION FOR DESIGN (3-0) 3 hours credit—Optimization methods that are adaptable for computer-aided design are presented. A series of simple optimum design problems is used to demonstrate several mathematical programming techniques. The unconstrained minimization problem and conversion of constrained to unconstrained problems are considered. Several methods for constrained problems are also considered using linear programming, gradient projection and feasible directions.

6390. SUPERVISED TEACHING IN MECHANICAL ENGINEERING (3-0) 3 hours credit—This course involves teaching under close supervision, attending group meetings, and individual conferences, and submitting reports as required. May be repeated for credit. This course is required for all teaching assistants and associates in mechanical engineering; however, it may not be used for degree credit. This course will be graded on a pass-fail (P-F) basis.

6197-6997. RESEARCH IN MECHANICAL ENGINEERING (Variable credit 1 to 9 semester hours as arranged)—This course may be repeated for credit.

6399, 6699, 6999. DISSERTATION Variable credit of three, six, or nine hours—Prerequisite: admission to candidacy for the Doctor of Philosophy degree.

Department of
PHYSICS (PHYS)

Areas of Study	*Degrees*
Physics	**M.A.**
Radiological Physics (See Interdepartmental & Intercampus Programs, p. 217)	**M.S.**

Master's Degree Plans: Thesis only

Chairman: Louis A. Rayburn

                    102 Science Hall   273-2266

Graduate Advisor: Truman D. Black

                    104 Science Hall   273-2266

Graduate Faculty:

     Professors Diana, Herrmann, McNutt, Rayburn
     Associate Professors Black, Cooke, Ellis, Fry, Rubins, Self, Terrell, Thompson
     Adjunct Associate Professors Claytor, Dowdey
     Adjunct Assistant Professor Cottam

OBJECTIVE

The objective of graduate work in physics is to prepare the student for continued professional and scholarly development as a physicist. The Physics M.A. Degree Program is designed to give the student a foundation in all fundamental areas of physics through formal courses and to give the student the experience of participating in original research in one of a variety of projects directed by the faculty.

DEGREE REQUIREMENTS

For admission to the Master of Arts 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 hours of advanced physics and supporting courses. Deficiencies must be removed.

A minimum of 30 hours is required for the Master of Arts degree, of which 18 hours, including a six hour thesis (minimum registration), will be in physics, and 12 hours may be selected from physics, mathematics, chemistry, geology, biology or engineering as approved by the Graduate Advisor.

5190. PHYSICS COLLOQUIUM (1-0) 1 hour credit—Lectures by students, faculty and invited speakers on current topics in physics. This course may be repeated for credit, and will be graded on a pass-fail (P-F) basis.

5306. CLASSICAL MECHANICS (3-0) 3 hours credit — The general principles of analytical mechanics, the kinematics of rigid bodies, canonical transformations. Hamilton-Jacobi theory. Prerequisite: physics 4319 (Advanced Mechanics) or permission of Graduate Advisor.

5307. QUANTUM MECHANICS I (3-0) 3 hours credit — Matrix formulation, theory of radiation, angular momentum, perturbation methods. Prerequisite: permission of Graduate Advisor.

5308. QUANTUM MECHANICS II (3-0) 3 hours credit—Approximate methods, symmetry and unitary groups, scattering theory. Prerequisite: physics 5307 or permission of Graduate Advisor.

5309. ELECTROMAGNETIC THEORY I (3-0) 3 hours credit —Boundary value problems in electrostatics and magnetostatics, Maxwell's equations. Prerequisite: permission of Graduate Advisor.

5310. STATISTICAL MECHANICS (3-0) 3 hours credit — 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: physics 4315 (Heat and Thermodynamics) or permission of Graduate Advisor.

5311. MATHEMATICAL METHODS IN PHYSICS I (3-0) 3 hours credit—A study of algebraic and analytical methods used in odern 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) 3 hours credit— A continuation of physics 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 0(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: physics 5311 or permission of Graduate Advisor.

5313. ELECTROMAGNETIC THEORY II (3-0) 3 hours credit —A 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: physics 5309 or physics 5311 or permission of Graduate Advisor.

5314. ADVANCED OPTICS (3-0) 3 hours credit—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) 3 hours credit—Crystal structure, lattice vibration, thermal properties, and band theory of solids. Prerequisite: permission of Graduate Advisor.

5316. SOLID STATE II (3-0) 3 hours credit—Electrical and <i>Physics</i> magnetic properties of crystalline solids, magnetic resonance, and optical phenomena. Prerequisite: permission of Graduate Advisor.

5317. RELATIVITY (3-0) 3 hours credit — The geometry of special relativity; particles in fields; collisions of particles; experiments and applications of relativity in optics, electrical engineering, atomic and nuclear physics, and space physics; fluids; fields; introduction to general relativity and the needed differential geometry. Prerequisite: permission of Graduate Advisor.

5318. ADVANCED NUCLEAR PHYSICS (3-0) 3 hours credit —Properties of nuclei, nuclear two-body problems, meson theory of nuclear forces, nuclear models, nuclear structure, and nuclear transitions. Prerequisite: physics 3446 (Nuclear Physics), physics 4326, or permission of Graduate Advisor.

5320. THEORETICAL PHYSICS (3-0) 3 hours credit—Meaning of physical theory, space and time in physics, the foundations of mechanics, probability and statistics, and continua. Prerequisite: physics 5306 or permission of Graduate Advisor.

5321. MODERN PHYSICS (3-0) 3 hours credit—This course will present a unified approach to the principle fields of modern physics, relativity, quantum mechanics, atomic spectroscopy, quantum statistics, solid state physics, particle physics, and nuclear physics. Prerequisite: permission of Graduate Advisor.

5323. ELEMENTARY PARTICLES (3-0) 3 hours credit—Production, detection, and classification of elementary particles. Qualitative study of strong, electromagnetic, and weak interactions, and their respective conservation laws. Semi-quantitative treatment of the SU(3) symmetry. Prerequisite: physics 5307 or permission of Graduate Advisor.

5325. QUANTUM FIELD THEORY (3-0) 3 hours credit — A study of the quantized field description of elementary particles and their interactions, developed from the principles of quantum mechanics and Lorentz invariance. Quantitative applications to electromagnetic and weak interactions. Prerequisite: physics 5308 or permission of Graduate Advisor.

5328. THEORETICAL SEISMOLOGY (3-0) 3 hours credit— Analysis of body and surface seismic waves utilized in industrial seismic exploration and in earthquake seismology for investigation of the deep interior of the earth. Rock elastic properties; reflection, refraction, interference, and diffraction of waves; seismic energy; wave amplitude, frequency, and velocity. Prerequisite: mathematics 3318 (Differential Equations) and physics 1442 (General College Physics) or 1444 (General Technical Physics) or permission of Graduate Advisor.

5350. SPECIAL TOPICS IN PRECOLLEGE PHYSICAL SCIENCE INSTRUCTION (1-6) 3 hours credit—This course is designed for experienced teachers of precollege physical science and/or physics. The intent of the course is to consider special problems in precollege physical science instruction and to expose teachers to new laboratory-oriented precollege curricula. This course may be repeated for credit as the subject matter changes. This course may not be used to satisfy any of the requirements for the Master of Arts degree in physics. Prerequisite: a bachelor's degree, teaching experience or an intent to teach, and permission of Graduate Advisor.

5391. SPECIAL TOPICS IN PHYSICS (3-0) 3 hours credit— Topics in physics, particularly from areas in which active research is being conducted, are assigned to individuals or small **161**

groups for intensive investigations. This course may be repeated for credit. Prerequisite: permission of Graduate Advisor.

5392. SELECTED TOPICS IN PHYSICS (3-0) 3 hours credit —Topics in this course may be varied from semester to semester depending on the needs and interest of the students. This course may be repeated for credit. Prerequisite: permission of Graduate Advisor.

5193-5693. READINGS IN PHYSICS (variable credit from one to six hours as arranged)—A conference course which may be repeated for credit. Prerequisite: permission of instructor.

5194-5694. RESEARCH IN PHYSICS (variable credit from one to six hours as arranged)—A conference course with laboratory which may be repeated for credit. Prerequisite: permission of instructor.

5398, 5698, 5998. THESIS Variable credit of three, six, or nine hours. Prerequisite: permission of Graduate Advisor.

The following courses may be applicable toward the graduate program if approved in advance by the graduate Advisor.

4325. SOLID STATE PHYSICS

4326. INTRODUCTION TO QUANTUM MECHANICS

Department of
POLITICAL SCIENCE (POLS)

Area of Study	*Degree*
Political Science	M.A.

Master's Degree Plan: Thesis only

Chairman: Samuel B. Hamlett

206 University Hall   273-2991

Graduate Advisor: John J. S. Moon

402 University Hall   273-2991

Graduate Faculty:

Professors Dawson, Hagard, Hamlett, Matthias, Richards

Associate Professors Moon, Odom, Saxe, Taborsky, Van Cleve

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
162 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 subject pursuits undertaken beyond the master's level. Particular attention is given newer methodologies and approaches employed by scholars in the field.

DEGREE REQUIREMENTS

Twenty-four hours of course work must include three hours of the conference course in Scope and Methods in Political Science for those who have not had political science 4329 or its equivalent. (political science 3310 does not satisfy this requirement.) Of the remaining 21 hours, at least three hours must be taken from each of four of the following six areas:

Political Behavior and Processes — 5310, 5350, 5391.

Comparative Politics — 5336, 5353, 5391.

International Politics and Organization — 5127, 5354, 5391.

Public Law and Jurisprudence — 5320, 5355, 5391.

Public Administration and Policy Studies — 5303, 5322, 5330, 5331, 5335, 5356, 5391.

Political Theory (Thoughts and Methodology) — 5338, 5339, 5357, 5391.

Six hours of supporting work from upper-division undergraduate courses or graduate courses in other disciplines may be substituted for course work in political science on the advice of the departmental graduate advisor. No more than three semester hours of advanced undergraduate work shall be taken in the area of supporting work.

A maximum of nine semester hours of advanced undergraduate work in political science and supporting areas may be included.

All candidates for the Degree of Master of Arts with a major in political science shall pass an oral examination over the candidate's graduate course work, as determined by the Department of Political Science.

5303. ORGANIZATIONAL THEORY AND DEVELOPMENT (3-0) 3 hours credit—This course will examine the evolution of organization theory; models of human and managerial behavior; contemporary theories of organization and change; and implications of concepts of the public interest for decision-making. (This course is also offered as urban affairs 5303 and criminal justice 5309.)

5310. FEDERALISM AND INTERGOVERNMENTAL RELATIONS (3-0) 3 hours credit—This course examines the theory and practice of federal systems, with attention paid to selected contemporary problems of intergovernmental relations arising under American federalism.

5320. CONTEMPORARY JUDICIAL POLITICS AND BEHAVIOR (3-0) 3 hours credit—This course examines the process and decision-making of the American judiciary with emphasis on contemporary constitutional issues.

5322. URBAN PUBLIC FINANCE (3-0) 3 hours credit—The tax, revenue, and fiscal problems of cities and local governments

in metropolitan areas are studied. Problems of matching costs and benefits in providing public services among different local governments will be analyzed. The increasingly complex dimensions of intergovernmental fiscal relations and public budgeting systems will be explored. (This course is also offered as urban affairs 5322.)

5327. COMPARATIVE FOREIGN POLICY (3-0) 3 hours credit —This course investigates the national interest, objectives and capabilities of selected nations, as well as their processes of decision-making with emphasis on common and specific causes of failure of foreign policy strategies.

5330. THE ADMINISTRATIVE SYSTEM (3-0) 3 hours credit —This course examines the role and scope of administration in public organizations and in various cultural contexts. The system's characteristics as a decision-making mechanism will be analyzed, with emphasis upon processes, regulations, and responsibility.

5331. URBAN GOVERNMENT ADMINISTRATION (3-0) 3 hours credit—This course analyzes the 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.

5335. LABOR RELATIONS IN THE PUBLIC SECTOR (3-0) 3 hours credit—This course examines the 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 SYSTEM OF THE SOVIET UNION (3-0) 3 hours credit — This course covers the development of Soviet political theory and social, political, and governmental structure from 1917 to the present.

5338. PEACE, JUSTICE AND SOCIAL CHANGE (3-0) 3 hours credit—This course examines problems relating to the establishment and maintenance of world peace and order with reference to justice and social change.

5339. EMPIRICAL THEORY AND METHODOLOGY (3-0) 3 hours credit—This course examines 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 are studied.

5350. SEMINAR IN POLITICAL BEHAVIOR AND PROCESSES (3-0) 3 hours credit.

5353. SEMINAR IN COMPARATIVE POLITICS (3-0) 3 hours credit.

5354. SEMINAR IN INTERNATIONAL POLITICS AND ORGANIZATION (3-0) 3 hours credit.

5355. SEMINAR IN PUBLIC LAWS AND JURISPRUDENCE (3-0) 3 hours credit.

5356. SEMINAR IN PUBLIC ADMINISTRATION AND POLICY STUDIES (3-0) 3 hours credit.

5357. SEMINAR IN POLITICAL THEORY (THOUGHTS AND METHODOLOGY) (3-0) 3 hours credit.

A seminar in each of the fields represented by the six courses above will be offered at least once in any four-semester span. The course may be repeated for credit as the topic changes.

5391. CONFERENCE COURSE IN POLITICAL SCIENCE 3 hours credit—Research and reading in a specialized field under the direction of a member of the graduate faculty.

5398, 5698, 5998. THESIS Variable credit of three, six, or nine hours—Original research designed to augment existing studies of problems or topics related to one of the major fields of study. A written report conforming to institutional and departmental standards is required.

Department of
PSYCHOLOGY (PSYC)

Area of Study	*Degrees*
General Experimental Psychology	M.A., PH.D.

Master's Degree Plan: Thesis only

Chairman: James R. Erickson

309-B Life Science   273-2281

Graduate Advisor: James N. Bowen

418 Life Science   273-2281

Graduate Faculty:

Professors Amster, Bernstein, Bowen, Cox, Erickson, McCain
Associate Professors Baerwaldt, Kopp, Paulus
Assistant Professors Ambler, Gatchel, Miller
Adjunct Associate Professor Gorsuch
Adjunct Assistant Professors Galosy, Garland

OBJECTIVE

The objective of graduate work in psychology is to educate the student in the methods and basic content of the discipline and to give him an apprenticeship in the execution of creative research.

Graduate work in the doctoral and master's programs will be offered in general experimental psychology. Student's individual programs may be arranged to give emphasis to a particular aspect of the general program.

Deadline for Financial Aid Applications—Students who wish to be considered for assistantships must have their application and departmental form sent to The University of Texas at Arlington by April 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.

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DEGREE REQUIREMENTS

In addition to the requirements outlined elsewhere, the Department of Psychology will require a satisfactory score on the Miller Analogies Test. Undergraduate courses in statistics and in experimental methods are also required but may be taken as deficiency courses.

The Department of Psychology has some rules which are more stringent than the minimums established by the University. Each entering graduate student will be furnished a copy of the departmental rules which will serve as guidelines for departmental actions and recommendations.

Degree Requirements for the Master of Arts Degree

The degree of Master of Arts in experimental psychology requires scholarly attainment in the basic subject matter of psychology as a science and the ability to demonstrate that attainment through an original piece of research. Although the M.A. program is designed to form the basis of the doctoral program, it is also open to those seeking a terminal master's degree.

General Curriculum and Research Requirements—Psychology 5405 and 5406 (Advanced Statistics I and II) will be required of all students. In addition, students will be required to take nine hours of core courses from 5411, 5422, 5431, and 5433. Up to nine hours of approved undergraduate courses may be applied to the M.A. requirements provided these are taken outside the Psychology Department. No undergraduate course in psychology may be taken for graduate credit.

As soon as practicable a student should decide on his or her area for concentration and research. After discussion with a staff member, and with the staff member's consent, the student selects a supervising professor. With the aid and advice of the supervising professor the student will prepare and present a proposed program to the proper committee within the department. The objective of the program is to give the student a broad exposure to various areas in psychology in addition to his or her area of concentration.

Degree requirements for the 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. There is no specific residence requirment imposed by the Department.

Foreign Language—Because of the growing importance of computers in psychology, all students who enter the program seeking a doctorate will be required to demonstrate proficiency in computer programming. This may be accomplished by a passing grade in Computer Science 2306 (Computer Programming and Applications) which may be taken on a pass-fail basis. The

166 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. This computer science requirement is in lieu of a foreign language requirement.

Mathematics—Experimental psychology is requiring increasing sophistication in mathematics. All prospective students are encouraged to recognize this trend and prepare themselves as well as possible. Mathematics through Introductory Calculus is desirable but not required.

Course requirements—Entering graduate students will be required to take the following courses during their first two semesters or 18 hours of enrollment. Exceptions may be made only with written permission of the departmental graduate committee.

Advanced Statistics I (5405).
Advanced Statistics II (5406).

Three of the following four courses:
Learning Theory (5411).
Advanced Social Psychology (5422).
Perceptual Processes (5431).
Advanced Physiological Psychology (5433).

Students with prior graduate work may be exempt from any or all 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:

(a) Experimental Design (psychology 5307—3 hours)
(b) Quantitative Methods (psychology 5308—3 hours) or Research Methods (psychology 5309—3 hours)
(c) Five courses (15 hours) from among those numbered psychology 5310 through 5335.
(d) Two six-hour research courses. These may be taken from among psychology 5698 and psychology 5640 through 5647. Students who plan to obtain the M.A. should elect psychology 5698 as one of the research courses and students who do not plan to obtain the M.A. should select their courses from the latter set of courses. In either event, one of the two research courses should be completed before the student takes the qualifying examination. The two research courses are a minimum requirement. Students are also strongly encouraged to take psychology 5391 before taking one of the six-hour courses.
(e) Three three-hour seminar courses (psychology 6304 through 6337—9 hours)
(f) Additional hours of course work to be determined by the Graduate Advisor and dissertation committee. The student should plan to take approximately 90 hours.

A student has completed the core requirements when he or she has:

(a) Received at least a B average in his core area courses.
(b) Received at least a B average in all other courses.
(c) Received a positive evaluation in his two major research courses.

COOPERATION WITH TEXAS CHRISTIAN UNIVERSITY

Due to their similarity in orientation and degree require-ments, the psychology departments of The University of Texas at Arlington and Texas Christian University are cooperative. There is routine interchange of graduate teaching personnel and research facilities. Students enroled at UT Arlington may elect to have one or more members of their qualifying and disserta-tion committees from among the TCU faculty although their major professor will normally be a member of the UT Arlington staff. Approved courses taken at other area institutions may also be applied to the gaduate program requirements and faculty members of these institutions may also serve on committees. For further details, students should consult the Graduate Advisor.

5405.   ADVANCED STATISTICS I (4-0) 4 hours credit—A re-view of essential mathematical ideas and techniques, a survey of the basic concepts of probability theory, mathematical expecta-tion, special distributions; parametric estimation theory. This course was previously numbered 5301.

5406.   ADVANCED STATISTICS II (4-0) 4 hours credit—In-cludes statistical hypothesis testing, Bayesian inference, decision theory, linear regression and correlation; analysis of variance; distribution-free techniques.

5307.   EXPERIMENTAL DESIGN (3-0) 3 hours credit — A study of the statistical aspects of complex experimental designs used in psychological research. Prerequisite: psychology 5301 or 5305. This course was previously numbered 5302.

5308.   QUANTITATIVE METHODS (3-0) 3 hours credit—A survey of techniques for analyzing multivariate data; particular topics include partial and multiple correlation, factor analysis, and the linear discriminant function. Prerequisite: Psychology 5306 and completion of computer science requirement or per-mission of instructor. This course was previously numbered 5303.

5309.   RESEARCH METHODS (3-0) 3 hours credit—This was previously numbered 5304.

5310.   MATHEMATICAL MODELS IN PSYCHOLOGY (3-0) 3 hours credit—Elementary probability theory, matrix algebra, and theory of linear difference equations applied to theoretical prob-lems in learning, signal detection, decision processes, and social interactions.

5411.   LEARNING THEORY (4-0) 4 hours credit—A survey of the basic theories of learning.

5312.   ANIMAL LEARNING (3-0) 3 hours credit—A survey of contemporary problems in animal learning.

5313.   COGNITIVE PROCESSES (3-0) 3 hours credit—An ap-plication and extension of basic concepts of psychology to more complex behavior. An investigation of such behaviors as con-cept formation, problem solving, and creative thinking.

5314.   PSYCHOLINGUISTICS (3-0) 3 hours credit — An in-vestigation of language in terms of its function, content and structure, with an emphasis on learning, perception, and gen-eration of linguistic units.

5315.   OPERANT PSYCHOLOGY (3-0) 3 hours credit — An 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) 3 hours credit—The course will consider the origins of psychology in the development of Western thought. Early conceptualization of problems and their modification with changes in evidence will be emphasized. This course offers the student an opportunity to integrate ideas from the various areas of psychology which are usually treated as being diverse and separate.

5317. PSYCHOPHYSIOLOGY (3-0) 3 hours credit—Introduction to human psychophysiological research and methodology. The course examines the physiological consequences of stimulus input, and explores possible interdependencies between verbal, overt motor, and physiological response events that will help to explain behavior. Emphasis is also placed on the assessment of emotional states in normal and psychopathological conditions, and laboratory procedures in response measurement and analysis.

5321. PERSONALITY AND BEHAVIOR DYNAMICS (3-0) 3 hours credit—Research in personality processes; particular topics include unconscious processes, anxiety, and conflict.

5422. ADVANCED SOCIAL PSYCHOLOGY (4-0) 4 hours credit—Problems in social psychology emphasizing integration of experimental design, research findings and theoretical formulations.

5323. ADVANCED DEVELOPMENTAL PSYCHOLOGY (3-0) 3 hours credit—A survey of development of behavior in both humans and sub-humans.

5325. THEORIES OF MOTIVATION (3-0) 3 hours credit— This course 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.

5431. PERCEPTUAL PROCESSES (4-0) 4 hours credit—A 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.

5332. SENSORY PROCESSES (3-0) 3 hours credit—Structure, function, and neural processes in the various sense modalities. Emphasis is placed upon the current literature and theory on vision, audition, somathesis, taste, and smell and their relationship to perception and behavior.

5433. ADVANCED PHYSIOLOGICAL PSYCHOLOGY (4-0) 4 hours credit—The biological and physical processes underlying behavior. Emphasis is placed upon neurophysiological, biochemical and endocrinological mechanisms serving as a foundation for behavior. Other topics covered are the neural and chemical basis for conditioning and learning, intelligence and language, reflexes and motor performance, and abnormal behavior.

5335. ANIMAL BEHAVIOR (3-0) 3 hours credit—A phylogenetic approach to some basic problems in behavior, with special emphasis on unlearned behavior.

5337. MAN-MACHINE SYSTEMS (3-0) 3 hours credit—The study of man-machine systems and human factors research; topics include response latency as a factor in equipment design, **169**

tracking behavior, vigilance decrement, and absolute judgment phenomena.

5338. PRACTICUM IN BEHAVIOR MODIFICATION (3-0) 3 hours credit—An intensive experience-based course in applied behavior analysis. Students, under the supervision of the instructor, develop and implement behavior training programs for individual retarded children in local school settings. The programs are designed to facilitate ongoing classroom instruction for the children in academic, verbal, and self-help skills. Prerequisite: psychology 2310 or psychology 3440 or psychology 4318, or the equivalent. By permission only. Graded on a pass-fail (P-F) basis.

5340. TEACHING UNDERGRADUATE PSYCHOLOGY (2-2) 3 hours credit—A survey of the approaches to teaching general psychology, course organizations, sources of knowledge, and keeping current with contemporary developments. The definition of objectives and evaluation of teaching effectiveness are also analyzed in their application. $2 lab fee.

5341. DECISION MAKING (3-0) 3 hours credit—A study of variables that influence choices.

5342. MATHEMATICAL LEARNING THEORY (3-0) 3 hours credit—A study of the variables that influence choices.

5343. SIGNAL DETECTION THEORY (3-0) 3 hours credit—A survey of signal detection theory considered both as a method and as a substantive approach to perception, memory and decision making in the social sciences. Prerequisite: Mathematics through Introductory Calculus (5305) or permission of instructor.

5344. PSYCHOMETRIC THEORY (3-0) 3 hours credit—An introduction to test construction. Topics include reliability theory, test validation, and item analysis.

5345. HUMAN LEARNING AND MEMORY (3-0) 3 hours credit—A survey of current approaches to the study of learning, transfer, and retention in human adults, with emphasis upon associative processes and verbal responses. This course would consider theories, methods, and findings in paired-associate learning, serial learning, free recall, verbal discrimination learning, short-term memory, concept learning, connected discourse and word association.

5346. SOCIAL BEHAVIOR OF ANIMALS (3-0) 3 hours credit—A survey of the research and theories related to nonhuman social behavior.

5347. ADVANCED ENVIRONMENTAL PSYCHOLOGY (3-0) 3 hours credit—A survey of the current literature on the impact of various features of the physical and social environment on human behavior. This course is 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 (variable credit from 1 to 3 semester hours as arranged) — Independent readings under the supervision of an individual faculty member. Students wishing to conduct an experiment should sign up for psychology 5191, 5291, or 5391. These courses may be repeated for credit with permission of the Graduate Advisor. Graded on a pass-fail (P-F) basis.

5389. CONTEMPORARY PROBLEMS IN PSYCHOLOGY (3-0) 3 hours credit—Topics vary; may be repeated for credit with permission of Graduate Advisor.

5181. LABORATORY IN PHYSIOLOGICAL PSYCHOLOGY (0-2) 1 hour credit—A laboratory examination of research tech-

niques and methodology in physiological psychology. Includes *Psychology*
neurological and psychopharmacological procedures.

5182. INSTRUMENTATION IN PSYCHOLOGY (0-3) 1 hour
credit—An introduction to the basic principles of mechanics,
electricity, and electronics with emphasis upon their application
to psychological research. Includes a survey of and familiarity
with psychological apparatus.

5191, 5291, 5391. RESEARCH IN PSYCHOLOGY (variable
credit from 1 to 3 semester hours as arranged)—Independent
research under the supervision of an individual faculty member;
may be repeated for credit with permission of Graduate Advisor.

**5640. RESEARCH IN HUMAN PERFORMANCE AND PER-
CEPTION** (2-12) 6 hours credit.

5641. RESEARCH IN LEARNING OR MOTIVATION (2-12) 6
hours credit.

5642. RESEARCH IN PHYSIOLOGICAL PSYCHOLOGY (2-
12) 6 hours credit.

5643. RESEARCH IN DEVELOPMENT (2-12) 6 hours credit.

5644. RESEARCH IN MATHEMATICAL PSYCHOLOGY (2-
12) 6 hours credit.

5645. RESEARCH IN GROUP PROCESSES (2-12) 6 hours
credit.

5646. RESEARCH IN PERCEPTION (2-12) 6 hours credit.

5647. RESEARCH IN COGNITIVE PSYCHOLOGY (2-12) 6
hours credit.

5398, 5698, 5998. THESIS Variable credit of three, six, or nine
hours—Prerequisite: 12 hours of advanced psychology and per-
mission of the Graduate Advisor.

6304. SEMINAR IN MATHEMATICAL PSYCHOLOGY (3-0)
3 hours credit. May be offered on a pass-fail (P-F) basis.

6311. SEMINAR IN LEARNING (3-0) 3 hours credit. May be
offered on a pass-fail (P-F) basis.

6313. SEMINAR IN COGNITIVE PROCESSES (3-0) 3 hours
credit. May be offered on a pass-fail (P-F) basis.

6322. SEMINAR IN SOCIAL PSYCHOLOGY (3-0) 3 hours
credit. May be offered on a pass-fail (P-F) basis.

6323. SEMINAR IN DEVELOPMENTAL PSYCHOLOGY (3-0)
3 hours credit. May be offered on a pass-fail (P-F) basis.

6325. SEMINAR IN MOTIVATION (3-0) 3 hours credit. May
be offered on a pass-fail (P-F) basis.

6331. SEMINAR IN PERCEPTION (3-0) 3 hours credit. May
be offered on a pass-fail (P-F) basis.

6333. SEMINAR IN PHYSIOLOGICAL PSYCHOLOGY (3-0)
3 hours credit. May be offered on a pass-fail (P-F) basis.

6334. SEMINAR IN PSYCHOPHYSIOLOGY (3-0) 3 hours
credit. May be offered on a pass-fail (P-F) basis.

6337. SEMINAR IN HUMAN PERFORMANCE (3-0) 3 hours
credit. May be offered on a pass-fail (P-F) basis.

6348. DISSERTATION PREPARATION (3-0) 3 hours credit
—The course is designed to aid advanced students in the identi-
fication of an appropriate dissertation problem and formulation
of a dissertation proposal. It will be taught in a seminar or
tutorial fashion by a faculty member related to the students'
dissertation interests. Offered only on a pass-fail (P-F) basis.

6399, 6699, 6999. DISSERTATION Variable credit of three, six,
or nine hours.

RADIOLOGICAL PHYSICS Program

See Interdepartmental and Intercampus Programs, p. 217

Graduate School of
SOCIAL WORK (SOCW)

Areas of Study   *Degrees*

Social Work   M.S.S.W.

Administration (See Interdepartmental and Intercampus Programs, p. 194)

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

Dean: Fernando G. Torgerson

301 Cooper Center   273-3181

Graduate Advisor: Lila B. Hagins

301 Cooper Center   273-3181

Graduate Faculty:

Professors Callicutt, Duehn, Mayadas, Torgerson

Associate Professors Arangio, Bisbee, Daley, Gorsuch, Hagins, Litrio, Saleebey

Assistant Professors Allbritton, Granvold, Grinnell, Hunter, Kersey, Maldonado, Millerman, Mitchell, Nichols, Sanchez, Shannon, Watkins, Watts, Welch

Visiting Assistant Professor Ayers

Adjunct Associate Professor P. Gaupp

Adjunct Assistant Professors Bernstein, Boro, Burrus, Eason, D. Gaupp, Gilliam, Keitch, Knox, Roberts, Stewart, Synar, Weiland

OBJECTIVES

The program leading to the Master of Science in Social Work degree focuses on developing professional leaders in the areas of direct social work practice and community social work practice. The program of instruction includes an intensive academic component integrated with a practicum component allowing the student to learn and apply theory concurrently.

Dual Social Work-Urban Affairs Program: In conjunction with the Institute of Urban Affairs, the Graduate School of Social Work participates in a dual degree program whereby a student can earn a Master of Arts in Urban Affairs and a Master of Science in Social Work. To participate in the program, a student must make separate applications to both the Institute and the Graduate School of Social Work. The dual program requires students to complete 46 hours of coursework in the School of Social Work, 24 hours in the Institute, and 12 hours of joint coursework. Six of the 12 hours of joint courses are in research and students must complete either a six-hour research practicum or thesis in the Graduate School of Social Work or an internship report in the Institute.

ADMISSION REQUIREMENTS

In addition to requirements for admission to the Graduate School listed elsewhere, intellectual maturity, emotional stability, and ability and interest in working with people are among the necessary personal qualifications for admission to the Graduate School of Social Work. Applicants must also have demonstrated professional leadership or potential for professional leadership. Letters of reference and a personal interview are required.

ADVANCED STANDINGS

An applicant who has graduated from an accredited undergraduate program in social work-social welfare may request admission to the graduate program with advanced standing. Such requests will be considered by the Committee on Graduate Studies, on an individual basis, course by course, depending on the applicant's demonstrated academic and practice competence.

DEGREE REQUIREMENTS

The program leading to the degree of Master of Science in Social Work covers four semesters for full-time students and requires the completion of 64 semester hours of graduate work including class and field instruction and a thesis or thesis substitute. A non-thesis degree plan involving the preparation of a substantial research report is available with special approval by the Committee on Graduate Studies.

CONTINUATION

The Graduate School of Social Work, in fulfillment of its responsibility to graduate high quality professional social workers, has established certain policies and procedures. In addition to **173**

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 second-year course work and field instruction in the area of specialization (Direct Practice or Community Practice) and,

(2) Demonstrate suitability for professional social work practice.

At such time as a student fails to achieve (1) above, or questions are raised by faculty concerning (2) above, a formal review by the Committee on Graduate Studies resulting in favorable comment (recommendation) by the committee will be required for continuation in the program.

PROGRAM OF STUDY

The first year generic curriculum includes:

1. Description and analysis of social welfare policy and social welfare institutions established to translate policy into services.
2. The behavioral, social, economic and political sciences which rationalize practice and the administrative and management concepts and principles needed to administer programs.
3. Causes and prevention of social dysfunctioning.
4. The methods, techniques and tools needed to identify, reduce and prevent social problems.
5. Practice under faculty supervision.

FIRST YEAR

Fall Semester			Spring Semester		
*(R) SOCW 5301	Human Behavior I	(3)	(R) SOCW 5302	Human Behavior II	(3)
(R) SOCW 5303	Social Policy	(3)	(R) SOCW 6322	Research Methods	(3)
(R) SOCW 5304	Direct Practice I	(3)	(R) SOCW 5305	Direct Practice II	(3)
(R) SOCW 5306	Community Practice I	(3)	(R) SOCW 5307	Community Practice II	(3)
(R) SOCW 5251	Applied Direct Practice I	(2)	(R) SOCW 5253	Applied Direct Practice II	(2)
(R) SOCW 5252	Applied Community Practice I	(2)	(R) SOCW 5254	Applied Community Practice II	(2)
		16			16

*(R) — Required course

In the second year, students concentrate in one of two core areas of study: (1) direct practice—service to individuals, families, and small groups; (2) community practice with further specialization in either community planning or administration.

SECOND YEAR

Fall Semester			Spring Semester		
*(R) SOCW 6324	Statistics and Research	(3)	(R) SOCW 6305	Policy Integrating Seminary	(3)
(R) SOCW 6451 (6651) 6452 (6652)	Applied Direct Practice III or Applied Community Practice III	(4-6)	(R) SOCW 6453 (6653) 6454 (6654)	Applied Direct Practice IV or Applied Community Practice IV	(4-6)
(R)	Direct Practice, Planning or Administration course	(3)	(R)	Direct Practice, Planning or Administration course	(3)
(R)	Research Practicum or Thesis	(0-6)	(R)	Research Practicum or Thesis	(0-6)
**(E)	Electives	(0-6)	(E)	Electives	(0-6)
		16			16

*(R) — Required course
**(E) — Elective

PART-TIME PROGRAM (M.S. S.W.)

A limited number of students may be enrolled under a program which allows students to complete the first 32 hours of graduate work on a part-time basis. The remaining 32 hours must be completed on full-time status. The part-time program is designed to accommodate those persons who, due to employment, economic, or family reasons, would find it impossible to attend on a full-time basis for two years.

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.

Required courses for the part-time program are sequenced as follows:

YEAR I

Fall Semester		Spring Semester	
*(R) SOCW 5301 Human Behavior I	(3)	(R) SOCW 5302 Human Behavior II	(3)
(R) SOCW Social Policy	(3)	(R) SOCW 6322 Research Methods	(3)
	6		6

YEAR II

Fall Semester		Spring Semester	
(R) SOCW 5304 Direct Practice I	(3)	(R) SOCW 5305 Direct Practice II	(3)
(R) SOCW 5306 Community Practice I	(3)	(R) SOCW 5307 Community Practice II	(3)
	6		6

SUMMER FOLLOWING YEAR II

(R) SOCW 5251 Applied Dircet Practice I	(2)
(R) SOCW 5252 Applied Community Practice I	(2)
(R) SOCW 5253 Applied Direct Practice II	(2)
(R) SOCW 5254 Applied Community Practice II	(2)
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YEAR III

Second year level courses amounting to 32 credit hours

*(R) — Required course

Human Behavior and the Social Environment

5301. HUMAN BEHAVIOR AND THE SOCIAL ENVIRONMENT I (3-0) 3 hours credit—An exploration of basic human experiences, this course will present an overview of the normal social functioning and behavior of the individual within the context of the family, group, community and other social systems. Special emphasis is placed on the interrelatedness and impact of the physical, emotional, intellectual, cultural and social systems related to the stages of human development. Required of all first-year students.

5302. HUMAN BEHAVIOR AND THE SOCIAL ENVIRONMENT II (3-0) 3 hours credit—A continuation of 5301 with particular emphasis on theories of, and research into, social deviance and psychopathology. Prerequisite: 5301 or permission of the instructor. Required of all first-year students.

6301. HUMAN BEHAVIOR AND THE SOCIAL ENVIRONMENT III (3-0) 3 hours credit—This course, intended for students who select the specialty of direct practice in their second year, is a study of personality theories. The focus is on the commonalities and critical differences between the theories and their status in terms of current empirical research into the area of

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personality dynamics. Prerequisite: 5302 or permission of the instructor.

6302. HUMAN BEHAVIOR AND THE SOCIAL ENVIRON-MENT IV (3-0) 3 hours credit—This course is a wide-ranging seminar exploring the potential impact of some recent theoretical, conceptual and empirical developments in the behavioral sciences upon the practice of social work and the institution of social welfare. Prerequisite: permission of the instructor.

6303. HUMAN BEHAVIOR AND THE SOCIAL ENVIRON-MENT V (3-0) 3 hours credit—This course provides an analysis of the influences, external and internal, on human behavior in formal organization, as well as the forms that behavior takes within organizations. Of special concern is the interaction between personality attributes and organizational imperatives. Prerequisite: permission of the instructor.

6320. PSYCHOLOGICAL INTIMACY (3-0) 3 hours credit—Exploration of the development and ending of psychologically intimate relationships. This course focuses on theoretical and empirical responses to two basic questions: (1) how do people go about initiating, developing, and sustaining psychologically intimate relationships? (2) what happens when these relationships deteriorate? The intent includes: (1) enhancement of psychological intimacy in one's own experiences; and (2) attainment of knowledge about processes of psychological intimacy which can be taught to others.

6325. FACTORS IN ALCOHOLISM (3-0) 3 hours credit—The course will focus on the alcohol abuser; physiological, psychological, and social factors in the causation of and effects of alcohol abuse. Study of several very different approaches to treatment. Prerequisite: permission of instructor.

6326. SOCIAL WORK AND SELECTED SOCIOLOGICAL PERSPECTIVES (3-0) 3 hours credit—An overview of selected sociological theories, concepts and models, with particular emphasis upon their relevance to the development of social work theory and research. Areas of interest may include the sociology of knowledge, social values, role theory, social structure, community power, ecology and demography, social stratification, social change, and others. Prerequisite: permission of instructor.

6327. APPLICATION OF PSYCHOLOGICAL KNOWLEDGE TO PRACTICE RESEARCH AND THEORY (3-0) 3 hours credit —A seminar devoted to examination of selected bodies of knowledge from psychology, and to the evaluation of their applicability to problems of social work. Focus is on evolution of conceptual and research strategies for utilizing psychological findings in the development of social work knowledge. Prerequisite: permission of instructor.

6332. SOCIAL WORK AND SELECTED PERSPECTIVES FROM POLITICAL SCIENCE (3-0) 3 hours credit—Special problems are considered in the strategies of applying political science research and knowledge in social work. Prerequisite: permission of instructor.

6333. APPLICATION OF ECONOMIC THEORY TO SOCIAL WORK PRACTICE (3-0) 3 hours credit—Examination of problems arising from characteristics and interactions of social welfare systems and the field of economics, including conceptual issues of research and application. Special attention is given to existing and potential strategies for promoting collaboration. Prerequisite: permission of instructor.

5303. FOUNDATIONS OF SOCIAL WELFARE POLICY AND SERVICES (3-0) 3 hours credit—This course 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. Students are required to evaluate social welfare programs by utilizing a set of analytic criteria. The profession of social work is also 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) 3 hours credit—This seminar examines current policies, programs, and practices which have been established to deal with the problem population and gives particular attention to new perspectives on the delivery system and staffing in Child Welfare. Through analysis and research it provides for students knowledge for more effective practice in the field of Child Welfare. Prerequisite: 5303 and permission of the instructor.

6305. SOCIAL WELFARE POLICY AND SERVICES INTEGRATING SEMINAR (3-0) 3 hours credit—This seminar focuses on issues and problems of broad concern to the profession of social work. Members of the faculty may serve as consultants and resource persons to seminar members who are required to make analyses and presentations on issues that predict as well as apprehend the urgent concerns of the social work profession. Prerequisite: 5303 or permission of the instructor. Required of all second-year students.

6319. ISSUES IN COMMUNITY MENTAL HEALTH (3-0) 3 hours credit—This seminar examines significant policy issues in mental health through the application of an analytic model. Issues considered include problem definition, client identification and analysis, manpower, organization and delivery of services and economic issues. Substantive knowledge is developed through discussion and analysis of these inter-related issues. Prerequisite: 5303 and permission of the instructor.

6321. ISSUES IN ALCOHOL ABUSE AND ALCOHOLISM (3-0) 3 hours credit—This seminar examines significant policy issues in the area of alcohol abuse and alcoholism through the application of an analytic model. Issues considered include problem definition, client identification and analysis, manpower, organization and delivery of services, and economic issues. Substantive knowledge is developed through discussion and analysis of these interrelated issues. Prerequisite: 5303 and permission of the instructor.

6328. SOCIAL POLICY RESEARCH AND ANALYSIS (3-0) 3 hours credit—This seminar is addressed to 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 will be considered, as well as more formal research designed to add to professional knowledge concerning intervention in macro-systems. Prerequisite: 6322 and 6324 or equivalents and permission of instructor. Required of all doctoral students concentrating in social welfare administration.

6329. SOCIAL WORK AND THE LAW (3-0) 3 hours credit—This course will present an overview of legal principles and procedures as they apply to social workers and their interaction with clients. Special emphasis is placed on family law with specific problems in the fields of mental health, consumerism, mal- **177**

practice, courtroom testimony, criminal law, estates and community legal services.

6331. PROFESSIONAL AND INSTITUTIONAL HISTORY AND PHILOSOPHY OF SOCIAL WELFARE (3-0) 3 hours credit—A historical and philosophical and perspective on social welfare and social work concepts, issues, and trends. Prerequisite: permission of instructor. Required of all doctoral students concentrating in social welfare administration whose master's degree is in a field other than social work.

Direct Practice

5304. DIRECT SOCIAL WORK PRACTICE (3-0) 3 hours credit—Introduction to basic direct service methodologies of social work intervention at the individual, family, and group levels. Common elements of direct service methodology—criteria for problem identification, goal determination, and selection of intervention techniques and treatment strategies are explored. Knowledge and skill required in the management of the worker-client relationship and effect desired treatment outcomes is emphasized. Required of all first-year students.

5305. DIRECT SOCIAL WORK PRACTICE II (3-0) 3 hours credit—Further attention is given to change theories, intervention strategies and therapeutic techniques employed at the individual, family, and group levels. Emphasis is placed on developing criteria for selection among alternative approaches, intervention activities which are appropriate to the specific goal of intervention and the specific practice context. Course content will also focus on the utilization of small group theory, process and group formulation criteria. Prerequisite: 5304 or equivalent. Required of all first-year students.

All students electing to major in Direct Practice are required to take at least one Direct Practice elective in both their third and fourth semesters.

6307. SOCIO-BEHAVIORAL THEORY FOR DIRECT SOCIAL WORK PRACTICE (3-0) 3 hours credit—An introduction to the experimental bases and clinical applications of socio-behavioral approaches relevant to social work practice. Attention is given to different change methods such as reinforcement, extinction, shaping, modeling and aversive control. Application is made directly to the wide range of behaviors of concern to the social worker. Recent theoretical formulations and relevant research are considered. Prerequisite: 5305 or equivalent and permission of instructor.

6308. ADVANCED SEMINAR IN DIRECT SOCIAL WORK PRACTICE IV (3-0) 3 hours credit—This seminar will focus on the integration of theoretical knowledge and practice principles in terms of their utilization for direct practice. Emphasis is placed on recent theoretical developments in the social and behavioral sciences as well as to current practice trends. Attention is given to an examination of substantive and methodological issues in current research as applied to interventions with individuals and family groups. Prerequisite: 6306, or 6307 or equivalent and permission of instructor.

6309. SUPERVISION AND CONSULTATION FOR DIRECT PRACTICE (3-0) 3 hours credit—An introduction to the philosophy, objectives, and methods of the supervisory and consultative processes. Application of relevant social and behavioral science concepts and social work theory to principles of administration, teaching, and learning. Administrative, supervisory, educative,

and helping aspects of the social worker's leadership function with a range of social service personnel will be explored. Prerequisite: 5305 or equivalent and permission of instructor.

6310. SEMINAR IN TREATMENT MODALITIES (3-0) 3 hours credit—A critical examination of a broad spectrum of intervention methodologies employed by a variety of allied helping professions. Attention is given to problems of their efficacy, the status of empirical validation, and the adequacy of their explanations of human behavior for given practice situations. Prerequisite: 5305 or equivalent and permission of instructor.

6311. SEMINAR IN DIRECT METHODS IN MARITAL AND FAMILY COUNSELING (3-0) 3 hours credit—Examination of various psychological, social and behavioral treatment approaches as they relate to the treatment of problems in marital and familial adjustment. Emphasis will be 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. Case material from the student's field experience is utilized. Prerequisite: 5305 or equivalent and permission of instructor.

6312. GROUP DYNAMICS I AND SOCIAL WORK PRACTICE (3-0) 3 hours credit—The objective of this course is to examine contemporary social-psychological concepts and small group research, with a view to testing their applicabiltiy to practice propositions and operational principles, in work with both task and personality satisfaction groups. Prerequisite: 5305 and permission of instructor.

6313. GROUP METHODS IN COUNSELING II AND SOCIAL WORK PRACTICE (3-0) 3 hours credit—A 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: 6312 or permission of instructor.

6323. MICROCOUNSELING: INTERPERSONAL COMPETENCE IN SOCIAL WORK PRACTICE (3-0) 3 hours credit— The rationale for the organization of this course is borrowed from empirical studies related to interpersonal behavioral control which suggest that there are certain specific behavioral dimensions which are essential for effective therapeutic outcome. The course content will draw upon existing studies and theories in the areas of (1) self-concept, (2) levels of performance in interventive encounters, and (3) worker behaviors allegedly related to client change within the contexts of the microcounseling model.

Community Planning and Administration

5306. COMMUNITY PLANNING AND ADMINISTRATION I (3-0) 3 hours credit—An introductory survey course of community organization, social planning, administration, and management with emphasis on common areas of knowledge and practice skills. The development of analytical approaches to the understanding of community and organizational phenomena. Illustrations are given to aid in understanding theoretical concepts. Beginning development or rational analytical schemes to guide the practitioner in his choice of strategies and tactics. Required of all first-year students.

5307. COMMUNITY PLANNING AND ADMINISTRATION II (3-0) 3 hours credit—Community social and related service sys-

tems and their interrelationships will be reviewed. The client systems of the administrator, community planner, and community organizer will be identified. Methodologies in problem identification and analysis will be reviewed. The respective roles of the community practitioner, related professional disciplines, and the citizen participant will be studied for their respective utility. Trends in planning will be reviewed and a general problem resolution model developed. Prerequisite: 5306 or permission from the instructor. Required of all first-year students.

6314. ADMINISTRATION (3-0) 3 hours credit—An introduction and exploration of the major schools of thought in organization and management theory. These include scientific management, human relations, sociological, and systems perspectives. Throughout the course, significant organizational variables will be identified to help the student identify implications for the practice of social welfare administration. Required of administration majors. Prerequisite: 5307 and permission of instructor.

6315. COMMUNITY PROBLEM SOLVING (3-0) 3 hours credit —Building on the practice skill clusters developed in SW 6317, this course integrates skills into strategies of implementation, with particular emphasis on the role of consumers/citizens. Students prepare and defend a project proposal, based on a thorough process of community problem solving. Each student prepares a personalized problem solving model. Prerequisite: 6317 and permission of the instructor. Required of all community planning majors.

6316. ADVANCED ADMINISTRATION (3-0) 3 hours credit —This course is designed to explore selected organizational and administration issues. A focus on skills and methodologies useful to the administrator in dealing with such issues will be maintained. Student leadership and responsibility for class presentations is planned for the latter part of the course. Prerequisite: 6314 and permission of instructor. Required of administration majors.

6317. ADVANCED PLANNING (3-0) 3 hours credit—This course focuses on a limited number of practice skill clusters deemed central to the planner's functions. Theoretical and empirical literature are reviewed for each skill cluster. Skill development is stressed, with role playing, exercises, simulations and games utilized as means to achieve desired skill levels. Key concepts including practice by objectives, consultative roles, power relationships in planning, accountability, and citizen participation. Prerequisite: 5307 and permission of instructor. Required of all community planning majors.

6318. MANAGEMENT (3-0) 3 hours credit—Study of the principles of management as applied to social welfare organizations and programs. Social theory knowledge applicable to management will be reviewed. Principles and problems of personnel administration, supervision and leadership, motivation, and communication within an organization will be reviewed.

6119. ADMINISTRATIVE LEADERSHIP IN SOCIAL PROGRAMS (1-0) 1 hour credit—This seminar aims to help the student integrate in the final semester the knowledge, skills and values acquired in other courses during the preceding three semesters around the concepts of (a) administrative leadership, (b) social systems, (c) role, (d) organizational behavior, (e) multi-causation of problems, and (f) interdisciplinary approach to problem solving. To the degree possible, the student's own experience during the previous three semesters will be utilized in bringing life and substance to the above concepts as they relate to administrative processes.

6334. SOCIAL WORK AND THE POLITICAL PROCESS (3-0) 3 hours credit—A seminar course designed to create an awareness of the realistic aspects as well as the theoretical aspects of the political process. There will be focus upon identification of the systems (i.e., city council, school board, planning and zoning commission, etc.), relationships among the systems, areas of entry into the systems, general methods and strategies of intervention, and emerging "style" of each student consistent with principles developed in the course. Prerequisite: permission of instructor.

6335. ADVANCED SEMINAR IN THE THEORY AND PRACTICE OF SOCIAL WORK ADMINISTRATION (3-0) 3 hours credit—Critical evaluation of social work administration practice conceptualizations and instances of current practice, focusing on adequacy of theoretical formulations and their fit to the requisites of practice. Prerequisite: permission of instructor.

Research

6322. RESEARCH METHODS IN SOCIAL WORK (3-0) 3 hours credit—An 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, corerlations, analyses of variance, and report writing.

6324. STATISTICS AND RESEARCH METHODS IN SOCIAL WORK II (3-0) 3 hours credit—An advanced course in the application of research principles and techniques. Topics include multiple regression and statistical control, advanced 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.

6336. SEMINAR IN LARGE SCALE ORGANIZATIONAL AND EVALUATIVE RESEARCH (3-0) 3 hours credit—An examination of the problems and issues involved in evaluating the effectiveness of service outcome in large social service delivery systems (e.g., public welfare systems, hospitals, national voluntary health agencies). A variety of research designs and exemplars of evaluative research will be critically examined. Attention will be devoted to accreditation and accountability of human service practice. The seminar will also be devoted to presentation and discussion of current research projects by faculty and students. Prerequisite: 6322 and 6324 or equivalents and permission of instructor. Required of all doctoral students concentrating in social welfare administration.

6395, 6695. RESEARCH PRACTICUM 3 or 6 hours credit—An individual or small group research project in the student's major area of specialization with emphasis on applying research principles and procedures. A substantial research report is expected at the conclusion of the course.

6398, 6698. THESIS. Variable credit during a single semester of three or six hours. Requires an individual research project in the individual's area of specialization, with a minimum of 6 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, and the Dean of the Graduate School. Defense in a final oral examination is required. Prerequisite: permission of the Graduate Advisor and the instructor in charge.

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Field Instruction

Field Instruction is a directed educational experience in social work practice with instruction offered by agency or campus-based faculty members. Offered concurrently or subsequent to classroom instruction, the field courses offer an opportunity for a student to integrate and utilize classroom content in the context of practice.

5151. APPLIED DIRECT SOCIAL WORK PRACTICE I (0-4) 1 hour credit.

5152. APPLIED COMMUNITY PLANNING AND ADMINISTRATION I (0-4) 1 hour credit.

5251. APPLIED DIRECT SOCIAL WORK PRACTICE I (0-8) 2 hours credit.

5252. APPLIED COMMUNITY PLANNING AND ADMINISTRATION I (0-8) 2 hours credit.

5253. APPLIED DIRECT SOCIAL WORK PRACTICE II (0-8) 2 hours credit.

5254. APPLIED COMMUNITY PLANNING AND ADMINISTRATION II (0-8) 2 hours credit.

5353. APPLIED DIRECT SOCIAL WORK PRACTICE II (0-12) 3 hours credit.

5354. APPLIED COMMUNITY PLANNING AND ADMINISTRATION II (0-12) 3 hours credit.

6251. APPLIED DIRECT SOCIAL WORK PRACTICE III (0-8) 2 hours credit.

6252. APPLIED COMMUNITY PLANNING AND ADMINISTRATION III (0-8) 2 hours credit.

6253. APPLIED DIRECT SOCIAL WORK PRACTICE IV (0-8) 2 hours credit.

6254. APPLIED COMMUNITY PLANNING AND ADMINISTRATION IV (0-8) 2 hours credit.

6451. APPLIED DIRECT SOCIAL WORK PRACTICE III (0-16) 4 hours credit.

6452. APPLIED COMMUNITY PLANNING AND ADMINISTRATION III (0-16) 4 hours credit.

6453. APPLIED DIRECT SOCIAL WORK PRACTICE IV (0-16) 4 hours credit.

6454. APPLIED COMMUNITY PLANNING AND ADMINISTRATION IV (0-16) 4 hours credit.

6651. APPLIED DIRECT SOCIAL WORK PRACTICE III (0-24) 6 hours credit.

6652. APPLIED COMMUNITY PLANNING AND ADMINISTRATION III (0-24) 6 hours credit.

6653. APPLIED DIRECT SOCIAL WORK PRACTICE IV (0-24) 6 hours credit.

6654. APPLIED COMMUNITY PLANNING AND ADMINISTRATION IV (0-24) 6 hours credit.

The addition of two credit hours to the field course requires one additional day (8 hours) to be spent in the course. The additional day will be at the same location and taught by the same instructor as the four-credit-hour required field course for which the student would register. The additional day will allow the student to pursue theoretical, conceptual, and experiential material in a special area of interest with the consent of the in-

structor. As prescribed by the instructor, the student will attain, through selected readings, conferences, didactic presentations and sense data, a breadth and depth of knowledge and practice in a special interest area above and beyond that which is covered by other academic or field courses.

Tutorials

6190, 6290, 6390. TUTORIAL 1, 2, or 3 hours credit—Arrangements may be made for a directed and supervised tutorial in a select area of special interest to the student. Prerequisite: permission of Graduate Advisor. This course may be repeated for credit.

Special Seminars

6192, 6292, 6392. SELECTED TOPICS IN SOCIAL WELFARE 1, 2, or 3 hours credit—Topics in this course may be varied from semester to semester depending on the needs and interest of the students. Prerequisite: permission of Graduate Advisor. This course may be repeated for credit.

Department of
SOCIOLOGY (SOCI)

Area of Study	*Degree*
Sociology	M.A.

Master's Degree Plan: Thesis only

Chairman: Lee Taylor   205 University Hall   273-2661

Graduate Advisor: Graduate Advisor
447 University Hall   273-2661

Graduate Faculty:

Professor Taylor
Associate Professors Anderson, Lord, Stacey
Assistant Professors Rombough, Ventimiglia, Weed

OBJECTIVE

The objectives of graduate work in sociology are two fold. First, the student is expected to become acquainted in depth with the theory, methods, and content of the discipline. Second, the student is intended to prepare for the professional practice of sociology in urban agencies and government as well as academic careers. Basic research opportunities and professional work on urban planning and design teams are available to students who prepare for professional practice.

Before entering graduate work in sociology, students are required to have a core knowledge in the field. Undergraduate courses in theory, statistics, and methods are required. When a student's record shows inadequate preparation in any major area, he may be required to make up such deficiencies through additional course work.

Special interests not represented in the courses listed in this Catalog may be pursued through one or both of the conference courses (5392, 5393), so long as adequate graduate supervision is available.

5301. SOCIOLOGICAL THEORY (3-0) 3 hours credit—This course covers the development of sociological theory from 1800 to the present. Prerequisite: Sociology 1311.

5302. THEORY CONSTRUCTION (3-0) 3 hours credit—The study of modern writers as they deal with the logic of theory construction and address questions concerning the philosophy of science. Students individually utilize formal terms such as models, hypotheses, and derivation in developing various mathematical, schematic, and verbal modes of theorizing. Prerequisite: Sociology 1311.

5303. COMPARATIVE SOCIAL CHANGE (3-0) 3 hours credit—This seminar involves selected aspects of social change. The units of analysis will be large scale: societies, their value systems and institutions. Attention will be given to the various theories and attempts at measurement of social change. Prerequisite: Sociology 1311.

5304. STRATIFICATION (3-0) 3 hours credit—This seminar will direct attention to the origin, substance, and function of social stratification and social mobility in contemporary American society. The primary focus of attention will be on the individual, group, and societal consequences of class, status, and power differentials. In addition, some attention will be given to current literature and methodologies in stratification study. Prerequisite: Sociology 1311.

5305. URBAN ANTHROPOLOGY (3-0) 3 hours credit—This seminar will deal with the development and differentiation of cities with emphasis on the contribution of cross-cultural anthropological perspectives to the understanding of urban life in the United States. Readings and student papers will cover current literature in this subfield. Prerequisite: Sociology 1311.

5306. ADVANCED MANPOWER STUDIES (2-2) 3 hours credit—This course will emphasize the sociological aspect of manpower: planning, utilization, training, and legislation. Prerequisite: Sociology 1311.

5307. OCCUPATIONS AND PROFESSIONS ANALYSIS (3-0) 3 hours credit—This seminar will constitute an indepth examination of selected occupations at major blue collar, white collar, and professional levels for both theoretical and methodological points of view. Prerequisite: Sociology 1311.

5308. POPULATION AND URBAN MANPOWER (3-0) 3 hours credit—This seminar covers the study and evaluation of demographic techniques used in manpower projections at the federal, state and municipal levels.

5309. SOCIOLOGY AND SOCIAL ISSUES (3-0) 3 hours credit —This seminar explores the relationship between social and cultural systems and the kinds of social issues confronting societies. Social issues are employed as a means of analyzing social structure and social policy. Consideration is then given to the process by which social perception of issues arises, methods by which data are gathered, the sociological theories of social problems, and the relationship between issues and remedial policy.

5318. SEMINAR IN SOCIAL PSYCHOLOGY (3-0) 3 hours credit.

5325. SEMINAR IN SOCIAL ORGANIZATION (3-0) 3 hours credit.

5330. THE SOCIOLOGY OF URBAN POLITICS (3-0) 3 hours credit—This seminar examines the structure and functioning of the community political institution in urban society. Topics considered include: historical trends in community power structure, factors influencing power structure configurations, decision and policy-making, community extralocal political relationships, and minority politics.

5340. ADVANCED STATISTICS FOR SOCIOLOGISTS (2-2) 3 hours credit—This seminar is concerned with the testing of scientific hypotheses. Analysis of variance, regression analysis, pearsonian or zero-order correlation, multiple and partial techniques will be considered. Prerequisite: Sociology 1311.

5341. STUDIES OF DEVIANCE (2-2) 3 hours credit — This seminar will be oriented to a substantive study of deviant behavior and to divergent methodological approaches to deviance. A knowledge of the basic theories will be assumed so as to concentrate on current sociological and social-psychological studies. Prerequisite: Sociology 1311.

5342. URBAN SOCIOLOGY AND PLANNING (2-2) 3 hours credit—This course is a descriptive study of the form and development of the urban community with respect to its demographic structure, spacial and temporal pattern, and functional organization. The sociological aspects of planned change will be studied. Prerequisite: Sociology 1311.

5343. POPULATION AND URBAN ECOLOGY (2-2) 3 hours credit—This seminar will cover population theory and research into population trends, composition, and migration. This will include a review and evaluation of census data, vital statistics, demographic surveys and their uses with emphasis on measurement methods and analytical techniques. Special emphasis will be placed on ecumenopolis trends. Prerequisite: Sociology 1311.

5344. THE BLACK COMMUNITY (2-2) 3 hours credit—This seminar will include a sociological perspective of black communities and the forces external to them. Various community studies will be examined as resource material, but the primary focus of the course will be on the community as a problem-solving mechanism. Prerequisite: Sociology 1311.

5345. ADVANCED ETHNOLOGY (2-2) 3 hours credit—In this seminar discussion will be based on student reports and critiques of assigned readings. Major emphasis will be on the areas of ethnology and social anthropology. Prerequisite: Sociology 1311.

5346. URBAN SOCIAL ORGANIZATION AND NEW TOWNS (2-2) 3 hours credit—This seminar will examine social organization theory and relate it to the planning of neighborhoods, new towns, and urban regions. Prerequisite: Sociology 1311.

5347. RESEARCH DESIGN (2-2) 3 hours credit—This seminar focuses on the design, plan, structure, and strategies currently used in sociological research. The interrelatedness between the-

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ory, methods, and statistics is covered. Also included are the limitations of theory, problems of measurement error, sampling techniques, and the application of mathematical models, and the presentation of statistical data. Prerequisite: Sociology 1311.

5348. ADVANCED RESEARCH PRACTICUM (3-0) 3 hours credit—This course is designed to expand the research capabilities and experience of graduate students. Students will work closely with faculty members on all phases of ongoing research projects, and will meet in seminar to discuss problems and share information and experiences. In addition to gaining experience in the detailed skills involved in doing research, students will be expected to participate in the preparation of a research proposal for submission to a funding agency and in the writing of a research report for presentation at professional meetings and/or for publication. This course may not be taken as credit toward the thirty hours of coursework needed for the M.A. degree.

5349. METHODS IN DEMOGRAPHIC RESEARCH (3-0) 3 hours credit—This seminar covers the review and evaluation of censuses, vital statistics, and demographic surveys and their uses, with emphasis on measurement, methods, and analytical techniques.

5380. TEACHING UNDERGRADUATE SOCIOLOGY I (0-3) 3 hours credit—This course focuses on the practical problems of teaching undergraduate sociology. Students are assigned to one or two professors for the semester in order to observe and discuss the fine points of such activities as textbook selection, course organization, lecture preparation, laboratory procedure, examination construction and correction, and handling of special problems. Students will be given an opportunity to participate in as many of these as practicable, including the presentation of a set of their own lectures or laboratory exercises. This course may not be taken as credit toward the 30 hours of course work needed for the M.A. Degree.

5381. TEACHING UNDERGRADUATE SOCIOLOGY II (0-3) 3 hours credit—This course is the same as 5380, except that students are assigned to different professors teaching in areas different from the previous semester. This course may not be taken as credit toward the 30 hours of course work needed for the M.A. Degree.

5391, 5691. INTERNSHIP AND THESIS Variable credit of three or six hours—Professionally oriented graduate students in sociology are encouraged to participate in an internship program and out of that experience a thesis is to be written. The internship will be an internal part of the graduate offering. Placement and work will be under close supervision of the student's major professor.

5392. CONFERENCE COURSE IN SOCIOLOGY I 3 hours credit.

5393. CONFERENCE COURSE IN SOCIOLOGY II 3 hours credit.

5394. SPECIAL TOPICS IN SOCIAL PSYCHOLOGY (3-0) 3 hours credit—This course covers different topics each semester, such as social attitudes and mass communication, symbolic interactionism, sociolinguistics. It may be repeated for credit as the topic changes.

5395. SPECIAL TOPICS IN CRIMINOLOGY AND CORRECTIONS (3-0) 3 hours credit—This course covers different topics each semester in the fields of criminology, penology, and corrections. It may be repeated for credit as the topic changes.

5398, 5698. THESIS Variable credit of three or six hours.

URBAN AND REGIONAL AFFAIRS
Programs Division (URBA)

Areas of Study	*Degrees*
Urban Affairs	**M.A.**
Administration (See Interdepartmental and	
Intercampus Programs, p. 194)	**PH.D.**

Division Director: James V. Cornehls
548 University Hall 273-3071

Graduate Advisor: Delbert A. Taebel
543 University Hall 273-3071

Graduate Faculty:

Professors Cornehls, Geisel, Schkade
Associate Professors Taebel, Wyman
Asistant Professors Cummings, Georges, Rosentraub

OBJECTIVES

The activities of the Institute of Urban Studies are organized into three broad, functional areas: graduate instruction and related research; applied research and services provided public and private groups and officials; and criminal justice programs. The applied research and service activities are viewed as important adjuncts to the graduate instruction program. Graduate students in urban affairs may be involved in research and service projects that are relevant and timely in relation to contemporary urban problems. Members of the applied research and service staff may serve as resource specialists to graduate students and members of the graduate instructional staff. The wide contacts of institute staff members with public officials and agencies and private groups outside the University and involved in urban affairs can be helpful in arranging internships and for placing graduates in positions of employment.

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 which require 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 **187**

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.

Dual Social Work-Urban Affairs Program: In conjunction with the Graduate School of Social Work, the Institute participates in a dual degree program whereby a student can earn a Masters of Urban Affairs and a Master of Science in Social Work. To participate in the program, a student must make separate applications to both the Institute and the Graduate School of Social Work. The dual program requires students to complete 46 hours of course work in the School of Social Work, 24 hours in the Institute, and 12 hours of joint course work. Six of the 12 hours of joint courses are in research and students must complete either a six-hour research practicum in the Graduate School of Social Work or an internship report in the Institute.

DEGREE REQUIREMENTS

The Master of Arts degree in urban affairs seeks to provide students with an understanding of cities in five general and interrelated areas of knowledge:

Cities as political and administrative entities
Cities as social entities
Cities as economic entities
Cities as spatial and environmental entities
Historical, systemic and research approaches to cities

Within each of these areas, there are core courses required to be taken by all students. Students may elect either the generic urban affairs program or one of the specialization programs. Under the generic program, students would take one additional course in each of the five areas listed above in addition to core courses. A student also may elect to specialize in such areas as Community Relations, Urban Planning, Environment, Policy Analysis, and Management. A student selecting one of the specialities would take the core courses and an additional 15 hours of course work related to the speciality. This course work may be taken either in the Institute of Urban Studies or in other departments and schools which offer appropriate courses related to the area of specialization.

Satisfactory completion of a minimum of 30 semester hours of courses will be required and completion of a thesis or thesis substitute, carrying a minimum of six semester hours credit, will be necessary to receive the degree. Additional prerequisite courses may also be required.

Cities and Urban Areas as Political and Administrative Entities

5300. THE URBAN POLITICAL SYSTEM (3-0) 3 hours credit —This course examines the city as a political system, including the impact of urbanization and fragmentation on politics. The input dimensions, including voting patterns and interest group development, are then explored. Finally, the decision-making

structures, especially types of community power structures and *Urban* the impact of the reform movement on structural processes, are *Affairs* examined. (This course is also offered as political science 5331; credit will be granted only once.)

5301. POLITICS OF MINORITY GROUPS (3-0) 3 hours credit —This seminar is a continuation of the course listed above, and concentrates on recent developments related to partisan activities and political involvement of minority groups in cities and metropolitan areas. Emphasis will be on roles of black and Mexican American groups and individuals.

5302. URBAN POLICY AND INTERGOVERNMENTAL RELATIONS (3-0) 3 hours credit—This seminar is a 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 also is explored.

5303. ORGANIZATION THEORY AND DEVELOPMENT (3-0) 3 hours credit—This course will examine the evolution of organization theory; models of human and managerial behavior; contemporary theories of organization and change; and implications of concepts of the public interest for decision-making. (This course is also offered as criminal justice 5309 and political science 5303; credit will be granted only once.)

5304. URBAN MANAGEMENT (3-0) 3 hours credit—This course concentrates on the historical and legal evolution of urban public organizational forms. It also provides an overview of the major administrative processes in local government such as budgeting, personnel, systems analysis, and information systems. Finally, the major role issues facing urban public managers are explored.

5390. SPECIAL TOPICS IN URBAN POLITICS AND ADMINISTRATION (3-0) 3 hours credit—This course will deal with different topics each semester from such areas as: interest groups in urban community, the judicial system, political conflict, outputs of the political system, and the urban bureaucracy. The seminar may be repeated for credit as the topic changes.

Cities and Urban Areas as Social Entities

5310. THEORIES OF URBAN SOCIETY (3-0) 3 hours credit —Several theoretical perspectives of the community and community organization are examined in this course. Special emphasis is given to theories from human ecology, organization and stratification, and social welfare.

5311. URBAN SOCIAL PATHOLOGIES (3-0) 3 hours credit— This seminar deals with the nature and extent of major types of social pathologies and deviant behavior in cities and urban areas: family disorganization, crime and delinquency, poor health, lack of education, and unemployment. Newer concepts and techniques for maintaining "social accounts" and information systems for monitoring changes in socio-economic well-being will be studied.

5312. MINORITY GROUP RELATIONS AND SOCIAL PROBLEMS (3-0) 3 hours credit — Special problems of minority groups, primarily black and Mexican American groups, will be studied. The phenomenon of racial discrimination and the causes and consequences of violence and direct action or confrontation tactics will be examined, with emphasis on recent and contemporary problems and issues.

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5313. SOCIAL POLICY FORMATION (3-0) 3 hours credit—This course will utilize a sociological approach in the study of policy formation in such areas as aging, social planning, and community problem solving.

5314. COMMUNITY AND NEIGHBORHOOD ORGANIZATION (3-0) 3 hours credit—This seminar will focus on the structures and processes in the analysis and development of community and neighborhood organizations. Special emphasis will be given to poverty and minority communities and neighborhoods.

5391. SPECIAL TOPICS IN URBAN SOCIETY (3-0) 3 hours credit—This course will deal with different topics each semester and will focus on such selected urban sociological problems as criminology, housing, and transportation. It may be repeated for credit when the topic changes.

Urban Areas as Economic Entities

5320. THE URBAN ECONOMY (3-0) 3 hours credit—The internal dynamics of the growth and development of the urban system and its relation to the national economy are examined in this course. National and urban economic policy, urban growth and land use, market imperfections, urban financial issues, and the environmental implications of urban growth are studied through lecture, game simulation and policy debates.

5321. URBAN ECONOMIC ISSUES (3-0) 3 hours credit—This course examines the structure of U.S. industry and its effects on various aspects of economic and consumer welfare. Monopoly power, price fixing, and the exploitation of consumers (especially minorities and the poor) are studied. Such issues as the control of mortgage finance and consumer credit, "red-lining" of residential districts, and ghetto formation are additional topics covered in the course. Public policy efforts to provide for industrial regulation and consumer protection are assesed for their effectiveness and relevance to the nature of consumer exploitation.

5322. URBAN PUBLIC FINANCE (3-0) 3 hours credit—The tax, revenue, and fiscal problems of cities and local governments in metropolitan areas are studied. Problems of matching costs and benefits in providing public services among different local governments will be analyzed. The increasingly complex dimensions of intergovernmental fiscal relations and public budgeting systems will be explored. (This course is also offered as political science 5322; credit will be granted only once.)

5323. THE POLITICAL ECONOMY OF URBAN POVERTY (3-0) 3 hours credit—Topics covered include problems in measurement, definition and the conceptualization of poverty, as well as models of discrimination and the special place of minorities in poverty. The principal aims of the seminar are to develop understanding of the significant issues in urban poverty and to provide a framework for evaluating public policy.

5392. SPECIAL TOPICS IN URBAN ECONOMICS (3-0) 3 hours credit—This seminar will deal with different topics each semester and will focus on the economic dimensions of selected urban problems from such areas as welfare, housing, transportation, manpower, and economic development. The seminar may be repeated for credit as the topic changes.

Cities and Urban Areas as Spatial and Environmental Entities

5330. URBAN GEOGRAPHY (3-0) 3 hours credit—This seminar emphasizes areal aspects associated with urban centers and

the arrangements of urban centers in space as well as their *Urban*
internal patterns. *Affairs*

5331. SOCIAL ECOLOGY OF SPATIAL RELATIONSHIPS
(3-0) 3 hours credit—This seminar involves extensive readings
into such social processes as social ecology, urban crime and vio-
lence, arson, slum and ghetto exemplified in the works of leading
urbanologists.

5332. URBAN AND REGIONAL PLANNING (3-0) 3 hours
credit—This seminar deals with the nature of the planning
process in cities and urban regions and with concepts and tech-
niques used by professional planners and planning organizations.
Emphasis will be on understanding the role, limitations, and
political aspects of urban planning as opposed to instruction in
how to practice the art of planning. (This course is also offered
as architecture 5302; credit will be granted only once.)

5333. URBAN DESIGN (3-0) 3 hours credit—This seminar
seeks to provide understanding and appreciation on the part of
serious and systematic non-architecture students of the concepts
and skills of architects and physical design specialists. The im-
portance of design, form, and visual or aesthetic factors will be
studied. The interdependence of physical design and aesthetic
and governmental policies and social problems in urban areas
will be explored. (This course is also offered as architecture 5301;
credit will be granted only once.)

5334. ECOLOGY AND THE URBAN ENVIRONMENT (3-0)
3 hours credit—The interdependence of man and the physical
environment will be studied. Trends and problems related to
pollution of the environment will be studied. Problems and issues
of public policy and regulatory mechanisms to cope wtih pollu-
tion will be examined. The approach of ecologists and other
disciplines concerned with the physical environment will be
explored.

**5393. SPECIAL TOPICS IN URBAN GEOGRAPHY, PLAN-
NING AND ENVIRONMENT** (3-0) 3 hours credit—This course
will deal with different topics each semester and will focus on
selected problems. This seminar may be repeated for credit as
the topic changes.

Historical and Research Approaches to the Urban Community

5341. URBAN HISTORY (3-0) 3 hours credit—This seminar
involves extensive reading primarily in the history of urbaniza-
tion and metropolitanization of the people of the United States.
The historical method as exemplified in the works of leading
historians will be analyzed. Examples of the scholarship of se-
lected historians and treatises on selected cities, regions, and
urban institutions will be studied. (This course is also offered as
History 5303; credit will be granted only once.)

5342. URBAN SYSTEMS (3-0) 3 hours credit—This seminar
will focus on urban processes as systems with emphasis on flows,
transformation processes, performance criteria, physical and spa-
tial factors, human dimensions and similar considerations.

5343. COMPARATIVE URBAN SYSTEMS (3-0) 3 hours credit
—This seminar will examine urbanization and the institutional
processes of cities on an intracultural or intercultural basis. The
course will focus on cities from a functional perspective, empha-
sizing such areas as housing, health care and transportation in
a comparative framework.

5344. METHODS OF SOCIAL RESEARCH AND ANALYSIS
(3-0) 3 hours credit—This seminar concentrates on research

methodology and statistical techniques useful in analysis of urban trends and problems. Newer concepts and procedures for use of computers in social research will be studied. Special problems and methods of evaluative research related to programs and policies for coping with urban problems will be explored.

5345. STRATEGIES FOR URBAN RESEARCH (3-0) 3 hours credit—This seminar will focus on the study of conceptual and methodological approaches for the analysis of urban processes and the design of selected urban systems.

5346. SPATIAL ANALYSIS OF SOCIAL PROCESSES (3-0) 3 hours credit—This seminar concentrates on research methodology, cartographic and statistical techniques useful in the spatial analysis of such social processes as urban crime and violence, social ecology, arson, slum and ghetto formation as exemplified in the research techniques utilized by urban social geographers.

5394. SPECIAL TOPICS IN URBAN RESEARCH (3-0) 3 hours credit—This seminar will deal with different topics each semester and will concentrate on a variety of methodological techniques and research strategies, such as demographic research and survey techniques. This course may be repeated for credit as topic changes.

5395. SPECIAL TOPICS IN URBAN PROBLEMS (3-0) 3 hours credit—Based on an interdisciplinary approach, this seminar will focus on a single major urban problem, such as transportation or housing. The course may be repeated for credit when the topic changes.

5396. CONFERENCE COURSE IN URBAN AFFAIRS (3-0) 3 hours credit—Reading and research in a specialized area of urban affairs under the direction of a member of the graduate faculty.

5397, 5697. INTERNSHIP REPORT Variable credit of three or six hours—Under special conditions, a student may elect an internship report in lieu of the thesis requirement. The report on the internship will meet the same standards of scholarship and writing applied to the traditional thesis.

5398, 5698. THESIS Variable credit of three or six hours—A thesis conforming to university and departmental requirements may be prepared by graduate students in urban affairs.
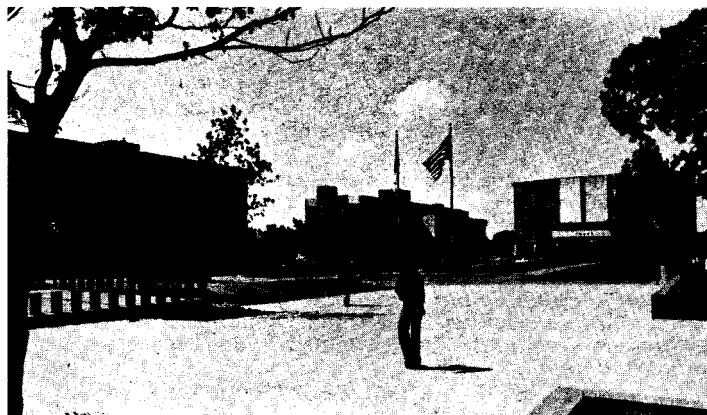
INTERDEPARTMENTAL
and
INTERCAMPUS
PROGRAMS

ADMINISTRATION Program (ADMN)

Areas of Study		*Degrees*
Business Administration		**PH.D.**
Social Work		**PH.D.**
Urban Affairs		**PH.D.**

Graduate Advisors:

Business Administration
 Richard J. Vargo   203 Business   273-2881
Social Work
 James W. Callicut   202 Cooper Center   273-3181
Urban Affairs
 Delbert A. Taebel 543   University Hall   273-3071

Graduate Faculty:

Professors Callicutt, Cornehls, Courtney, Geisel, Holland, Mullendore, Ross, Schkade, Snavely, Stanley, Torgenson and Wofford

Associate Professors Arangio, Carney, McCrea, McDaniel, Taebel

OBJECTIVE

The Doctor of Philosophy in administration program is a unique approach to the preparation of students for a variety of administrative positions. Students study in interdisciplinary fields broadly related to general administration and specialize at the dissertation stage by means of a substantive research project.

A student's program consists of course work, independent study, research, and a dissertation in an administrative area. Candidates for the degree select five areas to study from among the following: accounting, economics, finance, management, management science, marketing, social systems, social welfare, urban systems, and urban affairs. Upon special request and approval, a student may include an appropriate external area as one of the five fields. At some time during the program, the students must demonstrate competence in an administration core consisting of analysis, organization, and policy. Proficiency in research is required of all students.

ADMISSION REQUIREMENTS

Students planning to concentrate in social work should hold a **194** master's degree in social work or in a related academic field.

There is no specific background requirement for students plan- *Administration*
ning to concentrate in business administration or urban affairs.

DEGREE REQUIREMENTS

Residence and Course Requirement—A student in the program
must successfully complete a minimum of 15 semester hours
in one 12 month period during his doctoral program. The doctoral
program must include at least 24 semester hours of course work
in addition to credit received for dissertation courses.

Foreign Language — Knowledge of a foreign language is re-
quired only when that knowledge is appropriate for the disserta-
tion research. The requirement will be set in individual cases by
the student's doctoral committee.

Diagnostic Evaluation — The diagnostic evaluation, to be ad-
ministered according to the Graduate School regulations, will
cover the administrative core of analysis, organization, and policy.

Time Limit — All coursework and the comprehensive exami-
nation must be completed within five calendar years after entry
(registration date for first course or courses) into the program.
All remaining degree requirements must be completed within
three calendar years from the date of successful completion of the
comprehensive examination.

6301.   SEMINAR IN ADMINISTRATIVE ACCOUNTING (3-0)
3 hours credit.

**6302.   SEMINAR ON ADMINISTRATIVE APPLICATIONS
OF ECONOMICS (3-0)** 3 hours credit.

**6303.   ADVANCED SEMINAR IN FINANCIAL MANAGE-
MENT (3-0)** 3 hours credit.

**6304.   SEMINAR ON ANALYSIS AND PLANNING FOR AD-
MINISTRATION (3-0)** 3 hours credit.

6305.   SEMINAR IN URBAN POLICY PROCESSES (3-0) 3
hours credit.

**6306.   SEMINAR IN PHYSICAL DISTRIBUTION AND
TRANSPORTATION (3-0)** 3 hours credit.

6307.   SEMINAR IN SOCIAL SYSTEMS (3-0) 3 hours credit.

6399, 6699, 6999.   DISSERTATION Variable credit of three, six,
or nine hours.

BIOMEDICAL ENGINEERING Program (BME)

Areas of Study	*Degrees*
Biomedical Engineering	M.S., PH.D., M.D./PH.D.
	Certificates
Clinical Engineering	Internship
	Residency

Master's Degree Plans: Thesis and Non-Thesis

Graduate Advisor: Alfred R. Potvin
414 or 316 Engineering   273-2671

Graduate Faculty:

Associate Professor Potvin
Assistant Professor Axe
Adjunct Associate Professor Mishelevich
Adjunct Assistant Professor Stokeley

OBJECTIVES

The Biomedical Engineering Program is jointly offered by the University of Texas at Arlington and the University of Texas Health Science Center at Dallas. Biomedical research and teaching efforts of various departments in the biological, engineering, mathematical, physical, and medical sciences of both institutions are coordinated through the program. 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 medical and hospital systems, cardio-pulmonary assistance and oxygen transport, neurophysiological systems and cybernetics, radiological image processing, biomedical instrumentation, rehabilitation, biomaterials and biomechanics, simulation systems, and computer science.

The master's program is based upon graduate level work in one of the engineering disciplines supplemented with attainment of a fundamental knowledge of mathematics and life and physical sciences. The program is designed to prepare the student for a professional career in biomedical engineering.

, A six-month internship in clinical engineering after completion of the master's degree prepares a student for a professional career in clinical engineering. Students completing the internship program are awarded a certificate.

196   The doctoral program is based upon graduate level work in

one of the engineering disciplines and extensive graduate training in the life and related physical sciences. The program is aimed at the development of professional biomedical engineers capable of independent research.

Biomedical Engineering

A one-year postdoctoral residency in clinical engineering is intended as preparation for clinical research. Students completing the residence program are awarded a certificate.

A combined M.D.-Ph.D. program in biomedical engineering is available for qualified students. The Graduate Advisor should be consulted for information.

ADMISSION

Application for admission should be made at either UT Arlington or UTHSCD, although a student will be enrolled in both institutions while in the program. Normally, the institution through which the student applies and is admitted is the student's home institution.

In addition to admission requirements of the Graduate School, the bachelor's degree held by applicants to the program should be in engineering, biological, physical, or mathematical sciences. Students required to take the TOEFL must achieve a score of at least 550. Applicants to the doctoral program normally should hold a master's degree in biomedical engineering or the equivalent, a graduate grade-point average exceeding 3.4, and combined scores of at least 1100 on the GRE. Students with unusual backgrounds and experience will be considered individually.

DEGREE REQUIREMENTS

In the following degree plan descriptions, the three-digit numbers refer to courses offered at UTHSCD and the four digit numbers to those offered at UT Arlington. Courses indicated by an asterisk (*) are to be taken only with the written consent of the Graduate Advisor.

Non-Thesis Master's Degree Plan — Students selecting this plan take 37 credit hours including the courses listed below.
   Life Sciences: Physiology 680, Anatomy 383, and Chemistry 4312 (or equivalent*)
   One Engineering Discipline: 4 courses*
   Biomedical Engineering: 5101 or 183 (1 year, first year), 5380* or 396*, 385 and two courses* chosen from 5311, 5345, 5335, 6335, 5325, 380, and 5392 or 396. (Students taking Physiology 680 must ordinarily take BIME 5311 or a course in neurophysiology.)

Thesis Master's Degree Plan—Student selecting this plan take 37 credit hours in a program similar to the non-thesis plan but with the substitution of Physiology 680 by Physiology 381 and of BIME 5380 or 386 by BIME 5698 or 698.

Clinical Engineering Internship Plan—Students entering this program are required to take Introduction to Clinical Medicine 382, BIME 5998, and a comprehensive written/oral final examination.

Doctoral Degree Plan—The Ph.D. degree program consists of a minimum of 72 credit hours beyond the bachelor's degree level and includes the courses listed below.

Life Sciences: Physiology 680, Chemistry 4311 and 4312 or 680 (or equivalent*), Anatomy 383, Pharmacology 680, Neurobiology 581, and Introduction to Clinical Medicine 382

One Engineering Discipline: 7 courses*

Computer Science, Mathematics or Statistics: 3 courses*

Biomedical Engineering: 5101 or 183 (2 years, first 2 years), 385, and three courses* chosen from 5311, 5345, 5335, 6335, 5325, 380, and 5391 or 396.

Although exceptionally qualified applicants may be accepted into the Ph.D. program without first earning the Master of Science in biomedical engineering, all students must satisfactorily pass the Diagnostic Evaluation. This written examination is followed several weeks later by an oral examination and consists of three approximately equal parts: (1) one engineering discipline, (2) physical and related sciences (mathematics, computer science, statistics, chemistry, and physics), and (3) biological and medical sciences.

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.

Sufficient copies of the approved thesis or dissertation must be provided to satisfy the requirements of both UT Arlington and UTHSCD.

5101, 5201, 5301. SEMINAR IN BIOMEDICAL ENGINEERING (Variable credit from 1 to 3 hours as arranged)—University and guest lecturers speak on topics of current interest in the field of biomedical engineering. The course is offered on a pass-fail (P-F) basis only.

5191, 5291, 5391. DIRECTED RESEARCH IN BIOMEDICAL ENGINEERING (Variable credit from 1 to 3 hours credit as arranged)—The student shall participate in a research project under the direction of a faculty supervisor. Prerequisite: permission of the instructor.

5192, 5292, 5392. SELECTED TOPICS IN BIOMEDICAL ENGINEERING (Variable credit from 1 to 3 hours as arranged)—The material covered may vary from semester to semester. This course may be repeated for credit if different topics are covered for each registration. Prerequisite: permission of the instructor.

5311. NEUROPHYSIOLOGICAL SYSTEMS ANALYSIS (3-0) 3 hours credit—The course applies systems theory to neurophysiology. Topics covered include: the neuromuscular system, pupillary control, eye tracking, vestibular systems, temperature regulation, and central nervous system function. Prerequisite: courses in college biology and linear systems.

5312. BIOELECTRIC PHENOMENA (3-0) 3 hours credit—The course is designed to introduce the electrical behavior of nerve and muscle. Mathematical techniques are utilized to provide a quantitative basis for observed phenomena. Topics include physiology of nerve and muscle, electro-chemistry and elec-

trodes, subthreshold membrane phenomena, membrane action potentials, and volume-conductor fields. Prerequisite: courses in college biology, calculus, physics, and chemistry.

5325. CARDIO-PULMONARY-RENAL SYSTEMS ANALYSIS (3-0) 3 hours credit—This course covers the mechanisms at work in the cardio vascular, respiratory and renal systems. Current methods of evaluating systems performance and the effect of pathologies are also discussed. Prerequisite: Human physiology, or permission of instructor.

5335. BIOLOGICAL MATERIALS, MECHANICS AND PROC-ESSES (3-0) 3 hours credit—This course covers the typical functional behavior of various biological materials, and the transport of mass, momentum and energy in biological systems. Prerequisites: College biology, thermodynamics.

5345. CLINICAL INSTRUMENTATION AND MEASURE-MENTS (2-3) 3 hours credit—This course covers the measurement of physiological variables and historical developments of instrumentation. Lectures are augmented by lab demonstrations, and site visits to local hospitals and clinics. Topics include: electrode applications, cardiac and pulmonary instrumentation, surgical and intensive care monitoring, computer applications in medicine, evaluation of neurological function, X-rays and nuclear medicine, and electric safety. Prerequisites: Coursework in biology and electronics and consent of instructor.

5380. PROJECT IN BIOMEDICAL ENGINEERING (0-9) 3 hours credit—This course shall be taken by students enrolled in the non-thesis option for the M.S. degree. Individual instruction, research, and/or instrumentation development and evaluation may be elected under supervision of the instructor. A final report is required. Prerequisite: permission of the instructor.

5383, 5683, 5983. SURGICAL LABORATORY FOR BIOMEDI-CAL ENGINEERING (3, 6, or 9 hours credit)—This laboratory course is designed to provide the student fundamental experience in surgical procedures and in evaluating medical instrumentation. Staff physicians from local hospitals assist in coordinating this course. The course may be repeated for credit if different topics are covered for each registration. Prerequisite: permission of the instructor.

5384, 5684, 5984. INSTRUMENTATION LABORATORY FOR BIOMEDICAL ENGINEERING (3, 6, or 9 hours credit)—This laboratory course is designed to provide the student experience in designing, developing, and evaluating biomedical instrumentation. This course may be repeated for credit if different topics are covered for each registration. Prerequisite: permission of the instructor.

5398, 5698, 5998. THESIS (Variable credit of 3, 6, or 9 hours). Prerequisite: graduate standing in biomedical engineering.

6197, 6297, 6397, 6697, 6997. RESEARCH IN BIOMEDICAL ENGINEERING (1, 2, 3, 6, or 9 hours credit)—Individually approved research projects leading to a doctoral dissertation in the area of biomedical engineering.

6335. IRREVERSIBLE PROCESSES IN BIOLOGICAL SYS-TEMS (3-0) 3 hours credit—This course covers the application of the non-equilibrium thermodynamics formalism to biological systems and the cross coupling of entropy fluxes in various processes. Prerequisite: BIME 5325 and fluid mechanics.

6390, 6690, 6990. HOSPITAL INTERNSHIP FOR BIOMEDI-CAL ENGINEERS (3, 6, or 9 hours credit)—Each student interns at a local hospital under the individual supervision of the

course instructor and one staff physician. During the semester, the student rotates through areas such as cardiac, pulmonary, prosthetic, and neuro surgery, anesthesiology, radiology, catheterization, and emergency care. Prerequisites: Biomedical physiology and permission of the instructor.

6399, 6699, 6999. DISSERTATION (Variable credit of 3, 6 or 9 hours)—Preparation and submission of a doctoral dissertation in an area of biomedical engineering. Prerequisite: admission to candidacy for the Ph.D. in Biomedical Engineering.

Courses offered at The University of Texas Health Science Center at Dallas (UTHSCD)

374. **Real-time Computation and Communication.**

380. **Hospital Safety.**

381. **Fundamentals of Bioinstrumentation.**

382. **Introduction to Clinical Medicine.**

183. **Biomedical Engineering Seminar.**

384, 684. **Research in Biomedical Engineering.**

385. **Physiology for Biomedical Engineers.**

386. **Optical and Magnetic Instrumentation and Measurements.**

196, 296, 396. **Special Topics in Biomedical Engineering.**

698. **Thesis.**

699. **Dissertation.**

ENGINEERING: UNDIFFEREN-TIATED (ENID)

Area of Study		*Degree*
Engineering: Undifferentiated		**PH.D.**

Graduate Advisors:
Aerospace Engineering

Fred R. Payne	306 C Engineering	273-2603
Civil Engineering		
Tseng Huang	435 J Engineering	273-3665
Computer Science		
Roger S. Walker	106 Engineering	273-3785
Electrical Engineering		
Charles W. Jiles	317 H Engineering	273-2671
Engineering Mechanics		
J. H. Gaines	301 D Engineering	273-2603
Industrial Engineering		
Robert D. Dryden	214 C Engineering	273-3092
Interdisciplinary		
Andrew E. Salis	204 Engineering	273-2571
Materials Science		
Carl D. Wiseman	335 D Engineering	273-2561
Mechanical Engineering		
Calvin L. R. Barker	204 D Engineering	273-2571

Graduate Faculty: the graduate faculty of
the College of Engineering

OBJECTIVE

It is the objective of the undifferentiated and interdisciplinary programs in the College of Engineering to provide opportunities for students to draw from the talents and expertise of the faculty from any part of the College of Engineering, the University, as well as The University of Texas System in establishing a background of course work and research leading to the Doctor of Philosophy in Engineering (undifferentiated). In addition to the graduate courses described elsewhere for specific degree programs, a selection of courses in the fields of biomedical engineering, systems engineering, computer science, and energy systems is offered in support of strong interdisciplinary options and areas of emphasis for the Master of Science and Doctor of Philosophy programs in engineering.

Engineering   A program leading to the Doctor of Philosophy in Engineering (undifferentiated) is offered with opportunities for major emphasis in one or more of the following areas: aerospace engineering, civil engineering, electrical engineering, engineering mechanics, industrial engineering, material science and engineering, mechanical engineering, computer science and engineering and interdisciplinary studies.

DEGREE REQUIREMENTS

In addition to the general admission requirements of the graduate school, a student wishing to participate in the doctoral program in engineering must have completed work equivalent to that required for the master's degree in engineering at this university. An adequate background in mathematics, science and the engineering sciences is considered basic to any engineering program at the doctoral level.

The Ph.D. requirements are the same as those listed in the Advanced Degrees and Requirements section of this catalog. A students' program will consist of course work, independent study, and a dissertation in fields pertinent to his areas of interest in engineering. 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 should be prepared to prove proficiency in the engineering sciences to the satisfaction of the Engineering Graduate Council. For the Doctor of Philosophy in Engineering degree a reading knowledge of one foreign language applicable to the student's field of study is required.

Students may complete formal course work requirements of the Ph.D. program on a part-time basis; however, dissertation research is expected to require full-time effort.

6197-6997. INTERDISCIPLINARY ENGINEERING RE-SEARCH (1 to 9 hours credit)—Individually approved research projects in one of the interdisciplinary programs in the College of Engineering. This course may be repeated for credit.

6399, 6699, 6999. DISSERTATION (variable credit of 3, 6, or 9 hours)—Preparation of a doctoral dissertation in an interdisciplinary engineering area. Prerequisite: admission to candidacy for the Doctor of Philosophy degree.

ENGINEERING MECHANICS
Program   (EM)

Areas of Study	*Degrees*
Engineering Mechanics	**M.S.**
Engineering: Undifferentiated (See Interdepartmental and Intercampus Programs, p. 201)	**PH.D.**

Master's Degree Plans: Thesis and Non-Thesis

Graduate Advisor: J. H. Gaines

301D Engineering   273-2603

Graduate Faculty:

Professors Dalley, Everard, Gaines, Huang, Lawrence
Associate Professors Stanovsky, Yuan

OBJECTIVE

The graduate program in engineering mechanics is designed to provide students with an understanding of the fundamentals of mechanics and prepare them for research in engineering problems involving mechanics and for careers in industry. 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 and candidates for a Doctor of Philosophy degree in engineering 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.

DEGREE REQUIREMENTS

The general degree requirements for the Master of Science and Doctor of Philosophy degrees 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 program of course work and research.

Engineering mechanics master's degree programs will normally include a thesis. With prior approval of the Engineering Mechanics Committee on Graduate Studies, however, it is possible to complete a master's program without thesis. For details on the non-thesis degree plan, consult the engineering mechanics Graduate Advisor.

5302. ENGINEERING MECHANICS SEMINAR (3-0) 3 hours credit—Semiformal discussion between faculty and students on progress and results of current research and on significant developments in the mechanics field. Prerequisite: permission of instructor.

5311. THEORY OF ELASTICITY I (3-0) 3 hours credit — Analysis of stress and strain in elastic bodies; equilibrium and compatibility conditions; analysis of two dimensional problems. Prerequisite: permission of instructor.

5312. THEORY OF ELASTICITY II (3-0) 3 hours credit — Continuation of Theory of Elasticity I; curvilinear coordinates, variational methods, axially symmetric stress distribution problems, and stress waves in solids studied. Prerequisite: engineering mechanics 5311.

5313. THEORY OF PLASTICITY (3-0) 3 hours credit—Stress-strain relations in three dimensions presented; three-dimensional yield conditions and flow law, thick-walled tube and sphere discussed; limit analysis and approximate theories. Prerequisite: permission of instructor.

5314. THEORY OF PLATES AND SHELLS (3-0) 3 hours credit—The theory is developed for the stress analysis of elastic plates and shells of revolution. Composite structures are considered in addition to the homogeneous and isotropic case. Prerequisite: permission of instructor.

5315. AEROELASTICITY (3-0) 3 hours credit—This course is a study of the interaction of aerodynamic (or hydrodynamic), inertia and elastic forces acting on vehicles moving through a fluid. Investigations of flutter and divergence are included. Prerequisite: aerospace engineering 4331 (Mechanical Vibrations) or equivalent; aerospace engineering 3303 (Aerodynamics of Perject Fluids) or equivalent, or permission of instructor.

5317. STRUCTURAL STATICS (3-0) 3 hours credit—The finite element method is used in the study of the static response of complex structures and of continuua. The matrix displacement and matrix force methods are applied to determine deflections and stresses. Applications of the method to field problems in rock mechanics, torsion, and heat conduction are also discussed. Analytical methods are emphasized, and digital computer applications are undertaken. Prerequisite: engineering mechanics 5311 or consent of instructor.

5318. STRUCTURAL DYNAMICS (3-0) 3 hours credit—Natural frequencies and forced and random response of complex structural systems are studied through the use of the finite element method. Computational aspects of these problems are discussed, and digital computer applications are undertaken. Prerequisite: engineering mechanics 5323 or consent of instructor.

5320. THEORY OF THIN ELASTIC SHELLS (3-0) 3 hours credit—Elements of differential geometry used in the general shell theory are introduced. Basic assumptions are discussed and fundamental elastic shell equations are formulated for shells of arbitrary shape. Specific equations and stress resultants are derived from the general formulation for cylindrical shells and

shells of revolution. Prerequisite: engineering mechanics 5311 or consent of instructor.

5321. ADVANCED DYNAMICS (3-0) 3 hours credit—Hamilton's Principle, Lagrange's Equation and Hamilton — Jacobi Equation are introduced. Dynamics of rigid body and theory of gyroscope are studied. Prerequisite: permission of instructor.

5322. THEORY OF ELASTIC STABILITY (3-0) 3 hours credit —Elastic stability of bars, buckling of plates and shells are discussed. Both classical and numerical solutions included. Prerequisite: permission of instructor.

5323. ADVANCED MECHANICAL VIBRATIONS (3-0) 3 hours credit — Application of generalized coordinates and Lagrange equations are studied. Free and forced vibrations of elastic systems are considered including damping effects. Prerequisite: aerospace engineering 4331 (Mechanical Vibrations) or equivalent.

5324. ENERGY METHODS IN APPLIED MECHANICS (3-0) 3 hours credit—Virtual displacements, minimum potential energy, principle of complementary energy, Castigliano's Theorem, action integral, variational principles, Hamilton's principles and Lagrange's equations presented. Applications are made to solve problems in stress analysis, elastic stability, vibration and related topics. Prerequisite: permission of instructor.

5325. DYNAMIC STABILITY OF ELASTIC SYSTEMS (3-0) 3 hours credit — The regions of dynamic instability of elastic systems due to parametric excitation are presented. Influence of damping is included. Prerequisite: permission of instructor.

5326. INTRODUCTION TO NONLINEAR MECHANICS (3-0) 3 hours credit—Nonlinear differential equations governing various phenomena of mechanics are derived. Physical and mathematical implications of linearizations discussed. Analytical, graphical and numerical methods of solutions to the free oscillations of systems having nonlinear characteristics are discussed. Response curves and stability considerations for forced oscillations included. Prerequisite: permission of instructor.

5327. DYNAMICS OF SPACE VEHICLES (3-0) 3 hours credit —The two-body problem, geometry of spatial orbits, orbit determination, trajectory modification, introduction to perturbation theory, equation of motion for thrusting rocket, boost trajectories and related topics are treated. Prerequisite: aerospace engineering 4336 (Intermediate Dynamics) or equivalent.

5328. FLUID DYNAMICS (3-0) 3 hours credit—An advanced study of the kinematics and dynamics of Newtonian fluid motion, stresses in fluids, and surface flow. Prerequisite: mechanical engineering 3313 (Fluid Mechanics) or equivalent.

5330. NUMERICAL VIBRATION ANALYSIS (3-0) 3 hours credit—The theories developed in engineering mechanics 5323 are applied to practical situations where numerical answers are required. All widely used methods for solving linear, nonlinear, and transient vibration problems numerically will be utilized in connection with computer programming. Prerequisite: engineering mechanics 5323 and a reasonable proficiency in computer programming and the consent of the instructor.

5331. SIMILITUDE AND THEORY OF MODELS (3-0) 3 hours credit — Similitude models, dimensional analysis, nomographs and graphical aids to analysis. Prerequisite: permission of instructor.

5341. EXPERIMENTAL MECHANICS (2-3) 3 hours credit— This course includes experimental and analytical methods in

structural mechanics. Various analogies are studied. Experimental methods of determining stress, strain, force, and displacement are studied. Prerequisite: permission of instructor. $4 lab fee.

5343. PHOTOELASTICITY (2-3) 3 hours credit—Methods of experimentally determining stress (or strain) fields are studied using birefringent plastic models and coatings. Techniques of model manufacture, data acquisition and reduction, use of the polariscope, interferometry and holography are studied. Prerequisite: graduate standing or consent of the instructor.

5191-5991. ADVANCED STUDIES IN ENGINEERING MECHANICS (Variable credit from 1 to 9 semester hours as arranged)—Topics selected from various branches of engineering mechanics, particularly those in which active research is being conducted. Prerequisite: permission of instructor or Graduate Advisor.

5398, 5698, 5998. THESIS Variable credit of three, six, or nine hours—Prerequisite: 12 hours of advanced engineering mechanics and approval of Graduate Advisor.

6197-6997. RESEARCH IN ENGINEERING MECHANICS (Variable credit 1 to 9 semester hours as arranged)—This course may be repeated for credit.

6399, 6699, 6999. DISSERTATION Variable credit of three, six, or nine hours—Prerequisite: admission to candidacy for the Doctor of Philosophy.

HUMANITIES Program (HUMA)

Areas of Study	*Degrees*
Humanities	M.A., PH.D.
Teaching	M.A.T.

Master's Degree Plans: Thesis and Non-Thesis

Graduate Advisors:

English
    Simone F. Turbeville   202 Carlisle Hall   273-2701
Foreign Languages and Linguistics
    Ted E. Frank   221E Hammond Hall   273-3161

Graduate Faculty: The graduate faculties of the Departments of English and Foreign Languages and Linguistics.

OBJECTIVE

Programs leading to the degrees of Master of Arts in the Humanities, Master of Arts in Teaching in the Humanities, and **206** Doctor of Philosophy in the Humanities are offered jointly by

the University of Texas at Arlington and the University of
Texas at Dallas. They are designed to integrate the traditional
disciplines of language, linguistics, literature, history, philoso-
phy, the visual arts, and music as they relate to the develop-
ment of man's ideas about himself, ideas which are expressed in
the monuments of his creation. The program leading to the doc-
toral degree in the humanities is aimed at developing scholars of
literatures, languages, and linguistics, and interpreters of the
humanities who can function effectively in a variety of situations
to enrich the lives of people and to provide professional consulta-
tion.

The focus at the University of Texas at Arlington will be on
literature and language (with concentrations in English, French,
German, or Spanish) and linguistics. The graduate student en-
rolled at the University of Texas at Arlington may also enroll
at the University of Texas at Dallas for courses or independent
study appropriate to the individual program as planned by the
student, the Graduate Advisor, and the supervising committee.
The degrees will be granted jointly by the University of Texas
at Arlington and the University of Texas at Dallas.

DEGREE REQUIREMENTS

MASTER OF ARTS IN THE HUMANITIES

A broad course of study is encouraged within the framework
of the specific requirements detailed for the Master of Arts de-
gree listed under English and Foreign Languages and Linguis-
tics. Approximately one-quarter of the total number of course
hours for the degree must be taken outside the area of concen-
tration.

MASTER OF ARTS IN TEACHING IN THE HUMANITIES (M.A.T.)

The Master of Arts in Teaching sequence is especially de-
signed for community college and secondary school teachers who
wish to deepen knowledge of their fields and develop more ex-
pertise in the interdisciplinary teaching of the humanities.

A non-thesis degree, the M.A.T., has been designed to amplify
a teacher's competence in language, literature, and other areas
of the humanities.

Concentration in English—The 36 semester hours of course
work required for the degree should be distributed as follows:

6 hours	Pedagogy (English 5389 and 5390)
6 hours	Linguistics (English 5331 and 5333)
15 hours	Chosen from the following:
	American Literature
	English Literature
	Comparative Literature
	Other English courses, such as
	Literary Criticism, Research Methods, or
	Bibliography.
9 hours	Humanities courses taken outside the Depart-
	ment of English.

When the student completes 18 hours of course work, (1) the
Graduate Advisor will assign him an examining and supervising

committee, including at least one professor from outside the Department of English; and (2) he will be given a diagnostic evaluation by the supervising committee.

The candidate for the M.A.T. degree will take a comprehensive oral examination during the final semester of enrollment in the program.

Concentration in French, German, or Spanish—Students pursuing this degree may choose one of the following options:

1. *36 hour non-thesis option*—*24 hours* of graduate courses taken in the Department of Foreign Languages and Linguistics, including 15 hours in the area of language studies, such as

Teaching of the Language	3 hours
Stylistics and/or Advanced Grammar	3 hours
History of the Language	3 hours
Language and Meaning	3 hours
Phonetics and Conversation	6 hours

   and 9 hours in the area of literature and *12 hours* of graduate courses taken outside the Department of Foreign Languages and Linguistics with 3 or 6 hours in Education, and approved electives in related fields, such as English, Sociology, Anthropology, Psychology, Communications, Art, and History.

2. *33 hour foreign study option*—*6 hours* of language or literature/ civilization courses in an approved program of study abroad, and a written report and inteview in the foreign language and relevant to the study abroad; *15 hours* in the Department of Foreign Languages and Linguistics, including an approved combination of language and literature/civilization courses; and *12 hours* outside the Department of Foreign Languages and Linguistics with 3 or 6 hours in Education, and approved electives in related fields, such as English, Sociology, Anthropology, Psychology, Communications, Art, and History.

3. *36 hour bilingual/bicultural option*—*24 hours* of graduate courses in the Department of Foreign Languages and Linguistics, including 15 hours in the area of language studies, such as

Teaching of the Language	3 hours
Stylistics and/or Advanced Grammar	3 hours
History of the Language	3 hours
Language and Meaning	3 hours
Phonetics and Conversation	6 hours

   and 9 hours in the area of literature and civilization, (a student may substitute for this part of the option 6 hours of study abroad in an approved program, a written report and interview, and 15 hours in the Department of Foreign Languages and Linguistics); and *12 hours* of approved graduate courses in the Department of Education. Note: Application has been made to the Texas Education Agency for teacher certification under this option.

DOCTOR OF PHILOSOPHY IN THE HUMANITIES

208 In addition to the general requirements for the doctoral degree stated in the introductory sections of this catalog, the following

requirements apply specifically to the program leading to the *Interdis-* Doctor of Philosophy in the Humanities: *ciplinary*

1. The student holding the M.A. or its equivalent will submit satisfactory scores on the advanced GRE test (Literature in English, French, German, or Spanish, as appropriate to the academic background of projected concentration).

2. The amount of course work beyond the M.A. or its equivalent will be determined by the doctoral committee in consultation with the Graduate Advisor and will be subject to the approval of the Graduate Studies Committee. Approximately one-quarter of the total number of course hours for the degree must be taken outside the area of concentration.

3. The student will demonstrate reading proficiency in at least two classical, medieval, or modern languages other than English (literary competence in one, translational competence in the other).

4. The doctoral applicant will spend a minimum of two consecutive, regular semesters of full time study (9 credit hours per semester) beyond the M.A., or its equivalent, and will earn at least 24 credit hours in residente.

For course descriptions consult the course listings under the Departments of English and Foreign Languages and Linguistics. Humanities students may also consult the Graduate Advisor in their area of concentration concerning appropriate humanities courses offered at the University of Texas at Dallas.

5398, 5698, 5998. THESIS Variable credit of three, six or nine hours—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 in the Humanities degree will be conferred. Prerequisite: permission of the Graduate Advisor in English or Foreign Languages.

6330. SEMINAR IN THE HUMANITIES (3-0) 3 hours credit —An interdisciplinary study of genres, themes, and iconology in literature and the arts. May be repeated for credit when subject matter changes.

6399, 6699, 6999. DISSERTATION Variable credit of three, six or nine hours.

INTERDISCIPLINARY STUDIES
(INDS)

Area of Study   *Degrees*

Interdisciplinary Studies   M.A., M.S.

Graduate Advisor: Garvin McCain

413 Life Science   273-2281

Graduate Faculty: All members of the graduate faculty of The University of Texas at Arlington.

OBJECTIVE

The purpose of the degree programs is to allow individuals with extensive professional experience to update their formal education in view of recent developments in their field(s) of specialization or to develop the professional skills appropriate to the student's aspirations. The programs will not be open to persons who have recently received baccalaureate degrees and who have no professional experience.

ADMISSION

An applicant to this program must satisfy the requirement for admission to the Graduate School and must also have had several years of professional experience in areas related to the graduate course work needed.

Most degree plans in Interdisciplinary Studies involve courses in several departments and must be designed by consultation with the appropriate graduate faculty members of those departments. Students entering the Interdisciplinary Studies program must have their degree plans approved by the Graduate Studies Committee for Interdisciplinary Studies *prior to registration for the first semester or session of work in the program.* Students not conforming to this regulation cannot be assured that the courses taken prior to approval will be acceptable for degree credit. Students applying after the application deadline for the semester or session in which they plan to enter the program may not be able to complete an approved degree plan in time for initial registration; therefore, the Graduate Studies Committee is not responsible for selection of courses taken prior to degree plan approval and cannot guarantee that such courses will apply to degree credit.

DEGREE REQUIREMENTS

The program is designed for a maximum of flexibility related to the specific professional objectives of the student. Prior to enrollment the student will be interviewed by the graduate advisor. If the student meets the normal requirements for admission to the graduate school a supervising committee composed of members of the graduate faculty will be appointed to supervise the formulation and completion of an individual program of work. Except for general oversight by the Interdisciplinary Graduate Studies Committee and the Graduate Dean, the supervising committee and the Graduate Dean, the supervising committee will have control of the individual's program. The student's program will typically work in (involve) at least two departments and may involve work in more than one of the schools (colleges). The primary emphasis is on the individual needs and aspirations of the student.

210   Students will normally take a minimum of 12 credit hours

5398, 5698, 5998. THESIS Variable credit of three, six or nine
hours—Research and preparation pertaining to the master's the-
sis.

MATERIALS SCIENCE Program
(MATS)

Area of Study	*Degrees*
Materials Science	M.S.
Engineering: Undifferentiated (See Interdepartmental and Inter- campus Programs, p. 201)	PH.D.

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

Graduate Advisor: Carl D. Wiseman
335D Engineering 273-2561

Graduate Faculty:

Professor Wiseman
Associate Professor Johnson

OBJECTIVE

The graduate program in materials science is designed to pro-
vide students with a fundamental understanding of phenomena
occurring in engineering materials and their associated mechani-
cal, physical and chemical properties. It will prepare students for
professional careers in materials science or for additional stud-
ies at the doctoral level.

The program is interdisciplinary and relates closely to the
fields of engineering, chemistry and physics.

DEGREE REQUIREMENTS

Students with Bachelor of Science degrees in non-engineering
disciplines, such as chemistry or physics, may qualify for gradu-
ate study in materials science upon the completion of a faculty-
approved program of undergraduate courses.

Normally, all materials science master's programs will be ex-
pected to include a thesis. With prior approval of the Materials

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Science Committee on Graduate Studies, it is possible to complete a master's program with a thesis substitute or non-thesis.

5301. PHYSICS OF ENGINEERING MATERIALS (3-0) 3 hours credit—The free electron and zone theories of metals and their applications to electrical conductivity, ferromagnetism, cohesion and crystal structure will be developed. Prerequisite: permission of instructor.

5310. DISLOCATION THEORY (3-0) 3 hours credit—The theory of dislocations and their reactions and interactions in crystalline materials is developed and extended into a basic understanding of mechanical properties of crystalline materials. Prerequisite: permission of instructor.

5311. ADVANCED DISLOCATION THEORY (3-0) 3 hours credit—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. Prerequisite: materials science 5310 and permission of instructor.

5312. MECHANICAL METALLURGY (3-0) 3 hours credit—Relationships of microstructure to the plastic deformation of single crystal and polycrystalline materials with emphasis on mechanical properties, embrittlement and fracture. Prerequisite: mechanical engineering 3345 or permission of instructor.

5313. ADVANCED PHYSICAL METALLURGY (3-0) 3 hours credit—Theory of ferrous and non-ferrous systems as related to physical and mechanical properties. Fracture mechanisms in metals and non-metals. Preferred orientation. Strengthening mechanisms. Prerequisite: permission of instructor.

5314. FRACTURE MECHANICS (3-0) 3 hours credit—The theory and applications of linear elastic fracture mechanics are discussed. Topics include stress analysis of cracks, crack-tip plasticity, fatigue and stress corrosion. Applicability to materials selection, failure analysis and structural reliability is reviewed. Prerequisite: permission of instructor.

5320. METALLURGICAL THERMODYNAMICS (3-0) 3 hours credit—Applications of thermodynamics to the study of metals, thermodynamic properties of liquid and solid solutions and their relationship to surfaces and crystalline defects. Prerequisite: permission of instructor.

5321. THEORY OF PHASE TRANSFORMATIONS (3-0) 3 hours credit—Theory of homogeneous and heterogeneous transformations, nucleation and growth, martensitic transformations, heat treatment and control of microstructure. Prerequisite: materials science 5320 and permission of instructor.

5322. KINETICS OF PHASE CHANGES (3-0) 3 hours credit — Kinetics of nucleation and growth of phases in metallurgical and ceramic systems including the effects of surfaces, stacking faults, dislocations and strain energy. Prerequisite: materials science 5320 and permission of instructor.

5123. PHASE DIAGRAMS (1-0) 1 hour credit—Construction an interpretation of multicomponent equilibrium diagrams, prediction of solidified structures and application to current processes. Prerequisite: permission of instructor.

5224. THEORY OF ALLOYS (2-0) 2 hours credit—Structural approach as applied to metallic alloys. Equilibrium, free energy, electron compounds, intermediate phases and order-disorder. Prerequisite: permission of instructor.

5227. HIGH TEMPERATURE PROPERTIES OF MATERIALS *Materials* (2-0) 2 hours credit—Oxidation, oxidation resistance and other *Science* high temperature properties of materials and their relationships with structure will be discussed. Prerequisite: permission of instructor.

5229. ADVANCED X-RAY STUDIES (2-0) 2 hours credit— The kinematical and dynamical theories of x-ray and electron scattering will be discussed. The application of x-rays to crystal structure determination and other research problems will be emphasized. Prerequisite: materials science 5342 and permission of instructor.

5315. SOLIDIFICATION (3-0) 3 hours credit—Application of phase diagrams to solidification. Principles and practices of casting and solidification. Nucleation, heat flow, chemical homogenization and structure of cast metals. Prerequisite: mechanical engineering 3345.

5330. CORROSION (3-0) 3 hours credit—The quantitative application of electrochemical principles to corrosion reactions is developed. The effects of metallurgical factors and environmental conditions on oxidation, erosion, and cracking are discussed along with materials selection. Prerequisite: permission of instructor.

5342. X-RAY METALLURGY (2-3) 3 hours credit—The 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, will be studied. Prerequisite: permission of instructor.

5181. ELECTRON MICROSCOPY (0-3) 1 hour credit—Laboratory techniques for using the electron microscope will be demonstrated. Specimen preparation for replica and transmission studies will be performed. Prerequisite: permission of instructor.

5191, 5291, 5391. ADVANCED STUDIES IN MATERIALS SCIENCE (Variable credit of from 1 to 3 hours as arranged)— Topics selected from various areas of materials science. Work performed as a thesis substitute normally will be accomplished under the course number 5391, with prior approval of the Committee on Graduate Studies.

5398, 5698, 5998. THESIS Variable credit of three, six, or nine hours. Prerequisite: approval of Graduate Advisor.

6197-6397. ADVANCED STUDIES IN MATERIALS SCIENCE (Variable credit from 1 to 3 semester hours)—Course may be repeated for credit: Prerequisite: approval of Graduate Advisor.

6399, 6699, 6999. DISSERTATION Variable credit of three, six, or nine hours. Prerequisite: admission to candidacy for the Doctor of Philosophy degree.

MATHEMATICAL SCIENCES
Program (MSCI)

Area of Study	*Degree*
Mathematics, Applied Mathematics	PH.D.

Graduate Advisor: Michael E. Lord
127 Hammond Hall 273-3261

Graduate Faculty: The Graduate Faculty of the Department of Mathematics with the support of the Graduate Faculties of the Colleges of Science, Engineering, and Business and the Graduate Faculty of the Department of Mathematics of the University of Texas at Dallas and The University of Texas Health Science Center at Dallas.

OBJECTIVES

A program leading to the Doctor of Philosophy degree in the mathematical sciences is offered jointly with The University of Texas at Dallas and The University of Texas Health Science Center at Dallas. This joint program utilizes the faculty and courses from all three institutions and the accent will be on "applicable" mathematics. The program will aim at both real and demonstrated competency on the part of the student over material ranging from various branches of abstract and applicable mathematics to a meaningful experience with various applications of mathematics. Finally, the nature of the dissertation will range from research in abstract mathematics to the discovery and testing of mathematical models for analyzing given problems 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 abstract mathematics, applied mathematics, probability, statistics, computer science, biometry, mathematical physics, management sciences, operations research, and mathematics education.

DEGREE REQUIREMENTS

Upon entering Graduate School, it is the student's responsibility to consult with the mathematical sciences Graduate Advisor 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 the following 30 graduate hours of core

areas. Furthermore, the student must complete an additional 30 *Mathematical* semester hours of graduate course work beyond these core areas *Sciences* and 18 semester hours of dissertation.

AREA	SEMESTER HOURS
Real Variables	6
Complex Variables	3
Ordinary and Partial Differential Equations	6
Linear Algebra	3
Probability and Statistics	6
Computer Organization and Usage	3
Computer Language and Applications	3
	30

Each student is expected to complete a minimum amount of graduate work in the Mathematics Department. However, this minimum amount will vary depending on the student's interest and background and will be determined on an individual basis by the Committee on Graduate Studies.

The foreign language requirement is satisfied by the computer science requirements.

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 Committee on Graduate Studies.

After 40 semester hours of graduate work and with the approval of the Committee on Graduate Studies, a comprehensive examination will be administered. The examination is ordinarily both written and oral. To pass, the student must exhibit outstanding intellectual capacity and sufficient knowledge to continue doctoral studies and begin a program of research. By permission of the examining committee and the Graduate Dean, and after a lapse of a period of at least one semester, a student who has failed the comprehensive examination may request a single re-examination. The student must be enrolled in the Graduate School at the time of the comprehensive examination.

If more than five years have elapsed since the date of the comprehensive examination taken by the candidate, the student may be required to take another comprehensive examination before admission to the final examination.

The Ph.D. 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. Therefore, the Committee on Graduate Studies for Mathematical Sciences has identified the courses which are directly applicable for credit in this program. However, it should be noted that every course in a student's program of work will be evaluated not only as to course content but also the way in which each course complements other courses in the program of work and also the ways in which each course broadens and furnishes depth to the pro- **215**

gram. To this end, all the courses listed below will be counted in the mathematical sciences program of work if the courses are presented in acceptable combinations. Also, it is possible, and furthermore even probable, that an individual student's program of work may be enhanced by taking courses that are not listed below. If the selection of such courses is made with the prior approval of the Graduate Advisor, then these courses will also be counted toward the Ph.D. degree.

The following courses are applicable for credit in this program and are listed under general categories and one should refer to the lists of Mathematics (MATH), Physics (PHYS), Industrial Enginering (INDE), Computer Science (COSC), Management Science (MASC), and Business Administration (BUSA) courses elsewhere in this catalog for specific descriptions.

APPLIED MATHEMATICS

MATH:	5320, 5321, 5324, 5325, 5326, 5329, 5333, 6301, 6305, 6307, 6313, 6321.
PHYS:	5309, 5311, 5312, 5313, 5317, 5320, 5391, 5392.
INDE:	5301, 5323.
MASC:	5321, 5327, 5328.

PROBABILITY AND STATISTICS

MATH:	5311, 5312, 5313, 5314, 6313.
INDE:	5309, 5311, 5317, 5318, 5322.
COSC:	5339.
MASC:	5323, 5325.
BUSA:	5301.

COMPUTER SCIENCE

MATH:	5300, 5309, 5310, 5338, 5339, 6325.
INDE:	5305, 5306, 5332, 5392.
COSC:	5301, 5303, 5304, 5307, 5309, 5310, 5311, 5318, 5327, 5328, 5330, 5331, 5392.
MASC:	5326.

ABSTRACT MATHEMATICS

MATH:	5301, 5304, 5307, 5308, 5315, 5316, 5317, 5318, 5322, 5323, 5327, 5328, 5331, 5332, 5334, 5336, 5391, 5392, 5193, 5693, 5395, 5695, 5398, 5698, 5998, 6331, 6335.

6398, 6698, 6998. DISSERTATION Variable credit of three, six, or nine hours. Prerequisite: admission to candidacy for the Doctor of Philosophy degree in mathematical sciences.

RADIOLOGICAL PHYSICS
Program   (RADP)

Area of Study   **Degree**

Radiological Physics   M.S.

Master's Degree Plans: Thesis only

Graduate Advisor: Truman D. Black
104 Science Hall   273-2266

Graduate Faculty: The graduate faculty of the Department of Physics and the graduate faculty of the Department of Radiology of the University of Texas Health Science 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 Health Science 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 UTHSCD. 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 the University of Texas at 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 varies 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 UTHSCD are applicable to this program:

3651810. RADIOLOGICAL PHYSICS
3653820. APPLIED RADIOLOGICAL PHYSICS
3650940. RESEARCH IN RADIOLOGICAL PHYSICS
3652860. ADVANCED RADIOLOGICAL PHYSICS
3651930. SEMINAR
3653830. DIAGNOSTIC RADIOLOGICAL PHYSICS
3653840. PHYSICS OF RADIOLOGICAL THERAPY
3653850. NUCLEAR PHYSICS AND PHYSICS OF NUCLEAR MEDICINE
3650960. TOPICS IN RADIOLOGICAL PHYSICS
3653910. READINGS IN RADIOLOGICAL PHYSICS
3650980. THESIS
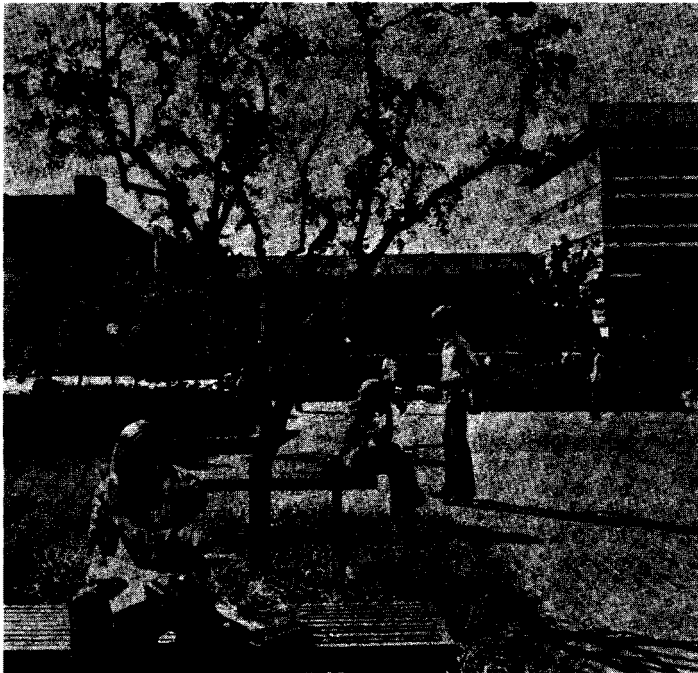
ADMINISTRATION
and
FACULTY
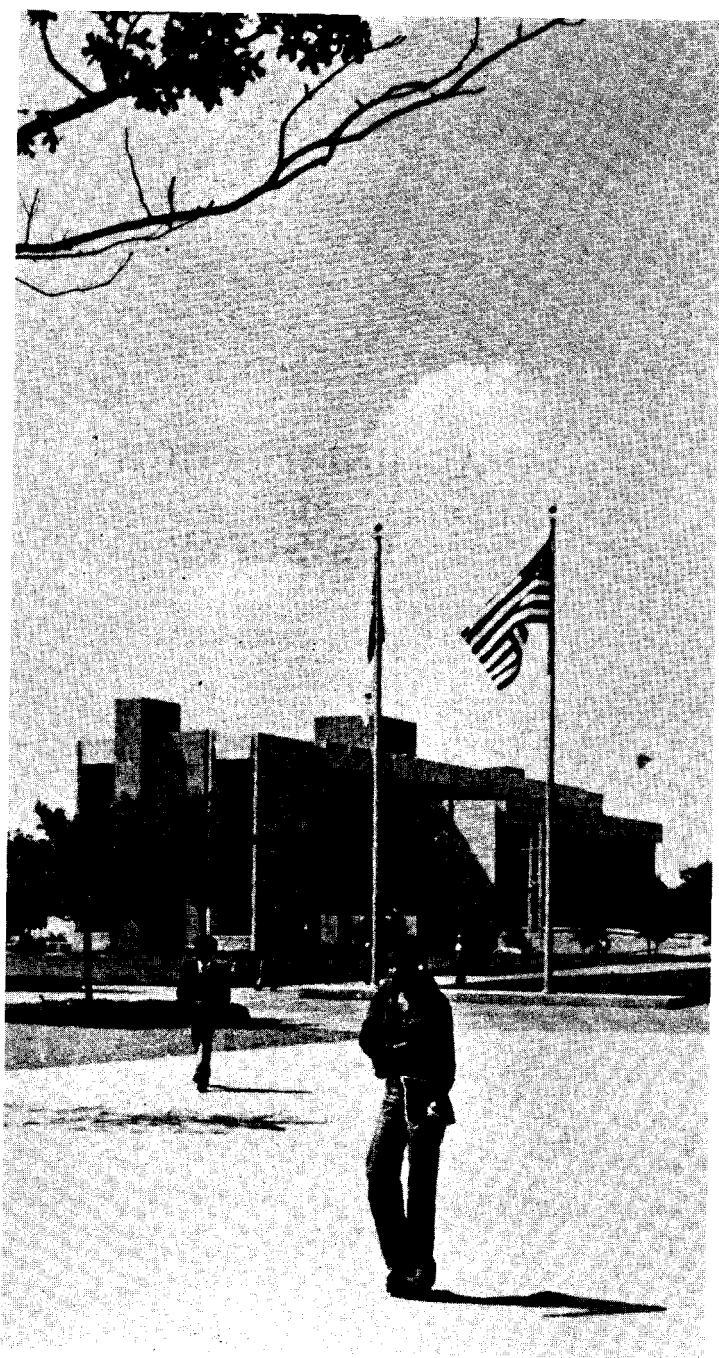
ADMINISTRATION

THE UNIVERSITY OF TEXAS SYSTEM

Charles A. LeMaistre, M.D., *Chancellor*
E. D. Walker, M.B.A., *Deputy Chancellor*

THE UNIVERSITY OF TEXAS AT ARLINGTON

GENERAL ADMINISTRATION

W. H. Nedderman, Ph.D., *President*
W. A. Baker, Ph.D., *Vice President for Academic Affairs*
J. Dudley Wetsel, M.B.A., *Vice President for Business Affairs*
B. Wayne Duke, Ed.D., *Dean of Student Life*
Elwood J. Preiss, M.A., *Assistant to the President, Dean of Student Administrative Services*
R. Zack Prince, M.A., *Registrar and Director of Admissions*
John A. Hudson, M.A., M.S. in L.S., *University Librarian*
A. L. von Rosenberg, B.S., *Business Manager*

DEANS OF THE COLLEGES AND DIRECTOR OF THE INSTITUTE

Roger A. Dickson, Ph.D., *Dean of the College of Business Administration*
Andrew E. Salis, Ph.D., *Dean of the College of Engineering*
Robert G. Landen, Ph.D., *Dean of the College of Liberal Arts*
Howard J. Arnott, Ph.D., *Dean of the College of Science*
Fernando Torgerson, Ph.D., *Dean of the Graduate School of Social Work*
Harold Box, B. Arch., FAIA, *Dean of the School of Architecture and Environmental Design*
Sherman M. Wyman, Ph.D., *Director of the Institute of Urban Studies*

THE GRADUATE SCHOOL

Bob F. Perkins, Ph.D., *Dean*
Kenneth M. Roemer, Ph.D., *Assistant Dean*

GRADUATE FACULTY

(Year in parentheses indicates year of initial employment.)

ABBOTT, JOHN P., *Assistant Professor of Accounting (1973). B.S., Texas Tech University, 1959; M.B.A., 1969; J.D., 1969; LL.M., Southern Methodist University, 1973. CPA.*

ACKER, BERTIE N., *Associate Professor of Foreign Languages (1965). B.A., Texas Woman's University, 1943; M.A., Southern Methodist University, 1957; Ph.D., University of Texas at Austin, 1971.*

ADAMS, DUANE A., *Professor of Foreign Languages (1960). B.A., University of Nebraska, 1947; M.A., 1949; Ph.D., Louisiana State University, 1963.*

ALDER, JAC, *Adjunct Assistant Professor of Communication (1975). B.Arch., Oklahoma University, 1957.*

ALEXANDER, M. WAYNE, *Assistant Professor of Business Administration (1973). B.S., Fresno State College, 1968; M.B.A., 1969; Ph.D., University of Illinois, 1974.*

ALLBRITTON, JULIE N., *Assistant Professor of Social Work (1970). B.A., Mississippi State College for Women, 1961; M.S.W., Louisiana State University, 1963.*

ALLGEIER, CATHY B., *Assistant Professor of Architecture (1974). B.F.A., Pratt Institute, 1964; M.Ed., Edinboro State College, 1971.*

ALMORE, MARY G., *Associate Professor of Urban Studies and Director of Criminal Justice Programs Division (1972). B.S., Florida State University, 1955; M.A., 1956; M.S., 1958; Ph.D., Texas Christian University, 1971.*

AMBLER, BRUCE A., *Assistant Professor of Psychology (1972). B.A., Haverford College, 1966; M.A., Cornell University, 1968; Ph.D., University of Oregon, 1972.*

AMSLER, ROBERT W., *Professor of History and Assistant Dean of the College of Liberal Arts (1957). B.A., University of Texas at Austin, 1936; M.A., 1940; Ph.D., 1950.*

AMSTER, HARRIETT, *Professor of Psychology (1973). A.B., Bryn Mawr College, 1950; M.A., Clark University, 1954; Ph.D., 1957.*

ANDERSON, R. BRUCE W., *Associate Professor of Sociology (1973). A.B., Stanford University, 1961; M.A., Northwestern University, 1965; Ph.D., Duke University, 1970.*

ANGUIZOLA, GUSTAVE, *Assistant Professor of History (1966). B.A., Evansville University, 1947; M.A., Indiana University, 1948; M.S., Michigan State University, 1953; Ph.D., Indiana University, 1954.*

ANTONIADES, ANTHONY C., *Associate 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.*

ARANGIO, ANTHONY J., *Associate Professor of Social Work (1969). B.S., Louisiana State University, 1962; M.S.W., 1964; Ph.D., Tulane University, 1970.*

ARMSTRONG, ANDREW T., *Associate Professor of Chemistry (1968). B.S., North Texas State University, 1958; M.S., 1959; Ph.D., Louisiana State University, 1967.*

ARMSTRONG, J. CLYDE, *Adjunct Associate Professor of Civil Engineering (1972). B.S., Texas A&M University, 1955; B.S., 1961; M.S., 1962; Ph.D., 1967. Professional Engineer.*

ARNOTT, HOWARD J., *Professor of Biology and Dean of the College of Science (1974). A.B., University of Southern California, 1952; M.S., 1953; Ph.D., University of California at Berkeley, 1958.*

AXE, John R., *Assistant Professor of Biomedical Engineering and Adjunct Assistant Professor of Mechanical Engineering (1975). B.S., U.S. Naval Academy, 1950; M.S., 1958; D.Eng., Catholic Universty, 1970.*

AYERS, ALMA JEWEL, *Visiting Assistant Professor of Social Work (1975). B.A., Fisk University, 1957; M.S.W., University of Denver, 1961.*

BAERWALDT, JAMES W., *Associate Professor of Psychology (1966). B.A., Wesleyan University, 1961; M.A., University of Michigan, 1965; Ph.D., 1968.*

BAKER, ANTHONY STARK, *Assistant Professor of History (1974). B.A., Denison University, 1958; M.A., Ohio State University, 1961; Ph.D., University of California at Los Angeles, 1973.*

BAKER, R. C., *Assistant Professor of Business Administration (1972). B.A., University of Texas at Austin, 1964; Ph.D., Texas A&M University, 1971.*

BAKER, W. A., *Professor of Chemistry and Vice President for Academic Affairs (1971). B.S., Texas A&I University, 1955; Ph.D., University of Texas at Austin, 1959.*

BARKER, CALVIN L. R., *Professor of Mechanical Engineering and Computer Science and Associate Dean of the College of Engineering (1960). B.S., University of Texas at Austin, 1953; M.S., California Institute of Technology, 1954; Ph.D., 1958. Professional Engineer.*

BATTISTA, O. A., *Adjunct Professor of Chemistry (1974). B.S., McGill University, 1940; Sc.D., St. Vincent College, 1955.*

BEACH, DON M., *Assistant Professor of Education (1973). B.S., Texas Tech University, 1969; M.Ed., 1970; Ph.D., George Peabody College for Teachers, 1973.*

BEARD, JACOB T. B., JR., *Assistant Professor of Mathematics (1971). B.S., Tennessee Technological University, 1962; M.S, 1967; Ph.D., University of Tennessee, 1971.*

BEAUDRY, HARRY R., *Associate Professor of English (1966). A.B., Rice University, 1952; M.A., Boston University, 1956; Ph.D., Duke University, 1968.*

BELLION, EDWARD, *Associate Professor of Chemistry (1970). B.Sc., University of Leeds, 1965; Ph.D., 1968.*

BERNFELD, STEPHEN R., *Associate Professor of Mathematics (1975). B.S., Rensselaer Polytechnic Institute, 1965; Ph.D., University of Maryland, 1969.*

BERNSTEIN, BARTON E., *Adjunct Associate Professor of Social Work (1974). B.A., Drake University, 1951; J.D., Boston University, 1953; M.L.A., Southern Methodist University, 1971.*

BERNSTEIN, IRA H., *Professor of Psychology (1964). B.A., University of Michigan, 1959; M.A., Vanderbilt University, 1961; Ph.D., 1963.*

BISBEE, JAMES R., *Associate Professor of Social Work (1968). B.B.A., University of Texas at Austin, 1941; M.S.W., Tulane University, 1947.*

BLACK, TRUMAN D., *Associate Professor of Physics (1965). B.S., University of Houston, 1959; M.A., Rice University, 1962; Ph.D., 1964.*

BLACKWELL, CHARLES C., JR., *Professor of Mechanical Engineering (1966). B.A., Rice University, 1955; B.S., 1956; M.S., Southern Methodist University, 1960; Ph.D., University of Arizona, 1966. Professional Engineer.*

BLAIR, LEON B., *Adjunct Professor of History (1967). B.A., Texas Tech University, 1940; M.A., Rice University, 1949; Ph.D., Texas Christian University, 1968.*

BLAKE, DANIEL M., *Associate Professor of Chemistry (1970). B.S., Colorado State University, 1965; Ph.D., Washington State University, 1969.*

BOCK, E. C., *Associate Professor of History (1966). A.B., St. Gregory's College, 1945; M.A., Oklahoma University, 1964; Ph.D., 1966.*

BOLEN, JAMES C., *Associate Professor of Mathematics (1960). B.A., Texas A&M University, 1954; M.S., 1956; Ph.D., Texas Christian University, 1968.*

BOLEY, ROBERT B., *Associate Professor of Biology (1965). B.S., Sam Houston State College, 1949; M.S., Texas A&M University, 1960; Ph.D., Ohio State University, 1963.*

BOON, JOHN D., *Professor of Geology (1942). B.S., Southern Methodist University, 1936.*

BORO, JOSEPH, *Adjunct Assistant Professor of Social Work (1975). B.S., University of Texas at Arlington, 1972; M.P.A., Southern Methodist University, 1973.*

BOWEN, JAMES N., *Professor of Psychology (1963). B.A., Hardin-Simmons University, 1960; Ph.D., University of Texas at Austin, 1963.*

BOX, HAROLD, *Professor of Architecture and Dean of the School of Architecture and Environmental Design (1971). B.Arch., University of Texas at Austin, 1950. FAIA. Registered Architect.*

BRAGG, LOUIS H., *Associate Professor of Biology (1960). B.S., North Texas State University, 1953; M.S., 1957; Ph.D., University of Texas at Austin, 1964.*

BROOKS, DOUGLAS M., *Assistant Professor of Education (1975). B.A., Blackburn College, 1969; M.S., Roosevelt University, 1971; Ph.D., Northwestern University, 1974.*

BROOKS, R. GENE. *Associate Professor of Architecture (1975). B.S., University of Houston, 1959; M.S., University of Texas at Austin, 1969. Registered Architect, Registered Planner.*

BROWN, KENNETH L., *Assistant Professor of Chemistry (1975). B.S., University of Chicago, 1968; Ph.D., University of Pennsylvania, 1971.*

BUCKLEY, ERNEST L., *Professor of Architecture (1972). B.S., South Dakota State University, 1947; M.S., Kansas State University, 1949; Ph.D., University of Texas at Arlington, 1972. FASCE, Professional Engineer.*

BUCKNER, JOYCE P., *Associate Professor of Education (1970). B.A., Ouachita Baptist University, 1959; M.S.E., Henderson State University, 1964; Ph.D., North Texas State University, 1970.*

BURKART, BURKE, *Associate Professor of Geology (1970). B.S., University of Texas at Austin, 1954; M.A., 1960; Ph.D., Rice University, 1965.*

BURNS, JOHN S., *Associate Professor of English (1964). B.A., New York University, 1951; M.A., Rice University, 1953; Ph.D., 1964.*

BURQUEST, DONALD A., *Adjunct Professor of Linguistics (1975). B.A., Wheaton College, 1961; M.A., University of California at Los Angeles, 1965; Ph.D., 1973.*

BURRUS, RONALD C., *Adjunct Assistant Professor of Social Work (1975). B.S., University of Houston, 1957; M.A., 1963; M.S.W., Tulane University, 1967.*

BUTCHER, ALLAN K., *Associate Professor of Urban Studies (1970). B.A., University of Florida, 1960; M.A., New School for Social Research, 1963; Ph.D., University of Texas at Austin, 1970.*

BUTLER, JAMES K., *Associate Professor of Biology (1960). B.A., University of Texas at Austin, 1950; M.A., 1952; Ph.D., 1961.*

CALABRO, PAT J., *Assistant Professor of Business Administration (1973). B.S., John Carroll University, 1965; M.B.A., Kent State University, 1969; Ph.D., Michigan State University, 1973.*

CALLICUTT, JAMES W., *Professor of Social Work and Associate Dean of the Graduate School of Social Work (1968). B.S., Memphis State College, 1951; M.S.S.W., University of Tennessee, 1958; Ph.D., Brandeis University, 1969.*

CANNON, DON L., *Associate Professor of Electrical Engineering (1970). B.S., Texas Tech University, 1961; M.S., Massachusetts Institute of Technology, 1963; Ph.D., University of Houston, 1970. Professional Engineer.*

CANTWELL, DONALD W., *Associate Professor of Business Administration (1959). B.B.A., Southern Methodist University, 1953; M.B.A., 1959; J.D., 1962. State Bar, 1962.*

CARNEY, MARNA K. *Professor of Economics (1967). B.S., Northwestern University, 1947; M.A., Southern Methodist University, 1965; Ph.D., 1968.*

CASH, FLOYD L., *Professor and Chairman of the Department of Electrical Engineering (1959). B.S., University of Oklahoma, 1946; M.S., University of Texas at Austin, 1951; Ph.D., 1955. Professional Engineer.*

CHEAVENS, FRANK, *Professor Emeritus of Psychology (1957). B.A., Baylor University, 1927; M.A., University of Texas at Austin, 1946; Ph.D., 1957.*

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.*

CHESTER, EDWARD W., *Associate Professor of History (1965). B.A., Morris Harvey College, 1956; M.A., University of Pittsburgh, 1958; Ph.D., 1961.*

CHIANG, W. WALTER, *Adjunct Assistant Professor of Civil Engineering (1975). B.S., Chung-Yuan Christian College, 1967; M.S., University of Texas at Austin, 1970.*

CLARK, DAYLE M., *Assistant Professor of Civil Engineering (1964). B.S., Texas Tech University, 1955; M.S., Southern Methodist University, 1967. Professional Engineer.*

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to Cooper Center

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Cooper St.

1. Activities Building
2. Men's PE
3. Trinity House (men)
4. Pachl Hall (men)
5. Fine Arts Building
6. Texas Hall
7. Davis Hall
   University administrative offices
8. Visitors' Parking

9. *Geology
10. Science
11. University Hall
12. *Engineering Lab Bldg.
13. Engineering
14. Preston Hall
15. Carlisle Hall
16. Ransom Hall
17. Girls' Gymnasium
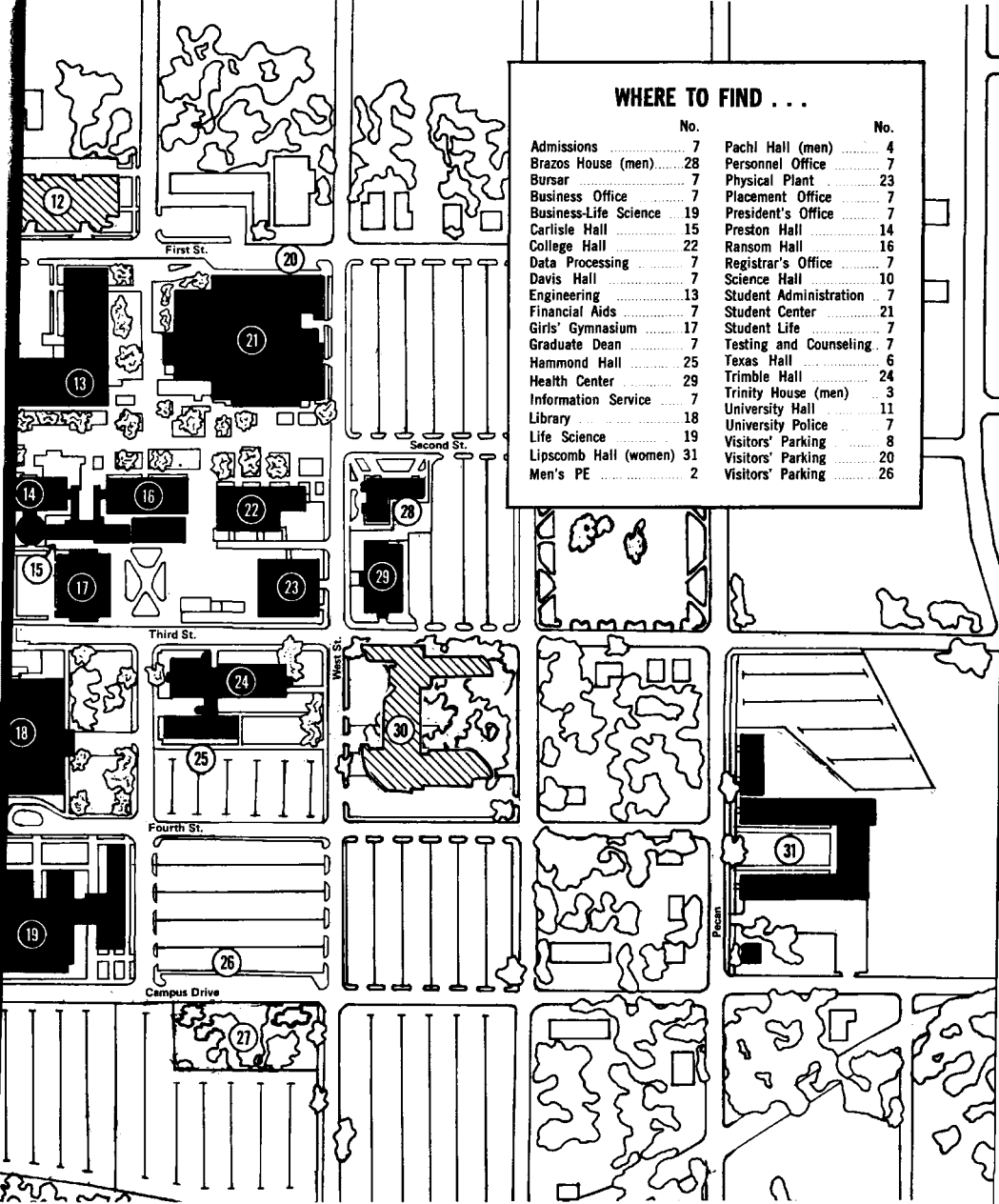
WHERE TO FIND . . .

	No.		No.
Admissions	7	Pachl Hall (men)	4
Brazos House (men)	28	Personnel Office	7
Bursar	7	Physical Plant	23
Business Office	7	Placement Office	7
Business-Life Science	19	President's Office	7
Carlisle Hall	15	Preston Hall	14
College Hall	22	Ransom Hall	16
Data Processing	7	Registrar's Office	7
Davis Hall	7	Science Hall	10
Engineering	13	Student Administration	7
Financial Aids	7	Student Center	21
Girls' Gymnasium	17	Student Life	7
Graduate Dean	7	Testing and Counseling	7
Hammond Hall	25	Texas Hall	6
Health Center	29	Trimble Hall	24
Information Service	7	Trinity House (men)	3
Library	18	University Hall	11
Life Science	19	University Police	7
Lipscomb Hall (women)	31	Visitors' Parking	8
Men's PE	2	Visitors' Parking	20
		Visitors' Parking	26

18. Library
19. Business-Life Science
20. Visitors' Parking
21. Student Center
22. College Hall
23. Physical Plant
24. Trimble Hall
25. Hammond Hall
26. Visitors' Parking

27. Park
28. Brazos House (men)
29. Health Center
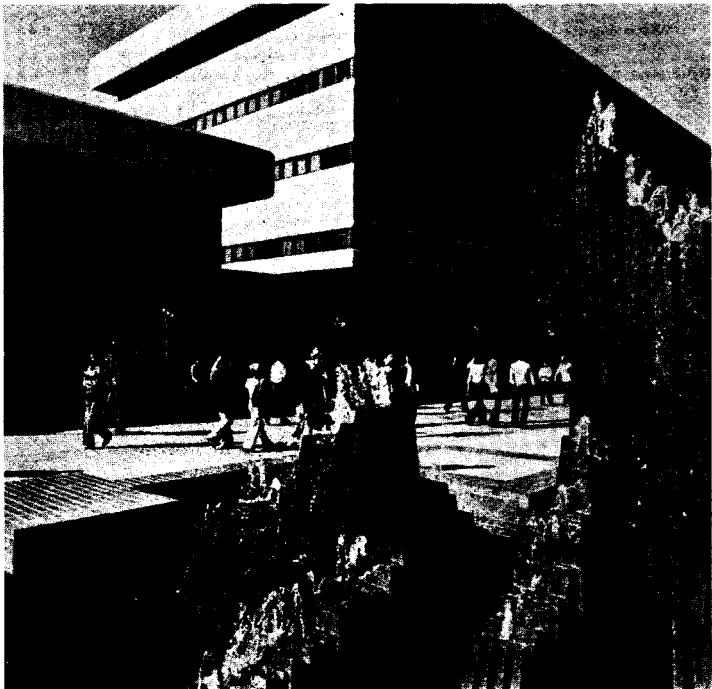30. *Business Administration Bldg.
31. Lipscomb Hall (women)

*Under construction

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