## BULLETIN

OF

## TEXAS TECHNOLOGICAL COLLEGE

## Catalog of the Graduate School 1967-1968



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## College Calendar, 1967-1968

## Fall Semester

Sept. 18-23 Registration for the fall semester.
Sept. 25 Classes begin.
Oct. 23 Last day to drop a course with a grade of W.
Nov. 22 12:30 P.M., classes dismissed for Thanksgiving holidays.
Nov. 27 Classes resumed.
Dec. 2010 P.M., classes dismissed for Christmas holidays.
Jan. $3 \quad$ Classes resumed.
Jan. 8 Last day to drop a course.
Jan. 19-26 Final examinations for the fall semester.

## Spring Semester

Jan. 29-
Feb. 3 Registration for the spring semester.
Feb. $5 \quad$ Classes begin.
March 4 Last day to drop a course with a grade of W.
April 8 7:30 A.M., classes dismissed for Spring Vacation.
April 16 7:30 A.M., classes resumed.
May 6 Last day to drop a course.
May 17 Last day to submit to the Graduate Dean the final copy of thesis or dissertation and to pay the binding fee.
May 21-28 Final examinations for the spring semester.
June 1 Commencement.

Summer Session, 1968
June 4 Summer session begins.
Aug. 24 Summer session ends.

## Officials and Graduate Faculty 1966-1967

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C. A. CASH, Vice Chairman
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Term Expires February 19, 1967

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Term Expires February 19, 1969


Term Expires February 19, 1971
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RETHA R. MARTIN ......................................................... Lubbock
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FLOYD D. BOZE, Ed.D., Dean of Admissions and Registrar
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GEORGE GAIL HEATHER, Ph.D., Dean of Business Administration
RAY CURTIS JANEWAY, M.S., Librarian
LEWIS NORTEN JONES, M.A., Dean of Men

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JACOB HOMER MILLIKIN, M.A., Director of Extension and Correspondence
FLORENCE LOUISE PHILLIPS, Ed.D., Dean of Women
ROBERT BYRON PRICE, M.B.A., C.P.A., Comptroller
FRED DURNFORD RIGBY, Ph.D., Dean of the Graduate School
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WILLA VAUGHN TINSLEY, Ph.D., Dean of Home Economics

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OTTO VINCENT ADAMS, M.S.E., D.Sc., Civil Engineering (Dean of Engineering 1932-1949)
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WELDON LEROY BRADSHAW, B.S., Architecture and Allied Arts
CHARLES VICTOR BULLEN, M.S. in E.E., Electrical Engineering
LEWIS BRISCOE COOPER, Ph.D., Education
WILLIAM MOORE CRAIG, Ph.D., Chemistry
CHARLES DUDLEY EAVES, Ph.D., History
MABEL DEANE ERWIN, M.A., Clothing and Textiles
RAYMOND ERNEST GARLIN, Ph.D., Education
EUNICE JOINER GATES, Ph.D., Foreign Languages
CARL HENNINGER, M.A., Foreign Languages
CECIL HORNE, B.A., Journalism
WILLIAM MORLEY JENNINGS, B.S., Health, Physical Education, and Recreation for Men
OSCAR ARVLE KINCHEN, Ph.D., History
FLORIAN ARTHUR KLEINSCHMIDT, M. in Arch., Architecture and Allied Arrs
JOHNNYE GILKERSON LANGFORD, M.A., Physical Education
SETH SHEPARD McKAY, Ph.D., History
JONNIE McCRERY MICHIE, M.A., Food and Nutrition
RUFUS ARTHUR MILLS, M.A., English
James harold murdouugh, M.S.E., Civil Engineering
ANNAH JOE PENDLETON, M.A., Speech
CONNER COLUMBUS PERRYMAN, B.S., Engineering Drawing
OSCAR ALLEN St. CLAIR, B.S. in E.E., Industrial Engineering
CLARENCE CARL SCHMIDT, Ph.D., Physics
WILLIAM MACKEY SLAGLE, M.A., Chemistry
FRED WINCHELL. SPARKS, Ph.D., Mathematics
ALAN LANG STROUT, Ph.D., English
EARL L. THOMPSON, Ph.D., Mathematics
RaLPH SYLVESTER UNDERWOOD, Ph.D., Mathematics
THOMAS FERDINAND WIESEN, M.B.A., Economics
WARREN WATSON YOCUM, Ph.D., Horticulture

[^1]
## Graduate Council

The Graduate Council is composed of ten members, eight of whom are elected by the Graduate Faculty and two of whom are appointed by the Dean. The Dean is ex officio chairman of the Council; the Associate Dean is an ex officio member of the Council. Members serve for a period of three years and are not eligible for immediate re-election unless they have been chosen to fill an unexpired term. By a system of rotation, some new members join the Council each year, replacing those whose terms of office have expired. The date after a name indicates the year of expiration of the individual's term of office.

The Graduate Council, assisted by the Graduate Faculty, is charged with the responsibility of formulating the policies of the Graduate School and the requirements for graduate degrees. These policies are administered by the Dean.

FRED DURNFORD RIGBY, Ph.D., Professor of Mathematics and Dean of the Graduate School, Chairman
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mONTY EARL DAVENPORT, Ph.D., Associate Professor of Mechanical Engineering (1968)

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HENRY JOSEPH SHINE, Ph.D., Professor of Chemistry (1968)
WARREN STANLEY WALKER, Ph.D., Professor of English (1969)

## Graduate Faculty

## Members

Members of the Graduate Faculty participate in all phases of the graduate program, assist in determining policy, and vote on candidates for graduate degrecs. Membership is conceived of as a means of recognizing the distinguished members of the faculty as evidenced by scholarship, creativity, and direction of graduate research and study.
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BENJAMIN BOCK, Ph.D., Associate Professor of Government
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MORRIS FRANK STUBBS, Ph.D., Professor of Chemistry
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ILSE HILDEGARDE WOLF, Ed.D., Professor of Home and Family Life
ARTHUR WESLEY YOUNG, Ph.D., Professor and Head of the Department of Agronomy and Range Management

## Associate Members

Associate Members of the Graduate Faculty teach courses of all graduate levels and act as members of students' advisory committees except that they may not serve as chairmen of doctoral committces.
burl monroe abel, M.B.A., Associate Professor of Finance
ROBERT SEXTON ADAMS, Ph.D., Assistant Professor of Management
robert CUSTER ALBIN, Ph.D., Assistant Professor of Animal Husbandry
THEODOR WALTER ALEXANDER, M.S., Associate Professor of Germanic Languages ARCHIE CORNELIOUS ALLEN, Ph.D., Assistant Professor of Biology
JAMES GEORGE ALLEN, M.A., Professor of English and Dean of Student Life
HUGH ALLEN ANDERSON, M.A., Associate Professor of Economics
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CECIL IRVY AYERS, M.S., Professor of Agronomy
GEORGE LEWIS BALDWIN, Ph.D., Associate Professor of Mathematics
WELDON EARNEST BECKNER, Ed.D., Assistant Professor of Secondary Education ethel Jane beitler, M.Ed., Associate Professor of Applied Arts
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JULIAN LAWSON BIGGERS, JR., Ph.D., Associate Professor of Education
JOHN JAMES BODOH, Ph.D., Assistant Professor of Classical Languages
GERMAIN BONIFACE BOER, Ph.D., C.P.A., Associate Professor of Accounting
PETER DRAGO BUBRESKO, M.A., Assistant Professor of Romance Languages
HENRY EDSEL BUCHANAN, M.A., Assistant Professor of Health, Physical Education, and Recreation for Men
CHARLES LOUIS BURFORD, M.S., Reg. Prof. Engr. (Oklahoma), Assistant Professor of Industrial Engineering
JOHN HOWARD BURNETT, Ph.D., Assistant Professor of Government
WILLIAM GASTON CAIN, JR., Ph.D., Professor of Management
DEORE J. CANNON, Ph.D., Associate Professor of Psychology
MARY SUE CARLOCK, Ph.D., Associate Professor of English
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CECIL ROBERTS COALE, JR., Ph.D., Assistant Professor of Electrical Engineering
JOHN WILLIAM COBB, JR., P.E.D., Professor of Health, Physical Education, and
Recreation for Men
DENNIS CLARK COGAN, Ph.D., Assistant Professor of Psychology
JACQUELIN COLLINS, Ph.D., Associate Professor of History
MURRay Whitfield coulter, Ph.D., Assistant Professor of Biology
JOHN PAUL CRAIG, Ph.D., Reg. Prof. Engr. (Texas), Associate Professor of Electrical Engineering
DUANE AUSTIN CRAWFORD, M.S., Reg. Prof. Engr. (Texas), Assistant Professor of Petroleum Engineering
ALEX BELCHER CROWDER, JR., Ed.D., Assistant Professor of Elementary Education
CHARLES EDWIN DALE, LL.B., Professor of Finance
JOE WINCIK DARNALL, Ph.D., Assistant Professor of Psychology
LEWIS JAMES DAVIES, Ph.D., Associate Professor of Sociology
ROBERT WALDO DEAHL, M.M., Associate Professor of Music
MAYNETTE DERR, Ph.D., Associate Professor of Clothing and Textiles
PHYlLIS DRAKE, M.S., Associate Professor of Home Economics Education and Home and Family Life
WILLIAM LYON DUCKER, B.S., Reg. Prof. Engr. (Texas, Oklahoma), Professor and Head of the Department of Petroleum Engineering
WILLIAM WAYNE DUMAS, Ed.D., Assistant Professor of Secondary Education

ROY SYLVAN DUNN, M.A., Associate Professor of Sociology and Director of the Southwest Coilection
MARVIN JOHN DVORACEK, M.S., Assistant Professor of Agricultural Engineering luta pelham eaves, m.b.A., Assistant Professor of Accounting FLOYD EUGENE EDDLEMAN, Ph.D., Associate Professor of English
ULRICH LEWIS EGGENBERGER, Ph.D., Associate Professor of Agricultural Education george o. ELLE, Ph.D., Professor of Horticulture
arthur mcauley elliot, Ph.D., Associate Professor of Biology
paUl Raymond ellsworth, M.A., Associate Professor of Music
LaURA KATHERINE EVANS, Ed.D., Professor of Education
bILLY COTTON EVERTON, Ed.D., Assistant Professor of Elementary Education
DOROTHY JANE FILGO, M.A., Assistant Professor of Elementary Education
James M. FOSTER, Ph.D., Assistant Professor of English
GORDON FULLER, Ph.D., Part-time Professor of Mathematics
Alfred A. FUNK, Ph.D., Assistant Professor of Speech
James rankin gammill, ed.D., Associate Professor of Secondary Education
wallace earl garets, M.S., Professor and Head of the Department of Journalism
HOWARD ELDON GOLDEN, Ph.D., Professor of Marketing
PRESTON FRAZIER GOTT, M.A., Associate Professor of Physics
LOLA BETH GREEN, Ph.D., Associate Professor of English
gerald art greenblatt, Ph.D., Assistant Professor of Biology
Clyde leroy Grimm, Jr., Ph.D., Assistant Professor of English
HERBERT WARREN GRUBB, Ph.D., Associate Professor of Agricultural Economics
JUNE EDITH HAHNER, Ph.D., Assistant Professor of History
PaUl DEAN HANNA, M.F.A., Assistant Professor of Architecture and Allied Arts ARREN MAYNOR HARDEE, Ph.D., Associate Professor of Romance Languages
LEVI MARLIN HARGRAVE, M.S., Professor of Agricultural Education
HUBERT REED HEICHELHEIM, Ph.D., Assistant Professor of Chemical Engineering ELLIS RICHARD HEINEMAN, M.A., Professor of Mathematics
SHELbY KEITH Hildebrand, Ph.D., Associate Professor of Mathematics
VERNA LEE BUTCHER HILDEBRAND, M.S., Assistant Professor of Home and Family Life
WALTER KENT HILL, A.M.D., Assistant Professor of Music
gladys keen holden, M.S., Associate Professor of Food and Nutrition
William butler horton, Jr., M.S., Assistant Professor of Sociology
David allen howe, Ph.D., Assistant Professor of Physics
James dean howze, m.S., Associate Professor of Architecture and Allied Arts
DOROTHY BEATRICE HOYLE, Ph.D., Professor of Health, Physical Education, and Recreation for Women
ROLF EUGENE HUFF, Ph.D., Assistant Professor of Biology
ALEXANDER POPE HULL, JR., Ph.D., Associate Professor of Germanic Languages
george keating hutchinson, Ph.D., Associate Professor of Industrial Engineering and Director of the Computer Center
alonzo david Jacka, Ph.D., Associate Professor of Geosciences
J. W. JACKSON, M.A., Professor of Government

LOUIS THOMAS JARDINE, M.A., Assistant Professor of Germanic Languages
CHESTER CARTWRIGHT JAYNES, M.S., Associate Professor of Agronomy and Range Management
LEONID AURELIJS JIRGENSONS, M.A., Assistant Professor of Classical Languggs WILLIAM RUDOLPH JOHNSON, Ph.D., Assistant Professor of History
DAVID BRUCE JORDAN, Ph.D., Assistant Professor of Health, Physical Education, and Recreation for Men
MARGARET KASSOUNY, M.S., Assistant Professor of Food and Nutrition
CONSTANTINE DEMETRIUS KASTRITSIS, Ph.D., Assistant Professor of Biology
gene kenney, m.m., Associate Professor of Music
RICHARD ORVILLE KESLIN, Ph.D., Associate Professor of Anthropology
kenneth CLarence Kilian, Ph.D., Assistant Professor of Agronomy M. DEAN KILLION, M.M., Professor of Music and Director of Bands THOMAS KUNHYUK KIM, Ph.D., Associate Professor of Economics lila allred Kinchen, M.S., Associate Professor of Clothing and Textiles James william Kitchen, Ph.D., Assistant Professor of Horticulture SHELDON CHARLES KLOCK, JR., M.A., Assistant Professor of Romance Languages MAGNE KRISTIANSEN, Ph.D., Assistant Professor of Electrical Engineering
franz ferdinand Kriwanek, M.A., Assistant Professor of Applied Arts LYLE CARLTON KUHNLEY, Ph.D., Associate Professor of Biology
JAMES EDWARD KUNTZ, Ph.D., Professor of Psychology and Director of the Counseling Center
MARTIN THEODORE KYRE, JR., Ph.D., Associate Professor of Government
JAMES HAROLD LAWRENCE, JR., Ph.D., Reg. Prof. Engr. (Texas), Associate Professor of Mechanical Engineering
ROBERT MALCOM LAWRENCE, Ph.D., Associate Professor of Government CHARLES ALFRED LAWRIE, M.M., Associate Professor of Music
HONG YONG LEE, M.S., Assistant Professor of Agricultural Economics
SAMUEL HUNT LEE, JR., Ph.D., Professor of Chemistry
THELMA HAMILTON LEONARD, Ed.D., Professor of Home Economics Education HAROLD LOYD LEWIS, Ph.D., Assistant Professor of Biology
TRUMAN ORVILLE LEWIS, Ph.D., Assistant Professor of Mathematics IRVING LIPSCHITZ, Ph.D., Assistant Professor of Chemistry
IVAN LEE LITTLE, Ph.D., Professor and Head of the Department of Philsosophy and Acting Dean of Arts and Sciences
MOHAMMAD ARFIN KHAN LODHI, Ph.D., Assistant Professor of Physics
MILDRED EILEEN LOWE, Ph.D., Associate Professor of Biology
JAMES RICHARD McDONALD, Ph.D., Assistant Professor of Civil Engineering
CLARA MUELLER McPHERSON, M.S., Assistant Professor of Food and Nutrition RAYMOND DeELMONT MACK, M.A., Associate Professor of Government
CHARLES HENRY MAHONE, Ph.D., Associate Professor of Psychology
GLEN ALAN MANN, Ph.D., Associate Professor of Physics
ROBERT EDWARD MARTIN, M.S., Reg. Prof. Engr. (Texas), Associate Professor of Mechanical Engineering
THOMAS OWEN MASTROIANNI, M.S., Assistant Professor of Music
BRUCE DOUGLAS MATTSON, Ed.D., Associate Professor of Special Education
HENRY JAMES MAXWELL, Ph.D., Associate Professor of Romance Languages
JUDSON DANA MAYNARD, Ph.D., Assistant Professor of Music
GEORGE PEYTON MECHAM, Ph.D., Professor of Elementary Education
ROY LEE MEEK, Ph.D., Assistant Professor of Government
KISHOR CHANDULAL MEHTA, Ph.D., Reg. Prof. Engr. (Texas), Assistant Professor of Civil Engineering
KORANDATTIL VENUGOPALAN MENON, Ph.D., Assistant Professor of Mathematics
RAYMOND ERWIN MEYER, Ph.D., Assistant Professor of Agronomy and Range Management
WILLIAM DONALD MILLER, Ph.D., Associate Professor of Geosciences
Raymond William mires, Ph.D., Assistant Professor of Physics
Robert wetsel mitchell., Ph.D., Assistant Professor of Biology
ROY ERNEST MITCHELl, Ph.D., Assistant Professor of Chemistry
EVELYN INA MONTGOMERY, Ph.D., Assistant Professor of Anthropology
WILliam D. MUller, Ph.D., Assistant Professor of Government
OTTO MILLARD NELSON, M.A., Assistant Professor of History
BENJAMIN HAVELOCK NEWCOMB, Ph.D., Assistant Professor of History
ROBERT LEE NEWELL, M.S. in M.E., Reg. Prof. Engr. (Texas), Professor of Mechanical Engineering and Assistant Dean of Engineering
WILLIAM DURWARD NORWOOD, JR., Ph.D., Associate Professor of English

JAMES EZRA OSBORN, Ph.D., Assistant Professor of Agricultural Economics
DOUGLAS FARRAR OWEN, Ph.D., Visiting Assistant Professor of Agronomy and Range Management
MARY SEYMOUR OWENS, M.A., Associate Professor of Health, Physical Education, and Recreation for Women
THOMAS RICHARD OWENS, Ph.D., Associate Professor of Agricultural Economics ROBERT MARSHALL PARKER, M.A., Associate Professor of Mathematics
roderick parkinson, m.ed., Assistant Professor of Architecture and Allied Arts
L. E. Parsons, B.S., Reg. Prof. Engr. (Texas), Professor and Acting Head of the Department of Textile Engineering
robert thomas pate, Ed.D., Assistant Professor of Elementary Education
WILLIE EDWARD PHILLIPS, Ph.D., Associate Professor of Electrical Engineering
ROBERT LEROY POE, Ed.D., Associate Professor of Mathematics
Juanita tittle pollard, m.a., Assistant Professor of Applied Arts
CHARLES WILLIAM POST, M.A., Associate Professor of Music
JOHN william Queen, m.F.A., Assistant Professor of Applied Arts
SUE AVA RAINEY, M.A., Professor of Health, Physical Education, and Recreation for Women
James verdo reese, Ph.D., Associate Professor of History
CORWIN C. REEVES, JR., M.S., Assistant Professor of Geosciences
Levern anthony reis, m. Met. E., Assistant Professor of Mechanical Engincering
ELBERT BRUNNER REYNOLDS, JR., Ph.D., Associate Professor of Mechanical Engineering
CHARLES LATHAN RIGGS, Ph.D., Professor of Mathematics
george stiegler robbert, Ph.D., Associate Professor of History
Loulse buenger robbert, Ph.D., Part-time Assistant Professor of History
arthur theophile roberts, Ph.D., C.P.A., Professor of Accounting
robert alan rooker, M.A., Assistant Professor of Journalism
FRaNCIS LEWIS ROSE, Ph.D., Assistant Professor of Zoology
billy IRVAN ROSS, Ph.D., Associate Professor of Marketing
CHESTER MORRISON ROWELL, JR., Ph.D., Assistant Professor of Biology
MICHAEL KENT RYLANDER, Ph.D., Assistant Professor of Biology
ALBERT JOSEPH SANGER, M.S., Associate Professor of Civil Engineering
RONALD EDWARD SCHULZ, M.A., Associate Professor of Speech
JOSEPH LAWRENCE SCHUSTER, Ph.D., Assistant Professor of Range Management
JESSE Q. SEALEY, Ph.D., Professor of Biology
HERMAN BRAZILL SEGREST, Ed.D., Professor of Health, Physical Education, and Recreation for Men
Ralph louis sellmeyer, m.A., Associate Professor of Journalism
HAROLD LESTER SIMPSON, Ph.D., Professor of Romance Languages
margaret ann wilson sitton, Ed.D., Assistant Professor of Home Economics Education
HENRY ELI SPECK, III, Ph.D., Assistant Professor of English
ALFRED BELL STREHLI, M.A., Professor of Romance Languages
Haskel grant Taylor, M.A., C.P.A., Professor of Accounting
dahlia Jewell terrell, Ph.D., Assistant Professor of English
JAC LYNDON THARPE, Ph.D., Associate Professor of English
ARTHUR DUDLEY THOMPSON, M.S., Assistant Professor of Architecture and Allied Arts
IDris Rhea Traylor, JR., Ph.D., Assistant Professor of History
SCOTTI MAE TUCKER, Ph.D., Professor of Romance Languages
mary jeanne van appledorn, Ph.D., Professor of Music
Harold david Viaille, Ph.D., Associate Professor of Psychology
Darrell lee vines, Ph.D., Assistant Professor of Electrical Engineering
CHARLES ERNEST WADE, Ph.D., Assistant Professor of Finance
James robert wall, Ph.D., Assistant Professor of Biology
estelle hays wallace, M.S., Associate Professor and Head of the Department of Home and Family Life
derald dee walling, Ph.D., Associate Professor of Mathematics
FRANK DOSTER WETHERILL, Ph.D., Assistant Professor of Romance Languages OLIVE BOONE WHEELER, Ed.D., Associate Professor of Elementary Education
JOHN THOMAS WHITE, Ph.D., Associate Professor of Mathematics
CARLTON JAMES WHITEHEAD, Ph.D., Associate Professor of Management
WILLIAM ELMER WHITTINGTON, Ph.D., Professor of Accounting
WILFORD WAYNE WILKINS, Ph.D., Assistant Professor of Electrical Engineering IRA LAWSON WILLIAMS, M.S., Reg. Prof. Engr. (Texas), Professor of Agricultural Engineering
billie frances williamson, m.A., Associate Professor of Home Economics Education and Assistant Dean of Home Economics
WELBORN KIEFER WILLINGHAM, Ph.D., Assistant Professor of Education
margaret eileen wilson, Ph.D., Professor and Head of the Department of Health, Physical Education, and Recreation for Women*
JOHN WITTMAN, JR., Ph.D., Associate Professor of Economics
paUl JOSEPH WOODS, Ph.D., Associate Professor of History and Acting Assistant Dean of Arts and Sciences
barbara Jean Zeches, m.S., Assistant Professor of Food and Nutrition
DALE WENDEL ZINN, Ph.D., Professor and Head of the Department of Animal Husbandry
EDWARD WILLIAM ZUKAUCKAS, JR., M.S., Associate Professor of Horticulture WOLODYMYR TARAS ZYLA, M.A., Assistant Professor of Germanic and Slavonic Languages

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## General Information

Texas Technological College, which was founded in 1923 and enrolled its first students in the fall of 1925 , is a state supported coeducational institution comprising the undergraduate schools of Agriculture, Arts and Sciences, Business Administration, Education, Engineering, and Home Economics, the School of Law, the Graduate School, and a number of special departments and divisions.

Lubbock, the seat of Texas Tech, is a city of approximately 160,000 inhabitants. It is situated in the South Plains area of West Texas at an altitude of 3,250 feet. Dry, crisp air and sunny days throughout practically the entire year provide a healthful and invigorating climate. Three airlines, two railways, splendid highways, and a network of bus routes make the city easily accessible from all directions.

The College campus, a contiguous tract of 1,839 acres, lies at the western edge of the business section of the city. College buildings number 177 , of which 100 are considered permanent.

The first president of Texas Technological College was Paul Whitfield Horn (1925-1932). He was followed by Bradford Knapp (19321938), Clifford Bartlett Jones (1938-1944, President Emeritus, 1944- ), William Marvin Whyburn (1944-1948), Dossic Marion Wiggins, (19481952), Edward Newlon Jones (1952-1959), Robert Cabaniss Goodwin (1959-1966), and Grover Elmer Murray (1966- ).

Graduate work has been offered at Texas Tech since 1927. In 1937 the graduate program became a separate unit under its own dean and council. Between 1928, when the first master's degree was awarded, and Aug. 31, 1966, a total of 3,802 masters' degrees had been conferred; and since 1952, when the doctorate was first awarded, 152 degrees have been conferred, of which 78 were Ph.D.'s and 74 were Ed.D.'s.

Professors who have served as graduate dean are William Albert Jackson (1937-1938), Robert Cabaniss Goodwin (1938-1945), William Curry Holden (1945-1950), William Bryan Gates (1950-1963), and Fred Durnford Rigby (1963- ).

## Special Facilities

## Housing Accommodations

Prospective graduate students who are interested in living in a College residence hall should address an inquiry to the Office of Room Reservations.

Information concerning living accommodations off the campus: may be obtained from the Office of the Dean of Men or the Office of the Dean of Women.

## Library

The collections of the College Library are intended to meet the research needs of faculty and students in support of the academic program and are housed in an air-conditioned building completed in 1962. Holdings now total nearly $1,000,000$ items, including books, periodicals, government documents, and other materials. The Library maintains the open-shelf principle so that its holdings may be readily available to students and faculty alike; individual study tables are distributed throughout the stacks. To improve its services the Library maintains readers for microfilm and microprint, provides a rapid copy service, and has individual study rooms for faculty members engaged in research. There is space in the stacks and the reserve and reference rooms for a total of 1009 readers. The Library is designated as one of the two Regional Depositories for U. S. Government Documents in Texas and as a depository of the Atomic Energy Commission. A recent acquisition of merit is the Mr. and Mrs. J. A. Koger History of Science Collection. During the past 15 years a program of intensive acquisition in support of research, as represented by our graduate programs, has been pursued. The benefits of this emphasis can only be appreciated in the Library stacks. The collection will have doubled in seven years, a record of pride and aggressive library support.

The acquisition program has been supplemented by contributions from Friends of the Library. Though the organization is only three years old, it has made possible the purchase of a bookstore stock, has contributed many individual volumes, and in 1967 purchased a sizeable collection in the history of art.

The Library is staffed by 35 professional and 40 clerical librarians who provide service during the following hours: 7:20 A.M. to 12 Midnight, Monday through Friday; 7:20 A.M. to S P.M., Saturday; 2 P.M. to Midnight Sunday. Closed holidays. Summer terms: 7:20 A.M. to 10 P.M. Monday through Friday; 7:20 A.M. to S P.M. Saturday. Closed Sundays and holidays.

## Placement Service

Graduate students are urged to file their complete records (including photographs) with the Placement Service (252 Electrical Engineering Building) even though they may not contemplate immediate use of its facilities. Experience has shown that sooner or later almost every graduate with a master's or doctor's degree feels the need of having his record on file at the Placement Office. Assembling such a record after the student has left the campus is difficult and sometimes impossible.

## Southwest Collection

In its capacity as both the College archives and a major repository for historical manuscripts, the Southwest Collection acquires, preserves, and makes available historical and literary materials of various types pertaining to Texas and Western America. These materials are suitable for use not only
by historians, but also by students of business, economics, literature, agriculture, sociology, and journalism, to name a few.

Quarters in the Social Science Building provide excellent facilities for study and research, as well as necessary space for storage of noncurrent business records, personal papers, maps, microfilms, tape recordings, periodicals, photographs, and newspapers. The manuscript holdings total two million leaves, and information on cataloged collections is published by the Library of Congress in The National Union Catalog of Manuscript Collections.

The Southwest Collection also houses preservation copies of the College's holdings of Texas, Southwestern, and Western books.

All materials are available for research or reference to both students and the general public, but because preservation is inherent in the operation of such a repository, items cannot be removed from the quarters.

The Southwest Collection is open during the following hours: 8 A.M. to 12 Noon and 1 P.M. to S P.M., Monday through Friday; 8 A.M. to 12 Noon Saturday; and, as the need arises, at other hours for research classes and students to utilize Southwest Collection holdings.

## International Center for Arid and Semi-Arid Land Studies (ICASALS)

The International Center for Arid and Semi-Arid Land Studies (ICASALS) was established as an integral part of Texas Technological College in 1966.

The Center has as its goal the development of a world-wide bank of information pertaining to the arid and semi-arid regions which make up more than half of the exposed surface of the earth. The range of subject matter is extremely broad, embracing not only agriculture, science, engineering, and various technologies, but also cultural and artistic topics concerning man's response to his environment.

Although no new courses, curricula, or degree programs have been established to date as a result of the International Center's establishment, it is expected that faculty members and students will take increasing interest in studies related to arid and semi-arid lands. Emphasis will be placed on studies in depth within departments as well as on interdisciplinary studies cutting across various departments and schools.

Current and prospective graduate students are encouraged to confer with the Organizational Director of the International Center for Arid and Semi-Arid Land Studies concerning possible opportunities for fellowships and scholarships.

## Student Health Center

The College Hospital provides limited accommodations for regularly enrolled students who are ill enough to require constant supervision but who do not require surgery or the services of specialists. The College cannot provide students with hospital service elsewhere, and it cannot assume responsibility for the continued medical care of students suffering from chronic diseases.

Additional details about the Student Health Center may be found in the General Catalog of Texas Technological College.

## Fees and Deposits

The following information concerning fees and deposits applies only to semesters of long sessions; the Summer School Catalog carries details about fees required in the summer terms.

Texas Technological College reserves the right to change fees at any time in keeping with acts of the Texas State Legislature or of the Board of Directors of the College.

No student is considered enrolled in the College until final settlement of fees has been made. Checks, money orders, and drafts are accepted subject to final payment.

By an act of the Texas Legislature, students who are not legal residents of Texas are required to pay a higher registration fee than those who are residents of the state. Prospective students should consult the Dean of Admissions about their legal residence. Any student who wrongfully pays the fees charged legal residents of Texas is subject to a penalty.

## REGISTRATION FEE PER SEMESTER FOR RESIDENTS OF TEXAS:

For 12 or more semester hours .................................... \$50
For 11 semester hours ....................................................... $\$ 47$
For 10 semester hours .................................................. \$43
For 9 semester hours .................................................. $\$ 39$
For 8 semester hours .................................................... $\$ 35$
For 7 semester hours ................................................... \$31
For 6 semester hours .................................................... $\$ 27$
For 5 semester hours .................................................... $\$ 23$
For 4 semester hours ................................................... $\$ 19$
For 3 semester hours or less ........................................ \$15
REGISTRATION FEE PER SEMESTER FOR NONRESIDENTS:
For 12 or more semester hours .................................. $\$ 200$
For 11 semester hours ................................................... $\$ 184$
For 10 semester hours ................................................... $\$ 167$
For 9 semester hours ................................................. \$150
For 8 semester hours .................................................... $\$ 134$
For 7 semester hours ........................................................ $\$ 117$
For 6 semester hours ................................................. $\$ 100$
For 5 semester hours ................................................. \$ 84
For 4 semester hours ...................................................... 67
For 3 semester hours or less .................................... \$ 50
STUDENT SERVICES FEE: $\$ 21$ per semester; required of all students enrolling for 6 or more semester hours.

GENERAL PROPERTY DEPOSIT: \$7, which must be maintained at all times by replacement of charges against it. The unused portion is returnable if a request is made not later than four years after the student's last attendance.

STUDENT UNION FEE: $\$ 5$ per semester; required of all students enrolling for 3 or more semester hours.

LABORATORY FEES: $\$ 2$ per semester for each course carrying 3 semester hours' credit or less; $\$ 4$ per semester for each course carrying 4 or more semester hours' credit.

CHANGE-OF-SCHEDULE FEE: $\$ 3$ for each change atter registration has been completed unless the change is made for the convenience of the College.

VISITOR'S FEE: $\$ 10$ for each course. Applicable only to persons not enrolling in the College.

FEE FOR REPLACING LOST I-D ACTIVITY CARD:

## Fall

After Oct. 15
After Nov. 15
After Dec 15 - $\$ 10$
\$ 5

Spring
After March 1 ................. \$15
After April 1 ....................... $\$ 10$
After May 1 ....................... $\$$ s
FEE FOR A DUPLICATE RECEIPT: $\$ .50$.
LOCKER OR GYMNASIUM FEE: Students who are not enrolled in a class in physical education but who wish to use the gymnasium will be required to pay a fee of $\$ 1$ for a locker. Towel service is available for a fee of $\$ 2, \$ 1$ of which represents a deposit. This deposit is refundable at the end of the semester.

FACULTY FEE FOR GYMNASIUM-NATATORIUM FACILITIES: $\$ 2$ for each fiscal year or portion thereof.

## FEES FOR SPECIAL COURSES AND FACILITIES: APPLIED MUSIC

The college registration fee does not ccver the following costs for individual instruction offered by the Departi ment of Music in voice and in wind and string instruments. When instruction is given in one of the following courses in applied music, the charges listed are made for each course, payable in full at the time of registration:

Applied Musie 115, 116, 215, 216, 315 , 316 $\$ 15.00$
Applied Music $125,126,145,146,225$; $226,235,236,245,246,325,326,345$, $346,425,426,435,436,445,446,535$, 545
$\$ 30.00$
The following charges are made for practice room use and piano rentals; they are payable at the College Business Office:

One hour per day per semester :...................... $\$ 5.00$
Each additional hour per day per semester $\$ 2.50$
Musical instrument rental for class strings, woodwinds, brasses (each class)

- HEALTH, PHYSICAL EDUCATION, AND RECREATION FOR MEN P.E. 4321 $\$ 12.50$
HEALTH, PHYSICAL EDUCATION, AND RECREATION FOR WOMEN' P.E. 4321 \$12.50
GRADUATION FEE: $\$ 5$. Once a diploma has been ordered for a student, there can be no refund of this. fee' even if he does not graduate as
expected. For a subsequent graduation, a supplementary fee of $\$ 2$ is required.

FEE FOR GRADUATING IN ABSENTIA: $\$ 1.50$.
Fee FOR BINDING REPORTS, THESES, AND DISSERTATIONS: Usually $\$ 3$ per copy, but the fee is subject to change without notice. The fee for the microfilming of a doctoral dissertation is $\$ 25$. Details are given in the section on Dissertation Fees.

EXEMPTION FROM FEES BECAUSE OF HONORABLE DISCHARGE FROM THE ARMED FORCES: Information may be obtained from the Coordinator of Veterans' Affairs in the Office of the Registrar.

REFUND OF FEES: Refunds are not made on courses of less than six weeks' duration. A student who is suspended from the College is not entitled to a refund of fees. With these exceptions, a student who officially withdraws during either semester will receive a refund of registration and activity fees according to the following schedule:
1st class day through the 14 th class day $\quad . . .80$ per cent
15 th through the 20 th class day
21 st through the 25 th class day
26 th through the 30 th class day
After the 30 th class day

## Fellowships, Traineeships, and Assistantships

All inquiries : concerning fellowships, traineeships; and assistantships should be addressed to the head of the department concerned. The following three year graduate fellowships and traineeships for doctoral study have been awarded to the College for allocation in specified areas for 1967-1968.

## Fellowships

Fellowships in the liberal arts and sciences, business, and engineering are available under Title IV of the National Defense Education Act. Preference is given to candidates who plan to prepare for college and university teaching.

## Traineeships

Graduate Traineeships are available from the National Science Foundation. These traineeships are available in the sciences, the social sciences, and technology.

Under a grant from the National Aeronautics and Space Administration, traineeships are awarded in space-related sciences and technology.

## Assistantships

Most of the departments which participate in the graduate program have Graduate Teaching Assistantships for properly qualified students. The duries and stipends vary in relation to the qualifications of the recipient and the amount of service he renders.

## Policies and Regulations

Graduate study is much more than a continuation of undergraduate work. Its true spirit is one of inquiry and the desire to add something to human knowledge. Graduate study should therefore be contemplated only by students who have already demonstrated in their undergraduate programs unusual intellectual attainments and the power of independent thought and investigation.

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

The Graduate School of Texas Technological College recognizes its obligation both to the standards mentioned above and to the citizens of Texas by a twofold classification of graduate students. In connection with the first obligation, the Graduate School requires evidence of an applicant's special ability for admission to its degree programs and reserves the right to decline to accept any applicant whose admission would not be to his best interest or that of the College. On the other hand, to fulfill its obligation to the citizens of Texas, the Graduate School makes its facilities available to a wide variety of students, who are not eligible or do not wish to become applicants for degrees.

## General

The Graduate School, like other schools of Texas Technological College, reserves the right to institute, after due notice and during the course of a student's work toward a degree, any new ruling which may be necessary for the good of the College and therefore, ultimately, of recipients of its degrees. Normally a student may graduate under the provisions of the Catalog in effect at the time he enrolls in the Graduate School.

## Responsibility of Students

Graduate students are expected to make themselves thoroughly $\mathrm{f}_{2}$ miliar with the regulations of the Graduate School and the requirements for degrees. Failure to follow the regulations and requirements almost inevitably results in complications for which the Graduate School cannot assume responsibility.

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

## Graduate Advisers

The Dean of the Graduate School is the general adviser for all graduate students, but, so far as particular courses are concerned, a student is counseled by the head of his major and minor departments or by other professors designated for such counseling. Advisement in matters pertaining to teachers' certificates is the responsibility of the Director of Teacher Certification.

## Enrollment by Faculty and Staff

Full-time members of the faculty and staff of Texas Technological College may enroll for courses by permission of the department heads concerned. In registering for graduate work, they become subject to the usual regulations of the Graduate School. However, no member of the faculty with a rank above instructor is eligible to receive a graduate degree from Texas Technological College.

## Enrollment by Undergraduates

An undergraduate student who is within 12 hours of graduation and who has at least a B average in his major subject may enroll for courses carrying graduate credit, subject to the approval and certification of an acceptable grade-point average by the dean of his undergraduate school and the approval of the Dean of the Graduate School. This approval must be obtained on special forms at the time of registration. No course taken without this approval may be counted for graduate credit.

An undergraduate who is permitted to enroll for graduate work as indicated above is required to take the Aptitude Test of the Graduate Record Examinations at the first administration of it after his enrollment for graduate work-if he has not taken it before.

The maximum amount of work that may be scheduled by an undergraduate taking courses for graduate credit is 16 hours in a semester or 6 hours in a summer term, including graduate and undergraduate work. Undergraduates permitted to enroll for graduate work are expected to complete all of their undergraduate requirements within the academic year in which they first enroll for graduate credit.

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

## Extracurricular Activities

Graduate students are not eligible to hold office in an organization which is primarily for undergraduates or to participate in college-sponsored extracurricular activities. They are encouraged, however, to participate in honor societies for which they may be qualified. Graduate students who are satisfactorily pursuing full-time programs of graduate work are eligible to serve as officers in organizations of this type.

## Work Load

A full graduate schedule is 12 hours in a semester or 6 hours in a summer term. The maximum enrollment in the Graduate School is 16 hours in a semester or 6 hours in a summer term.

For teaching assistants or others employed in part-time positions on the campus;' the pernissible load will be determined by the Dean and the head of the student's major department.

Full-time employees of the College are limited to 3 hours of graduate work in any term or semester.

Included in a graduate student's total load are extension courses añd correspondence courses which he may be taking and courses which he may be auditing.

## Prerequisites for a Graduate Major

For a graduate major, an applicant must have completed, or must take as undergraduate leveling work, a minimum of 18 semester hours (including at least 12 hours on the junior or senior level) in his proposed major subject and he must be accepted by the department concerned. Any department may specify additional prerequisites if they are considered necessary and may require an applicant to pass an examination before his acceptance:

## Residence

Study leading to a graduate degree involves sustained residence is well as the completion of courses. Residence, which is expressed in terms of weeks, months, or years, is credited for work done on the campus of Texas Technological College and for certain types of courses (theses, field courses, practicums, internships, individual study, or any other such course) when offered at a place and under circumstances specifically established by the department concerned and approved by the Graduate Council in advance of the offering of the course

Residence is not credited for work completed in the Division of Extens sion. Courses transferred from another graduate school will not redụce the minimum residence for the master's degree by more than six weeks.

The minimum residence for the master's degree and the doctor's degree will be found in the appropriate sections of this Catalog.

## Grades

The grades used in the Graduate School are the same as those used in undergraduate work ( $A, B, C, D$, and $F$ ), but graduate credit is allowed only for courses completed with grades of $A, B$, and $C$.

For graduate credit, no assigned grade may be raised unless an:ertor has been made. Every final grade of $A, B, C, D$, or F received by a student in courses taken for graduate credit in the major and minor subjects will be counted in the calculation of grade point averages. The substitution of another course for one completed with a low grade is not permitted.

Work completed at another graduate school with a grade less than B will not be accepted, but grades on transferred work will not raise the grade average on courses completed in this Graduate School.

## Symbols P and I

The symbol $\mathbf{P}$ (in progress) is assigned for every enrollment for a master's report (Course No. 630), master's thesis. (Course No. 631), or doctor's dissertation (Course No. 831) until the completed document has been approved by the student's adviser or committee and accepted by the Dean of the Graduate School. At that time the professor in charge will file change-of-grade cards replacing the symbol $P$ with letter grades.

P may be given by a professor when a student's work in a research course is not quite finished but is satisfactorily in progress at the end of a semester. This symbol must be replaced by a standard letter grade before credit can be granted for the work.

The symbol I (incomplete) may be given by a professor when a student's work in a regularly organized class has not been completed at the end of a semester and when the failure to complete the work has been solely due to causes beyond the student's control. It is not used as a substitute for $F$. When I stands for a year without action on the part of the student, it may become $F$.

## Proficiency in English

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

## Statement of Intention to Graduate

A student planning to graduate on a particular date must advise the Graduate Office of his desire at least 12 weeks before that date. He must also file the "Statement of Intention to Graduate" not later than nine weeks prior to his proposed date of graduation. No candidate's name will be placed on the "Tentative List of Graduates" for any commencement unless this statement has been received at the Graduate Office by the specified deadline.

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

## Teacher Certification

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

## Admission to the Graduate School

Two types of admission are granted: (1) GENERAL ADMISSION TO THE GRADUATE SCHOOL (that is, admission as an "Unclassified Graduate Student') and (2) ADMISSION TO A GRADUATE DEGREE PROGRAM. The requirements are explained in the following paragraphs.

GENERAL ADMISSION TO THE GRADUATE SCHOOL is granted through the Office of the Dean of Admissions. The basic prerequisite for admission to the Graduate School, regardless of the type of admission sought, is the possession of an acceptable bachelor's degree from a recognized college or university. In addition, any student transferring from another school must be a student in good standing at the time that he applies for admission to this Graduate School. General admission is granted on the basis of a formal application and satisfactory transcripts of the applicant's previous academic work. These documents should be submitted at least 30 days prior to the proposed enrollment- 60 days by applicants outside the United States. Credentials accepted for admission become the property of the College.

ADMISSION TO A GRADUATE DEGREE PROGRAM is granted through the Office of the Dean of the Graduate School and is restricted to applicants whose undergraduate records and scores on the Aptitude Test of the Graduate Record Examinations indicate probable success in such work. Admission to any particular graduate degree program is also contingent upon acceptance by the department or other institutional division concerned, and it is essential that the student communicate with an appropriate representative thereof.

## Procedure for Admission to a Graduate Degree Program

All applicants must obtain general admission to the Graduate School before they can be considered for admission to a master's or doctor's degree program. If possible, applicants should take the Aptitude Test of the Graduate Record Examinations early enough to have their test scores sent to the Dean of the Graduate School prior to their enrollment.

An applicant who has been granted general admission to the Graduate School but has not taken the Aptitude Test of the Graduate Record Examinations will be permitted to enroll in the Graduate School with the understanding that he will take the Aptitude Test at the first administration of it after his initial enrollment. This policy applies to any enrollment, whether graduate credit is involved or not, and is basically for the protection of the student. It is much to a student's advantage to ascertain as soon as possible whether he has satisfied the requirements for admission to a degree program. Unnecessary postponement of the Aptitude Test may result in a denial of degree credit for work already completed and may jeopardize an applicant's chances of admission to a degree program.

An applicant who has been granted general admission to the Graduate School and who has already taken the Aptitude Test of the Graduate Record Examinations should ask the Educational Testing Service to send his test scores to the Dean of the Graduate School.

As soon as the Graduate Office receives the test scores of an applicant who has been granted general admission, the Dean of the Graduate School
will evaluate the record, confer with the head of the student's proposed major department, and inform the applicant whether or not he has been accepted in a degree program. Students should understand, however, that the Educational Testing Service usually requires about a month to process test papers and distribute reports, and that the Dean and department head need some time in which to complete their evaluation of an applicant's record.

Applicants for admission to graduate degree programs must be accepted by their proposed major departments as well as by the Dean of the Graduate School. Such acceptance is merely provisional, however, and does not constitute admission to candidacy for a degree.

If a student who has been accepted by one department wishes to transfer to another, he is required to present at the Graduate Office a written statement from his present major department certifying that the transfer is authorized.

## Admission to a Second Graduate Degree Program

Permission to work toward a second graduate degree of the same level as the first is granted only in exceptional circumstances, and the applicant is subject to all requirements as a new student. No courses used for the first degree will be credited toward a second degree of the same level.

## Procedure for Nondegree Enrollment

Students who wish to enroll for courses for some nondegree purpose are required merely to secure general admission to the Graduate School.

Such students may later gain admission to a master's or doctor's degree program by petitioning the Dean of the Graduate School and by satisfying the customary requirements for admission to degree work. In general, however, degree credit cannot be expected for any courses completed prior to the student's official admission to a graduate degree program.

## The Aptitude Test of the Graduate Record Examinations

The Aptitude Test is an objective type examination requiring approximately three hours and yielding two scores-Verbal Factor (vocabulary and reading comprehension) and Quantitative Factor (logical and mathematical reasoning).

All of the Graduate Record Examinations, of which the Aptitude Test is merely one, are prepared and scored by the Educational Testing Service, 20 Nassau Street, Princeton, New Jersey. (It has no connection with Princeton University.) A western office is maintained at 4640 Hollywood Boulevard, Los Angeles 27, California. Applicants from Texas should direct their correspondence to the Princeton office.

The Graduate Record Examinations are administered in at least one center (usually several centers) in each of the 50 states and the District of Columbia, and in many foreign countries. In some of these centers, the tests are administered only once or twice a year; in many others, they are given at least four times a year, usually in January, April, July, and November.

Application blanks and details about the Aptitude Test and examination dates may be obtained from the Counseling Center of Texas Technologi-
cal College (which administers the tests in Lubbock), from similar agencies in other colleges and universities, or from the Educational Testing Service.

Each applicant is individually responsible for making arrangements to take the Aptitude Test and for having his scores sent to the Dean of the Graduate School, Texas Technological College, Lubbock, Texas 79409.

The completed application form and the examination fee (currently \$7) must reach the proper office of the Educational Testing Service approximately a month in advance of the test date. Upon receipt of the application and the fee, the Educational Testing Service will mail the applicant a ticket of admission to the examination, specifying the room and the hour at which it will be held.

Applicants should note that at Texas Technological College, the Graduate Record Examinations are administered by the Counseling Center, not by the Graduate School.

## Continuation in the Graduate School

Every student enrolled in the Graduate School, whether he is working toward a degree or not; is required to be diligent in his studies and to cooperate fully with the policies of the institution. The Graduate School reserves the right to place on probation or to drop from its rolls any graduate student who does not maintain a satisfactory academic standing of who fails to conform to the regulations of the College or to the conventions of good citizenship.

## Registration

Students who have been granted either type of admission to the Graduate School are expected to register in the Graduate School whether they contemplate degree work or not.

The details of registration are under the jurisdiction of the Registrat, who furnishes to each enrollee complete instructions for all steps in the procedure. Students should follow carefully those instructions and the additional ones listed below.

## Departmental Approval of Courses

The student should have his complete schedule of courses made out by an official representative of his major department and then have each individual course approved by a representative of the department offering it. It is the student's responsibility to see that the class tickets which are issued him correspond exactly to the courses listed on his schedule card.

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

## Registration in Session of Graduation

Students who began graduate study here after Sept. 1, 1963, are subject to the following regulation, which is designed to facilitate communication and to systematize the supervision of reports, theses, and dissertations:

Every candidate for a graduate degree must be registered in the Graduate School in the long session or the summer session in which his degre
is conferred. For graduation in a long session (that is, at the spring com-mencement-May or June), a student who completes all of his requirements in the fall semester is not required to register in the succeeding spring semester; for graduation in a summer session (that is, at the August commencement), a student who completes all of his requirements in the first summer term is not required to register in the second term. Failure to graduate at, the expected time necessitates additional registrations as may be necessary.

## Registration for Thesis Courses

Registration for a master's report (Course No. 630) is required at least once; for a master's thesis (Course No. 631), at least twice; and for a doctor's dissertation (Course No. 831), at least four times. Concurrent multiple registration for these courses is permissible.

At the discretion of the department concerned, a student who is not regularly enrolled in the Graduate School may be required to register for the appropriate thesis course in any term or semester in which he expects to receive assistance from his thesis adviser or committee.

Enrollment for thesis courses is permitted only during a regular registration period. Students away from the campus may, however, register for a thesis course by mail, provided they make arrangements with the Registrar at least 30 days prior to the beginning of a registration period.

## Changes in Schedule and Withdrawal

A graduate student who wishes to drop a course or to withdraw from the Graduate School is required to make his request at the Graduate Office. A student who quits a course without official withdrawal will receive $F$ in that course.

After a schedule has been approved and the fees have been paid, each drop will be subject to a charge of $\$ 3$ unless it is made for the convenience of a department or the College.

## Degree Programs

## The Master's Degree

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

## Prerequisites

Admission to a master's degree program is dependent upon the applicant's undergraduate record, his scores on the Aptitude Test of the Graduate Record Examinations, and the recommendation of his proposed major department.

A substantial body of undergraduate work in the major subject and considerable breadth of background are essential for graduate study. Therefore, students whose undergraduate programs are seriously deficient in breadth or depth may be required to complete additional preparatory work without degree credit.

## Degrees Offered

In the "Program for the Master's Degree" and on the title-approval page of a report or thesis, the exact and official designation of the degree must be used:

Master of Arts<br>Master of Business Administration<br>Master of Education<br>Master of Music<br>Master of Music Education<br>Master of Science<br>Master of Science in Accounting**<br>Master of Science in Agricultural Engineering*<br>Master of Science in Chemical Engincering<br>Master of Science in Civil Engineering<br>Master of Science in Electrical Enginecring<br>Master of Science in Home Economics<br>Master of Science in Industrial Engineering<br>Master of Science in Mechanical Enginecring

[^5]
## Major Subject

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

## Minor

All programs for a master's degree normally embody a minor representing approximately one-fifth to one-fourth of the total program. However, departments offering masters' programs may permit students to take all of their work for the degree within the department. The minor may be completed in a single department or in several departments, but the courses comprising the minor are subject to the following limitations: (a) they must carry graduate credit; (b) they must be acceptable to the student's major department; and (c) each course (except the specially designed ones numbered 5335 ) must be approved by the department offering it. This approval is indicated in the degree plan by the signature of the department head (or graduate adviser) concerned. Its purpose is to make sure that a student does not enroll for a course for which he is not prepared.

## Basic Plans for the Master's Degree

Students should understand that the basic plans outlined below represent simply the minimum requirements of the Graduate School. All departments have the prerogative of increasing the quantitative requirements for any or all of their majors. In general, curricula involving any type of certificate (such as those for teachers, administrators, and counselors) and those exceptional programs requiring neither thesis nor report will enrubody considerably more than the 30 -hour minimum set by the Graduate School. The option between a report and a thesis is also a departmental prerogative although the preference of the student will naturally be considered.

The two plans are as follows:
PLAN 1: Required: A minimum of 24 semester hours of graduate course work, exclusive of credit for the master's thesis.

PLAN 2: Required: A minimum of 27 semester hours of graduate course work, exclusive of credit for the master's report.

Students beginning master's degree work in Education on or after June 1, 1966, may follow the 36 hour non-thesis plan, at the option of their adviser.

## Form for the Master's Degree Program

Early in his first semester of graduate study, everyone contemplating master's degree work is required to submit to the Dean of the Graduate School a "Program for the Master's Degree" as prepared by an official representative of the proposed major department and of other departments
as indicated under "Minor" in the preceding section. Delay in submission of a degree program may result in postponement of admission to candidacy and graduation.

The forms for the "Program" are available at the Graduate Office.
When the student receives his approved copy of his "Program" from the Graduate Office, he is expected to keep it and use it as the basis of all subsequent enrollments. Substitutions of courses (except the special group numbered 5335) can be made only on the written recommendation of the department or departments concerned and the approval of the Graduate Dean.

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

## Minimum Residence

The minimum residence for any master's degree is a full academic year (nine months) of graduate work or its approximate equivalent in five 6 -week summer terms. Part-time enrollment is evaluated on a fractional basis.

## Transferred and Extension Work

There is no automatic transfer of credit toward a master's degree, but, in general, work completed in residence at another accredited graduate school may, on the recommendation of the departments concerned, be accepted for as much as 6 semester hours toward a master's degree. Credit accepted from another graduate school will in no instance reduce the minimum residence by more than six weeks.

A maximum of 6 semester hours of extension work completed through the Division of Extension of Texas Technological College may be credited on the course work for a master's degree if the student had been officially admitted to the Graduate School (at least as an "Unclassified Student") prior to his enrollment for the extension work. Residence is not credited for extension work.

Not more than 9 semester hours of any combination of extension courses and courses completed elsewhere can be credited toward a master's degree.

GRADUATE CREDIT IS NEVER GRANTED FOR COURSES TAKEN BY CORRESPONDENCE.

## Language Requirement

For the Master of Arts and the Master of Science in mathematics and the pure sciences, a knowledge of a foreign language is required. This requirement may be applied to other degrees at the discretion of the department concerned. A student whose major is one foreign language is required to have a reading knowledge of another language. The essential purpose is to
assure that the student gains access to scholarly literature of his field in more than one language. A foreign student may use his native language (if it is not English) to meet this requirement if this essential purpose is served thereby and his major department approves.

To qualify for Admission to Candidacy for these masters' degrees, applicants are required to show proficiency in a foreign language acceptable to the major department and the Dean of the Graduate School. There are two basic plans. Departments have the option of following one or both plans.

PLAN I: Students may fulfill the reading knowledge requirement by taking for undergraduate credit, and successfully passing the 231, 232 (or 233,234 ) sequence in the required language. A grade of B or higher is required in the second course of the sequence taken, and cannot be more than seven years old when a student is admitted to candidacy.

PLAN II: The second plan for fulfilling the reading requirement is by examination. Under this plan the student takes an examination approved by the major department, the Graduate Dean, and the departments in foreign languages. Arrangements for taking these examinations in French, German, and Russian can be made at the Counseling Center which administers the tests for the Educational Testing Service. The examination in Spanish is also administered by the Counseling Center. The examinations are given three or four times each year; the student should consult with the Counseling Center for specific dates. The Departments of Classical and Romance Languages and Germanic and Slavonic Languages will continue to administer the examinations in any acceptable foreign languages other than those listed above.

## Grade Requirement for Graduation

For the master's degree in a program requiring a report or thesis, the minimum requirement for graduation is an average of B in the major subject and an overall average of $\mathbf{B}$ on all courses comprising the official program for the degree. At its discretion, any department may require a B average of students who take a minor in the department.

In the calculation of grade averages for graduation or any other purpose, grades on thesis courses are counted only to the extent of the minimum registration requirements; that is, once ( 3 sem. hours) for a master's report and twice ( 6 sem. hours) for a master's thesis.

## Admission to Candidacy

Every applicant for a master's degree is required to make formal "Application for Admission to Candidacy for the Master's Degree" as soon as he has completed 9 to 12 semester hours of the work listed in his "Program for the Master's Degree." This application is submitted to the Dean of the Graduate School on a form obtainable at the Graduate Office.

THE MINIMUM INTERVAL BETWEEN SUBMISSION OF THE APPLICATION FOR ADMISSION TO CANDIDACY AND GRADUATION IS FOUR MONTHS. Admission to candidacy will be granted at such time as all of the following requirements have been met:
(1) Official admission to master's degree work has been received.
(2) At least 9 semester hours of the graduate work required for the master's degree have been completed.
(3) All required leveling work has been completed.
(4) An average grade of $B$ or higher has been maintained in
(a) all completed graduate work, exclusive of thesis, required for the master's degree,
(b) all work taken for graduate credit in the major and minor subjects.
(s) Proficiency in English has been acceptably demonstrated-certified by the department in approving the "Application for Admission to Candidacy."
(6) Proficiency in a foreign language required for the particular degree has been acceptably demonstrated.
(7) The general field of the report or thesis has been stated and approved.
(8) Work to date is acceptable to the departments concerned, as attested by their approval of the "Application for Admission to Candidacy."
(9) The entire program conforms with the general requirements of the Graduate School and with the requirements of the particular degree.

## Report and Thesis

The master's report and the master's thesis are alike in that each is expected (1) to represent independent work by the student, conducted under the supervision of a director, and (2) to be written clearly and concisely in good English, or whatever language may be approved as in the case of a student with a major in Spanish or French.

The thesis usually involves research, an activity which naturally varies considerably from discipline to discipline. The report may or may not be based on research; it normally represents some type of investigation, criticism, or problem solving.

Administratively, the report and the thesis are treated alike. That is, each requires the approval of its director or committce and acceptance by the Dean of the Graduate School.

Available at the Texas Tech College Bookstore is a pamphlet entitled Instructions for Preparing and Submitting Reports, Theses, and Dissertations. All manuscripts must conform to the published policies.

## Time Limit

All work credited toward a master's degree must be completed within six years. Students whose graduate study here is interrupted by involuntary military service will be granted an extension of time for the period of their military duty, not exceeding five years.

## Final Examination

Within the term or semester in which he plans to graduate, at a time specified by his major department, every candidate for a master's degree is required to undergo a final comprehensive examination in his major field.

The final examination is normally given once each long session and once each summer. It is the student's responsibility to confer with the chairman of his advisory committee or the head of his major department about the time and place of the examination. No reminders will be provided by the departments or the Graduate School.

A student who fails the final examination may repeat it once, but not until after an interval of four months or more.

At the discretion of the department concerned, a student who passes the examination, but does not graduate within 12 months may be required to repeat the examination.

## The Doctor's Degree

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

## Admission to Doctoral Study

Admission to doctoral study is restricted to applicants whose backgrounds show definite promise of success on this the highest level of academic endeavor. The formal requirements for admission to the doctoral program are a distinguished record in previous work (undergraduate and graduate) and a high score on the Aptitude Test of the Graduate Record Examinations. Each doctoral department has additional requirements which applicants must satisfy for admission. It is essential that the student communicate with departmental advisers on this matter.

## Degrees Offered

Major work leading to the Doctor of Philosophy Degree is offered in the departments of Biology, Chemistry, Chemical Engineering, Civil Engineering, Electrical Engineering, English, Geosciences, Government, History, Industrial Engineering, Mathematics, Mechanical Engineering, Physics, and Psychology. The Doctor of Philosophy Degree is also offered in engineering on an interdisciplinary basis. The Doctor of Education Degree is offered with a major in Education. A program leading to the degree of Doctor of Business Administration is planned for initiation in the fall of 1967.

## Years of Study

A minimum of three years of graduate study beyond the bachelor's degree is required for the doctorate. Work completed for the master's degree is considered one of these years if it forms part of a logical sequence in the entire program.

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

Doctoral study cannot be calculated solely in terms of credit hours, but the program for the doctorate normally requires the completion of

60 to 80 or more semester hours of work beyond the bachelor's degree, exclusive of credit for the dissertation. It is expected that all of the work beyond the master's degree will be in courses open only to graduate students.

## Major and Minor

An applicant for the doctorate will devote most of his time to his major subject, but his program must include a minor of at least 18 se mester hours beyond the bachelor's degree in a field other than the major.

In exceptional circumstances and with special approval, programs at variance with this description may be acceptable. Such a program must be clearly specified and approved by the major department and the Dean of the Graduate School.

In addition to any work completed elsewhere in a minor subject, at least 6 semester hours must be completed here in that subject if it is to be considered an official minor.

An applicant for the Ed.D. Degree not having a departmental minor may take as part of his work outside of education those courses which are numbered 5335 but which are not restricted to students in elementary education.

## Residence Requirement

Regardless of the amount of graduate work he may have completed elsewhere, every applicant for the Ed.D. or the Ph.D. Degree is required to complete in residence in this Graduate School at least one year of graduate study beyond the master's degree or beyond the equivalent of this degree if he proceeds to doctoral work without taking a master's degree.

This residence may be accomplished in minimum length of time only by the completion of a full schedule of graduate work in each of the two consecutive semesters of a long session. (A full schedule is normally from 12 to 15 semester hours.) A student who holds a teaching or research assistantship or other part-time job closely related to his work toward the doctorate may satisfy the residence requirement at less than full but more than half schedule over a longer continuous period of time, but only if his plan to do so is approved by the Dean of the Graduate School. No part of this requirement can be satisfied by any type of off-campus enrollment.

## Preliminary Examination

As early in his doctoral study as possible, the applicant will undergo a preliminary examination (oral or written or both), administered by the major and minor departments. This examination will serve as the basis of further counseling of the applicant. The major department will file at the Graduate Office a report on this examination and will include a statement concerning the applicant's proficiency in English composition as determined by the major department on the basis of suitable tests.

## Languages and Statistics

As indicated in the preceding section, every applicant for the doctorate is required to demonstrate, early in his program, an adequate command of English composition.

In order to qualify for Admission to Candidacy, applicants for the Ph.D. Degree are required to demonstrate proficiency in a foreign language or languages acceptable to the major and minor departments and the Dean of the Graduate School. The basic requirement is a reading knowledge of two foreign languages. Two departures from this pattern are permissable at the option of the major department: they are (a) higher proficiency in a single language and (b) substitution of some other "tool" subject for one language. To exercise the latter option, a department must recommend, for approval by the Dean of the Graduate School, both the subject concerned and the means by which satisfactory proficiency is to be demonstrated.

There are two alternative procedures for establishing foreign language competence: (1) students may fulfill the reading knowledge requirement by taking for undergraduate credit and successfully passing the 231, 232 (or 233, 234) sequence in two languages (those seeking to present a high level of competency in a single language will complete the 331, 332 sequence) and a grade of B or higher is required in the second course of the sequence taken and cannot be more than seven years old when a student is approved for doctoral work; (2) the second method of fulfilling the language proficiency requirement is by examination. The student will take an examination approved by the major department, the Graduate Dean, and the departments in foreign languages. Under this plan the student may demonstrate higher proficiency by surpassing an examination threshold score which is higher than that required for basic reading knowledge. Arrangements for taking these examinations in French, German, and Russian can be made at the Counseling Center which administers the tests for the Educational Testing Service. The examination in Spanish is also administered by the Counseling Center. The examinations are given three or four times each year; consult with the Counseling Center for specific dates.

The Departments of Classical and Romance Languages and Germanic and Slavonic Languages will continue to administer the examinations in any acceptable foreign languages other than those listed above.

Departments may require a specialized examination in their particular disciplines in addition to one of the basic plans. These examinations may be administered and interpreted within the department requiring them; or at the request of the department involved, they may be administered by the departments in foreign languages.

In order to qualify for Admission to Candidacy, applicants for the Ed.D. Degree are required to show competency in educational evaluation and educational statistics and also a foreign language if their research requires such competency. The examination in educational statistics is administered by a committee representing the School of Education.

## Grade Requirement

For the doctor's degree, the minimum requirement for graduation is an average of B in the major and the minor treated separately. For this calculation, all courses taken for graduate credit outside the major are considered to comprise the doctoral minor.

In the calculation of grade averages for graduation or any other purpose, grades on dissertation courses are counted only to the extent of the minimum registration requirements.

## Advisory Committee

As soon as an applicant has passed the preliminary examination administered by his major and minor departments, an advisory committee will be appointed by the Dean on the recommendation of the departments concerned. This committee will hold meetings as often as necessary with the applicant and will direct his work at all stages. From time to time, the chairman of the committee will file written reports with the Dean and the heads of the departments concerned, indicating the applicant's progres.

## Qualifying Examination

The Qualifying Examination for Admission to Candidacy for the doctor's degree is one of the major features of the doctoral program. An applicant is eligible to attempt this examination only after he has satisfied the following requirements: (1) he must have been officially admitted to the doctoral program; (2) he must have passed the preliminary examination and have been provisionally accepted by his major and minor departments; and (3) he must have completed most of the course work prescribed by his committee.

The Qualifying Examination is prepared and administered by the candidate's advisory committee and any other professors the committee or the Dean may consider necessary. The major portion of the examination is an essay-type test, of at least six hours' duration. It usually includes also an oral examination under the supervision of the committee and any other professors that may be invited to participate.

## Procedure When the Examination Is Satisfactory

If the Qualifying Examination is considered satisfactory and the requirements in languages (including English) and/or statistics have been met, the chairman of the advisory committee will send to the Dean, for consideration by the Graduate Council, a formal written recommendation that the applicant be admitted to candidacy for the doctor's degree.

## Procedure When the Examination Is Not Satisfactory

If the Qualifying Examination is not satisfactory, the chairman of the advisory committee will so notify the Dean, in writing. An applicant who does not pass the Qualifying Examination may be permitted to repeat it once, after a lapse of at least a semester or 15 weeks.

## Admission to Candidacy

Authority for admitting an applicant to candidacy for a doctor's degree is vested in the Graduate Council. Upon receipt of a recommendation from the advisory committee, the Dean will submit it to the Graduate Council for action. The Council may approve the committee's recommendation, or it may, after consultation with the committee, suggest additional requirements which the applicant must satisfy.

By written communication, the Dean will transmit the results of the Council's action to the applicant, to the chairman of his advisory committee, and to the heads of the departments concerned.

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

## Dissertation

A dissertation is required of every candidate for the doctorate.
The subject of the dissertation must be approved by the advisory committee and the Dean at least four months before the candidate's proposed date of graduation.

The dissertation must demonstrate a mastery of the techniques of research, a thorough understanding of the subject matter and its background, and a high degree of skill in organizing and presenting the material. The disertation should embody a significant re-evaluation of existing knowledge or some contribution to learning. The work on the dissertation is constantly under the supervision of the advisory committee and any other professors the committee or the Dean may consider necessary.

Available at the Texas Tech College Bookstore is a pamphlet entitled Instructions for Preparing and Submitting Reports, Theses, and Dissertations. All manuscripts must conform to the published policies.

Three typewritten copies of the dissertation are required by the College. They must be accompanied by two copies of an abstract, not more than 600 words in length.

## Dissertation Fees

When a doctoral dissertation and its abstract have been approved by a student's advisory committee and accepted by the Dean of the Graduate School, the candidate will pay the College Cashier a "Microfilming and Shipping Charge" of $\$ 25$ for the microfilming of the complete dissertation by University Microfilms, Inc., of Ann Arbor, Michigan, and the publication of the abstract in Dissertation Abstracts. Other services rendered by University Microfilms, Inc., are explained in the local pamphlet of instructions.

In addition to the fee indicated above, the doctoral candidate will pay to the Texas Tech Press the fee for the binding of the three official typewritten copies of the dissertation. In 1967 this fee is $\$ 3$ per copy (plus $2 \%$ state sales tax), but like other fees, it is subject to change without notice as circumstances may require. If he wishes to do so, the student may have additional copies of his dissertation bound at the prevailing rate.

## Time Limit

All work for the doctorate must be completed within four years after the applicant has been admitted to candidacy.

## Intervals Between Examinations

At least three months must intervene between the preliminary examination and the qualifying examination and at least four months between the latter and the final examination.

## Final Examination

A final oral examination, usually over the general field of the dissertation, is required of every candidate for the doctorate. It may be scheduled ${ }^{\text {at }}$ any suitable time after the dissertation (not necessarily the final version)
has been approved by the advisory committee. The examination is conducted by the advisory committee under the supervision of the Dean or a professor designated to act in his place. Professors other than members of the student's committee may participate in the examination, but they have no vote in determining the outcome. At the conclusion of the examination, the chairman of the advisory committee will send a written notice to the Graduate Office, giving the result of the examination.

## Instructional Departments and Courses

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

## Indication of Credit

The number of semester hours' credit for each course is shown immediately following its title, usually in this form: (3:2:3). The first digit in parentheses indicates the number of semester hours' credit which the course carries; the second, the number of lecture hours per week; and the third, the number of laboratory hours per week. If the third digit is zero, the course requires no laboratory work. A single number in parentheses indicates the credit in semester hours.

## Prerequisites for Courses

Certain general prerequisites apply to all courses listed in this Catalog. For example, senior standing is the normal prerequisite for enrollment in a 400 course which carries graduate credit, and graduate standing is a prerequisite for enrollment in any course numbered 500 and above.

Enrollment in any course must be approved by the department offering it.

## Rank of Courses

Courses numbered in the 500 series and above are for graduate students. Many of the courses numbered in the 400 series may be taken for graduate credit. In such courses, a graduate student may, at the discretion of his professor, be assigned additional work beyond that required of undergraduates.

At least half of the work credited toward a master's degree is expected to be in courses in the 500 series and above (exclusive of the Thesis or Report). Most of the work credited toward a doctor's degree should be in courses of this rank. Courses numbered in the 300 series carrying graduate credit will be credited toward an advanced degree very rarely, and only when justified by exceptional circumstances.

## School of Agriculture

## Agricultural Economics

Professor Willard F. Williams, Head of the Department
MAJORS AND MINORS FOR THE MASTER'S DEGREE

For Undergraduates and Graduates
430. Special Problems in Agricultural Economics. (3)
431. Livestock Marketing. ( $3: 3: 0$ )
432. Statistical Methods in Agricultural Research. ( $3: 3: 0$ )
433. Production Economics. ( $3: 3: 0$ )
434. Advanced Agricultural Marketing. ( $3: 3: 0$ )
435. Agricultural Policies and Organizations. (3:3:0)
436. Trade in Agricultural Products. ( $3: 3: 0$ )
437. Farm and Ranch Appraisal. (3:2:3)
438. Range and Ranch Economics. ( $3: 3: 0$ )
439. Agricultural Price Analysis. ( $3: 3: 0$ )
4311. Agricultural Finance. ( $3: 3: 0$ )
4312. Mathematical Economics and Econometrics for Agriculture. (3:3:0)
4313. Agricultural Resource Economics. ( $3: 3: 0$ )
4314. Advanced Farm Management. ( $3: 2: 3$ )

For Graduates
511. Seminar. ( $1: 1: 0$ )
530. Research Methodology in Agricultural Economics. (3:3:0)
531. Advanced Production Economics. ( $3: 3: 0$ )
532. Seminar in Agricultural Policy. (3:3:0)
533. Seminar in Agricultural Marketing. (3:3:0)
534. Research in Agricultural Economics. (3) May be repeated for credit.
535. Contemporary Agricultural Economics. (3:3:0)
631. Master's Thesis. (3)

Enrollment required at least twice.

## Agricultural Education

Professor T. L. Leach, Head of the Department
MAJORS AND MINORS FOR THE MASTER'S DEGREE

For Undergraduates and Graduates
434. Methods of Teaching Vocational Agriculture in the High School. (3:2:3)
435. Methods in Supervised Farming and Future Farmer Work. (3:2:3)

For Graduates
522. Advanced Methods in High School Vocational Agriculture. ( $2: 2: 0$ )
523. Advanced Methods in Adult Agricultural Education. ( $2: 2: 0$ )
524. Advanced Methods in Future Farmer Work. (2:2:0)
531. Investigation in the Field of Agricultural Education. (3) May be repeated for credit.
532. Research Methods in Agricultural Education (3:3:0)
535. Problems. (3) May be repeated for credit.
536. Advanced Methods of Teaching Farm Mechanics. (3:3:0)
630. Master's Report. (3)
631. Master's Thesis. (3) Enrollment required at least twice.

## Agricultural Engineering

Professor W. L. Ulich, Head of the Department MAJORS AND MINORS FOR THE MASTER'S DEGREE

This program is jointly administered by the School of Engineering and the School of Agriculture.

For Undergraduates and Graduates
411. Agricultural Engineering Seminar. (1:1:0)
May be repeared for credit.
430. Agricultural Engineering Problems. (3)

May be repeated for credit.
433. Elements of Farm Tractor Design. (3:2:3)
434. Farm Electrification Systems. (3:2:3)
435. Farm Mechanics Problems. (3) May be repeated for credit.
436. Agricultural Processing Systems. (3:2:3)
437. Design of Farm Irrigation Systems. (3:2:3)
438. Environment and Functional Design of Agricultural Structures. (3:2:3)
439. Structural Design of Farm Buildings. (3:2:3)
442. Engineering for Soil and Water Conservation. (4:3:3)
4311. Advanced Agricultural Mechanics. (3:2:2)

## For Graduates

511. Seminar. ( $1: 1: 0$ )
512. Agricultural Engineering Research. (3)
513. Investigations in Advanced Agricultural Mechanics. (3)
514. Instrumentation and Research Methods. (3:3:0)
515. Advanced Theory of Farm Machinery Design. (3:2:2)
516. Theory of Agricultural Structures Design. ( $3: 3: 0$ )
53 s . Design Theory of Earth Structures. (3:3:0)
s36. Advanced Farm Electrification and Processing Systems. (3:3:0)
517. Advanced Theory of Water Utilization. (3:3:0)
518. Advanced Technical Problems in Agricultural Engineering. (3)
519. Bioengineering-Environmental Control. (3:3:0)
520. Master's Thesis. (3)

Enrollment required at least twice.

## Agronomy and Range Management

Professor A. W. Young, Head of the Department

## MAJORS AND MINORS FOR THE MASTER'S DEGREE

Students seeking a master's degree in the Department of Agronomy and Range Management should consult the Head of the Department about their programs before entolling for any courses. Major programs are available in crop science, soil science, and range science.

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

## AGRONOMY

For Undergraduates and Graduates
425. Seed Technology. ( $2: 1: 2$ )
430. Agronomy Problems. (3)

May be repeated for credit.
431. Fundamental Principles of Plant

Breeding. (3:3:0)
433. Cotton Production and Improvement. (3:3:0)
434. Soil Conservation and Land Use Planning. (3:2:3)
435. Soil Classification. ( $3: 2: 3$ )
436. Soil Chemistry. ( $3: 2: 3$ )
439. Soil Microbiology. (3:2:3)
4311. Soil Fertility. ( $3: 2: 3$ )
4313. Weeds and Weed Control. (3:2:2)
4314. Soil Physics. ( $3: 2: 3$ )

431s. Nutrition of Crop Plants. (3:3:0)
4316. Agricultural Plant Physiology. (3:3:0)

For Graduates
511. Seminar. (1:1:0)

May be repeated for credit.
532. Experimental Design and Analysis. (3:2:2)
533. Pedology. ( $3: 3: 0$ )
534. Research. (3)

May be repeated for credit.
536. Soil and Plant Relationships. ( $3: 3: 0$ )
537. Methods in Plant Breeding. (3:3:0)
630. Master's Report. (3)
631. Master's Thesis. (3)

Enrollment required at least twice.

## RANGE MANAGEMENT

For Undergraduates and Graduates
430. Wildlife Problems. (3)
431. Game Management. (3:2:3)
432. Range Management Problems. (3)
433. Waterfowl and Wetland Ecology. ( $3: 2: 3$ )
434. Upland Game Ecology. (3:2:3)
435. Range Improvement Practices. ( $3: 2: 3$ )
438. Range Analysis and Planning. (3:2:3)

For Graduates
510. Range Seminar. ( $1: 1: 0$ )

May be repeated for credit.
521. Contemporary Resource Use.
(2:2:0)
523. Range Research Methods. (2)
531. Synecology. (3:3:0)
532. Vegetation Influences. (3:3:0)
534. Range Research. (3)

May be repeated for credit.
536. Ecology of Arid Lands. $(3: 3: 0)$
630. Master's Report. (3)
631. Master's Thesis. (3)

Enrollment required at least twice.

## Animal Husbandry

## Professor Dale W. Zinn, Head of the Department MAJORS AND MINORS FOR THE MASTER'S DEGREE

The Department of Animal Husbandry offers majors in the following three areas: animal breeding, animal nutrition, and meat science.

For Undergraduates and Graduates
427. Swine Production. (2:2:0)
431. Beef Cattle Production. ( $3: 3: 0$ )
432. Animal Breeding. ( $3: 3: 0$ )
434. Horse Production. ( $3: 3: 0$ )
435. Dairy Cattle Production. ( $3: 3: 0$ )
436. Animal Nutrition. ( $3: 3: 0$ )
437. Livestock Record Systems. ( $3: 3: 0$ )
439. Endocrinology. ( $3: 3: 0$ )
441. Sheep, Wool, and Mohair Production. (4:3:2)

For Graduates
s11. Seminar. ( $1: 1: 0$ )
Enrollment required in each semester of student's residence.
533. Techniques in Animal Research. (3)
534. Research in Animal Science. (3)

May be repeated for credit.
536. Biometry. (3:2:2)
537. Advanced Animal Breeding. ( $3: 3: 0$ )
538. Advanced Animal Nutrition. ( $3: 3: 0$ )
539. Physiology of Reproduction. (3:2:2)
541. The Science of Meat and Meat Products. (4:3:3)
631. Master's Thesis. (3)

Enrollment required at least twice.
Dairy IndustryProfessor J. J. Willingham, Head of the Department
MAJORS AND MINORS FOR THE MASTER'S DEGREE

For Undergraduates and Graduates
411. Food and Dairy Industry Seminar. (1:1:0)
May be repeated for credit.
430. Food and Dairy Industry Problems. (3)

May be repeated for credit.
433. Market Milk. (3:2:3)
435. Food and Dairy Inspection and Quality Control. (3:2:3)
437. Food Plant Management and Merchandising. ( $3: 3: 0$ )
441. Dairy Products Manufacturing. (4:2:4)

For Graduates
s31. Food and Dairy Industry Research. (3)

May be repeated for credit.
535 . Food and Dairy Bacteriology Research. (3)
May be repeated for credit.
631. Master's Thesis. (3)

Enrollment required at least twice.

# Park Administration, Horticulture, and Entomology 

## Professor E. J. Urbanovsky, Head of the Department <br> MAJORS AND MINORS FOR THE MASTER'S DEGREE <br> PARK ADMINISTRATION

For Undergraduates and Graduates
422. Park Administration. (2:2:0)
430. Park Administration Problems. (3)
441. Landscape Architecture III. (4:1:8)
442. Landscape Architecture IV. (4:1:8)

## For Graduates

331. Park Administration Research. (3) May be repeated for credit.
332. Advanced Park Administration.
(4:3:2)
333. Advanced Park Planning and Design. (4:1:8)
334. Advanced Park Planning and Design. (4:1:8)
335. Master's Report. (3)
336. Master's Thesis. (3)

Enrollment required at least twice.

## HORTICULTURE

For Undergraduates and Graduates
421. Arboriculture. (2:1:3)
425. Horticulture Problems. (2)
430. Horticulture Problems. (3) May be repeated for credit.
431. Advanced Fruit Production. (3:3:0)
432. Advanced Turfgrass Management. (3:2:3)
435. Advanced Vegetable Production. ( $3: 3: 0$ )
436. Advanced Floricultural Science. (3:2:3)

For Graduates
511. Horticulture Seminar. ( $1: 1: 0$ )

May be repeated for credit.
531. Horticulture Research. (3)

May be repeated for credit.
532. Horticultural Crop Behavior. (3:3:0)
533. Horticultural Plant Evaluation

Techniques. ( $3: 3: 0$ )
630. Master's Report. (3)
631. Master's Thesis. (3)

Enrollment required at least twice.

## ENTOMOLOGY

For Undergraduates and Graduates
334. Insect Morphology. ( $3: 2: 3$ )
335. Insect Taxonomy. (3:2:3)
410. Seminar. 1:1:0)
421. Immature Insects. (2:1:3)
431. Agricultural Compounds. ( $3: 3: 0$ )
432. Insect Ecology. (3:2:3)
433. Insect Natural History. ( $3: 2: 2$ )
441. Insect Toxicology and Physiology. (4:3:3)
4311. Medical Entomology. ( $3: 2: 3$ )
4312. Acarology. ( $3: 2: 3$ )

For Graduates
521. Advanced Economic Entomology. (2:2:0)
522. Literature and History of Entomology. (2:2:0)
523. Advanced Insect Taxonomy. (2:0:6)
531. Entomology Research. (3)
630. Master's Report. (3)
631. Master's Thesis. (3)

Enrollment required at least twice.

# School of Arts and Sciences 

## Biology

## Professor E. D. Camp, Head of the Department <br> MAJORS AND MINORS FOR THE MASTER'S DEGREE AND THE DOCTOR'S DEGREE

The graduate faculty of the Department of Biology offers studies in four areas: biology, botany, microbiology, and zoology.

Before being recommended for admission to a master's degree program, the student may be required to take an examination which includes the subject matter usually required of undergraduates.

If the preliminary examination for admission to doctoral studies reveals serious weaknesses in the student's subject-matter background, the student may be required to take remedial courses designated by the graduate faculty of the department. The basic degree requirements of the Graduate School determine the policy of the department.

The student's advisory committee will make recommendations concerning language requirements and basic work in other sciences.

## BIOLOGY

For Undergraduates and Graduates
331. Heredity. (3:3:0)
333. Bio-Ecology. (3:2:3)
431. Biological Techniques. ( $3: 0: 9$ )

For Graduates
s11. Seminar. ( $1: 1: 0$ )
May be repeated for credit.
512. Advanced Experimental Heredity. (1:0:3)
532. Population Genetics. (3:2:3)
5312. Cytogenetics. (3:2:3)
5313. Biochemical Genetics. ( $3: 3: 0$ )
731. Research. (3) May be repeated for credit.
831. Doctor's Dissertation. (3)

Enrollment required at least four times.

## BOTANY

For Undergraduates and Graduates
331. Plant Physiology. ( $3: 2: 3$ )
332. Plant Pathology. $(3: 2: 3)$
339. Plant Anatomy. ( $3: 2: 3$ )
436. Plant Geography. $(3: 3: 0)$
438. Morphology of Fungi. (3:2:3)

## For Graduates

531. Problems in Botany. (3:0:9)

May be repeated for credit.
534. Advanced Plant Anatomy. (3:0:9)
535. Field Botany. ( $3: 3: 0$ )

May be repeated for credit.
536. Taxonomy of Lower Green Plants. (3:2:3)
537. Morphology of the Vascular Plants. (3:2:3)
538. Advanced Taxonomy of the Vascular Plants. (3:2:3)
539. Plant Speciation. (3:3:0)
5311. Morphogenesis and Plant Growth Regulators. (3:2:3)
630. Master's Report. (3)
631. Master's Thesis. (3)

Enrollment required at least twice.
731. Research. (3)

May be repeated for credit.
831. Doctor's Dissertation. (3)

Enrollment required at least four times.

## ENTOMOLOGY

For Undergraduates and Graduates
4311. Medical Entomology. (3:2:3)

## MICROBIOLOGY

For Undergraduates and Graduates
331. General Bacteriology. ( $3: 2: 3$ )
333. Communicable Diseases. ( $3: 3: 0$ )
334. Bacteriology of Foods and Food Sanitation. (3:2:3)
430. Advanced General Bacteriology. (3:2:3)
431. Problems in Bacteriology. (3:0:9) May be repeated for credit.
432. Immunology and Serology. (3:2:3)
433. Physiology of Bacteria. ( $3: 2: 3$ )
434. Pathogenic Bacteriology. (3:2:3)
435. Taxonomic and Determinative Bacteriology. (3:2:3)

For Graduates
521. Instrumental Methods of Microbiology. (2:0:6)
531. Research in Microbiology. (3:0:9) May be repeated for credit.
532. Selected Topics in Microbiology. ( $3: 3: 0$ )
May be repeated for credit.
533. General Virology. (3:2:3)
631. Master's Thesis. (3)

Enrollment required at least twice.

## ZOOLOGY

For Undergraduates and Graduates
331. Animal Histology. (3:2:4)
332. Comparative Vertebrate Embryology. (3:2:4)
333. Parasitology. ( $3: 2: 3$ )
435. Cytology. (3:2:3)
437. Natural History of the Vertebrates. ( $3: 2: 3$ )
438. Cellular Physiology. ( $3: 2: 3$ )
439. Comparative Animal Physiology. (3:2:3)

For Graduates
331. Problems in Zoology. (3:0:9) May be repeated for credit.
332. Principles and Methods of Systematic Zoology. (3:2:3)
33. Herpetology. ( $3: 2: 3$ )
334. Advanced Invertebrate Zoology. (3:2:3)

535 . Field Zoology. (3:3:0)
May be repeated for credit.
536. Mammalogy. (3:2:3)
537. Physiological Ecology of the Vertebrates. ( $3: 3: 0$ )
5311. Biology of the Acarina. (3:2:3)
5313. Ornithology. (3:2:3)
5314. Zoogeography. ( $3: 3: 0$ )
5317. Experimental Embryology. (3:2:3)
5318. Comparative Endocrinology. (3:2:3)
5319 . Ichthyology. (3:2:3)
630. Master's Report. (3)

631 . Master's Thesis. (3)
Enrollment required at least twice.
731. Research. (3)

May be repeated for credit.
831. Doctor's Dissertation. (3)

Enrollment required at least four times.

## Chemistry

## Professor Joe Dennis, Head of the Department <br> MAJORS AND MINORS FOR THE MASTER'S DEGREE AND THE DOCTOR'S DEGREE

Each student majoring in this department for an advanced degree must take written preliminary diagnostic examinations to ascertain his comprehension of chemistry. The examinations are based on the undergraduate curriculum. Each student is expected to take examinations in analytical, inorganic, organic, and physical chemistry. Those
students who desire to major in biochemistry will take examinations in physical, organic, biochemistry, and either analytical or inorganic chemistry. These examinations are given during the first week of each semester, according to schedules posted on the departmental bulletin board. Students will have an opportunity to register for such remedial courses as the examinations may show to be necessary.

Each graduate student in this department is expected to do some teaching before receiving an advanced degree. The minimal requirements are one laboratory for a Master's and two for a Doctoral degree.

## Special Regulations Concerning the Master's Degree

At least one semester before graduation, every applicant for the master's degree in this department must pass a reading examination in a foreign language acceptable to this department, as described in the section on language requirements for the master's degree.

## Special Regulations Concerning the Doctor's Degree

Credit for the research presented in the doctoral dissertation in this department shall constitute not less than one-sixth nor more than one-third of the total work presented for the degree.

At least 18 semester hours of work must be done outside this department.
315, 316. Organic Chemistry Labora- 5302. Advanced Inorganic Chemistry II. tory.* (1:0:3 each)
325, 326. Organic Chemistry Labora- 5304. Topics in Inorganic Chemistry. tory.* (2:0:6 each)
335, 336. Organic Chemistry.* (3:3:0 each)
342. Physiological Chemistry.* (4:3:3)
343. Introductory Physical Chemistry.* (4:3:3)
347, 348 . Physical Chemistry.* (4:3:3 each)
For Undergraduates and Graduates**
420. Chemical Literature. (2:2:0)
431. Qualitative Organic Analysis. (3:1:6)
432. Structure and Mechanisms in Organic Chemistry. ( $3: 3: 0$ )
436. Biological Chemistry I. ( $3: 2: 3$ )
437. Biological Chemistry II. ( $3: 2: 3$ )
438. Valency and Molecular Structure. (3:3:0)
445. Inorganic Chemistry. (4:3:3)
4312. Instrumental Analytical Methods. (3:2:3)

## For Graduates

511, 512. Seminar. (1:1:0 each) May be repeated for credit.
531, 532 . Research. (3 each) May be repeated for credit.
5117. Selected Topics in Analytical Chemistry. ( $1: 1: 0$ ) May be repeated for credit.
5301. Advanced Inorganic Chemistry I. ( $3: 3: 0$ )

[^6]5347. Chemical Thermodynamics. ( $3: 3: 0$ )
s348. Selected Topics in Physical Chemistry. ( $3: 3: 0$ )
May be repeated for credit.
631. Master's Thesis. (3)

Enrollment required at least twice.
831. Doctor's Dissertation. (3)

Enrollment required at least four times.

## Classical and Romance Languages

## Professor Harley D. Oberhelman, Head of the Department

The departments of Classical and Romance Languages, English, and Germanic and Shavonic Languages offer interdepartmental programs in linguistics and comparative literature at the master's and doctor's levels. See section of the Department of English for information about these programs.

## MINORS ONLY FOR THE DOCTOR'S DEGREE

FRENCH

## MAJORS AND MINORS FOR THE MASTER'S DEGREE

For Undergraduates and Graduates
430. Advanced Grammar, Composition, and Conversation. ( $3: 3: 0$ )
433. Literature of the Nineteenth Century. ( $3: 3: 0$ )
434. Literature of the Nineteenth Century. (3:3:0)
43s. Readings in French Language and Literature I. ( $3: 3: 0$ )
May be repeated for credit.
436. Readings in French Language and Literature II. ( $3: 3: 0$ )
437. Twentieth Century Novel. (3:3:0)
438. Twentieth Century Drama and Poetry. ( $3: 3: 0$ )
May be repeated for credit.
4311. The Classical Theater. ( $3: 3: 0$ )
4312. Eighteenth Century Literature.
(3:3:0)
4315. Survey of French Classics I. (3:3:0)
4316. Survey of French Classiscs II. (3:3:0)
4321. Phonetics and Diction. (3:3:0)

For Graduates
5312. Studies in French Language and Literature I. ( $3: 3: 0$ ) May be repeated for credit.
5313. Studies in French Language and Literature II. (3:3:0) May be repeated for credit.
630. Master's Report. (3)
631. Master's Thesis. (3)

Enrollment required at least twice.

## GREEK

## MINORS ONLY FOR THE MASTER'S DEGREE

For Undergraduates and Graduates
430. Individual Problems in Greek. (3)

May be repeated for credit.

## ITALIAN

MINORS ONLY FOR THE MASTER'S DEGREE

For Undergraduates and Graduates
430. Individual Problems in Italian. (3) May be repeated for credit.
435. Readings in Italian Language and Literature I. ( $3: 3: 0$ )
May be repeated for credit.
436. Readings in Ytalian Language and Literature II. ( $3: 3: 0$ )
May be repeated for credit.

## LATIN <br> MINORS ONLY FOR THE MASTER'S DEGREE

For Undergraduates and Graduates
431. Advanced Composition and Grammar Review. (3:3:0)
435. Readings in Latin Literature I. (3:3:0)
May be repeated for credit.
436. Readings in Latin Literature II. ( $3: 3: 0$ )
May be repeated for credit.

## PORTUGUESE

MINORS ONLY FOR THE MASTER'S DEGREE

For Undergraduates and Graduates
430. Individual Problems in Portuguese. (3)

May be repeated for credit.
435. Readings in Portuguese and Brazilian Language and Literature I. (3:3:0)
May be repeated for credit.
436. Readings in Portuguese and Brazilian Language and Literature II. (3:3:0)
May be repeated for credit.

## SPANISH

## MAJORS AND MINORS FOR THE MASTER'S DEGREE

For Undergraduates and Graduates
431. Nineteenth Century Prose. ( $3: 3: 0$ )
432. Nineteenth Century Prose. $(3: 3: 0)$
433. Modern Drama and Poetry. ( $3: 3: 0$ )
434. Modern Drama and Poetry. (3:3:0)
436. Advanced Composition and Conversation. (3:3:0)
4312. The Prose of the Golden Age. ( $3: 3: 0$ )
4313. The Prose of the Golden Age. (3:3:0)
4314. The Drama of the Golden Age. ( $3: 3: 0$ )
4315. The Drama of the Golden Age. ( $3: 3: 0$ )
4316. A Survey of Spanish Literature. (3:3:0)
4317. A Survey of Spanish Literature. (3:3:0)
4318. Readings in Contemporary Spanish Literature. ( $3: 3: 0$ )
4319. Readings in Contemporary Spanish Literature. (3:3:0)
4321. The Latin American Novel I. ( $3: 3: 0$ )
4322. The Latin American Novel II. ( $3: 3: 0$ )
4323. The Latin American Short Story. ( $3: 3: 0$ )
4324. Readings in Spanish American Literature and Civilization. ( $3: 3: 0$ )
4325. Readings in Spanish American Literature and Civilization. ( $3: 3: 0$ )
4326. Survey of Spanish American Literature. (3:3:0)
4327. Survey of Spanish American Literature. ( $3: 3: 0$ )
4328, 4329. Spanish Civilization. (3:3:0 each)
Offered in Mexico.

## For Graduates

541,542 . Summer Language Institute. (4:21:25 each)
5312. Studies in Spanish and Spanish American Literature. (3:3:0) May be repeated for credit.
5313. Studies in Spanish and Spanish American Literature. ( $3: 3: 0$ ) May be repeated for credit.
630. Master's Report (3)
631. Master's Thesis. (3) Enrollment required at least twice.

## LINGUISTICS

For Undergraduates and Graduates
4311. Applied Linguistics for Modern Foreign Languages. (3:3:0)

For Graduates
s30. Romance Linguistics. ( $3: 3: 0$ )
5311. Linguistic Techniques in Teaching Romance Languages. ( $3: 3: 0$ )
5335. Spanish and English as Second Languages in the Elementary School. (3:3:0)

## English

## Professor Everett A. Gillis, Head of the Department <br> MAJORS AND MINORS FOR THE MASTER'S DEGREE AND THE DOCTOR'S DEGREE

Students seeking the master's or doctor's degree in English should consult with the Head of the Department or the Director of Graduate Studies in English about their program before enrolling in any courses.

The Master of Arts program offers English majors the opportunity to study in seven fields: English literature before 1700; English literature after 1700; American literature; comparative literature; English language; folklore; and literary criticism. The requirements for the degree include a thesis and 24 semester hours beyond the Bachelor of Arts Degree: 18 semester hours within the specialized areas listed above, and 6 semester hours in an appropriate minor.

Candidates for the doctor's degree are offered the opportunity for specialized studies in nine fields: English literature to 1500; English literature, 1500-1700; English literature, 1700-1832; English literature, 1832-present; American literature to 1865; American literature since 1865; comparative literature; English language/linguistics; folklore/literary criticism. The course work for the doctoral program includes approximately 60 semester hours beyond the Master of Arts degree including the doctoral dissertation under the supervision of a doctoral committee.

Interdepartmental Programs in Linguistics and Comparative Literature. The Departments of Classical and Romance Languages, English, and Germanic and Slavonic Languages offer interdepartmental programs in linguistics and comparative literature at the master's and doctor's levels.

At the master's level the programs are administered by interdepartmental committees composed of staff members of these departments who are teaching in the programs. The degrees offered are the Master of Arts with a major in English and a program in either linguistics or comparative literature; and the Master of Arts with a major in French, German, or Spanish with a program in either of these two fields. Credit is offered on a reciprocal basis for courses taken in either department.

The doctor's degree is offered by the Department of English with a major in English and fields of specialization in linguistics or comparative literature.

Inquiries concerning these programs may be addressed to the head of one of the sponsoring departments.

In addition to the general regulations of the Graduate School contained in this Catalog, applicants for the above degrees should consult the Director of Graduate Studies in English for information on special departmental regulations, graduate scholarships, and teaching assistantships.

| For Undergraduates and Graduates* | 4331. Pre-Shakespearean Drama. $(3: 3: 0)$ |
| :--- | :--- |
| 433. Chaucer. $(3: 3: 0)$ | 4332. History of Literary Criticism. |
| 434. Milton and His Age. $(3: 3: 0)$ |  |
| 438. History of the English Language. | 433.Philosophical Ideas in Literature. <br> $(3: 3: 0)$ |
|  | $(3: 3: 0)$ |

439. American English. (3:3:0)

[^7]4336. Teaching English in Secondary Schools. ( $3: 3: 0$ )
4337. English Literary History: A synthesis. ( $3: 3: 0$ )
4338. Exposition for Advanced Students. ( $3: 3: 0$ )
4341. Regional Literature of the United States. ( $3: 3: 0$ )
4343. Modern American and European Drama. (3:3:0)
4344, 4345. Comparative Literature. (3:3:0 each)
4349. Ancient and Medieval Literature. ( $3: 3: 0$ )
4355 . Modern Continental Literature. ( $3: 3: 0$ )

## For Graduates*

530. Studies in Medieval Literature. (3:3:0)
531. Studies in Comparative Literature. (3:3:0)
532. Teaching of College English. (3:3:0)
533. Studies in Renaissance Literature. (3:3:0)
534. Old English. ( $3: 3: 0)$
535. Studies in Early Victorian Literature. ( $3: 3: 0$ )
536. Studies in Early English Romantics. (3:3:0)
537. Studies in the Neo-Classical Age. (3:3:0)
538. Studies in Seventeenth Century Literature. (3:3:0)
539. Studies in Drama. ( $3: 3: 0$ )
540. Studies in Modern European Literature. $(3: 3: 0)$
s314. Studies in Literary Criticism. (3:3:0)
541. Studies in Folklore. (3:3:0)
542. Studies in Eighteenth Century American Literature. ( $3: 3: 0$ )
543. Studies in Shakespeare. (3:3:0)
544. Studies in Modern British Literature. (3:3:0)
545. Studies in Nineteenth Century American Literature. ( $3: 3: 0$ )
546. Studies in Twentieth Century American Literature. ( $3: 3: 0$ )
547. American Novel to 1900. (3:3:0)
548. American Novel since 1900. ( $3: 3: 0$ )
549. Studies in Modern Poetry. ( $3: 3: 0$ )
550. Principles of Language. (3:3:0)

5337 . Studies in Linguistics. (3:3:0)
5341 . Studies in Bibliography. (3:3:0)
5351 . Studies in Later Victorian Literature. ( $3: 3: 0$ )
5381. Studies in Later English Romantics. (3:3:0)
5391. Studies in the Age of Johnson. (3:3:0)
630. Master's Report. (3)
631. Master's Thesis. (3) Enrollment required at least twice.
731, 732. Research. (3 each)
831. Doctor's Dissertation. (3)

Enrollment required at least four times.

## Geosciences

## Professor R. B. Mattox, Head of the Department <br> MAJORS AND MINORS FOR THE MASTER'S DEGREE AND THE DOCTOR'S DEGREE

Departmental Regulations Concerning the Master's Degree
Before being recommended for admission to candidacy for the master's degree in this department, the student must satisfy the graduate staff that he is qualified. Students may be required to take written qualifying examinations in one or more of the following subjects: physical geology, historical geology, mineralogy and crystallography, structural geology, paleontology and field methods. Examinations will be given during the first week of each semester and students will have the opportunity to register for the remedial courses which are recommended.

Advanced Physical and Historical Geology (Geology 531, 532) is required of all candidates for graduate degrees.

[^8]
## Regulations Concerning the Doctor's Degree

The basic regulations and requirements for the degree of Doctor of Philosophy determine the policy of this department. Not more than 12 semester hours for the research presented in the doctoral dissertation will be credited towards fulfillment of the total requirements for the degree. The department recommends that the requirements for a reading knowledge of foreign languages be fulfilled in two of the following: German, Russian, French.

## GEOLOGY

For Undergraduates and Graduates
431, 432. Optical Mineralogy and Petrology. (3:1:6 each)
433. Petroleum Geology I. $(3: 3: 0)$
434. Petroleum Geology II. (3:2:3)
435. Stratigraphic Paleontology. (3:2:3)
436. Micropaleontology. (3:1:6)
437. Sedimentation I. (3:2:3)
438. Sedimentation II. $(3: 2: 3)$
439. Vertebrate Paleontology. (3:2:3)
4314. Principles of Stratigraphy. ( $3: 3: 0$ )
4315. Paleozoic, Mesozoic, Cenozoic

Stratigraphy. ( $3: 3: 0$ )
4316. Aerial Photo Interpretation. (3:2:3)

For Graduates
111. Seminar. ( $1: 1: 0$ )

Required of all graduate students majoring in this department.
321. Clay Mineralogy. (2:1:3)
s31, 532. Advanced Physical and Historical Geology. (3:3:0 each)
333. Petrology of Igneous Rocks. (3:3:0)
s34. Petrology of Metamorphic Rocks. (3:3:0)
535. 536. Advanced Work in Specific Fields. (3 each)
538. Geology of the Southwest. (3:3:0)
541. X-Ray Diffraction and Analysis. (4:3:3)
542. X-Ray Crystallography. (4:3:4)
563. Advanced Field Geology. (6)
s311. Stratigraphic Micropaleontology. (3:2:3)
5312. Economic Geology. (3:2:3)
5313. Applications of Geology in Engineering Projects. (3:2:3)
s324. Advanced Sedimentation. (3:2:3)
5327. Problems in Paleontology. (3:2:3)
5328. Advanced Structural Geology. (3:2:3)
631. Master's Thesis. (3) Enrollment required at least twice. 731, 732. Research. (3 each)
831. Doctor's Dissertation. (3) Enrollment required at least four times.

## MINOR CREDIT ONLY FOR THE MASTER'S DEGREE

332. Structural Geology. (3:2:3)

335, 336. General Paleontology I, II. (3:2:3 each)
337. Ground Water. ( $3: 3: 0$ )

Graduate credit with approval of Department Head and Graduate Dean.
363. Field Geology. (6)

## GEOCHEMISTRY

For Undergraduates and Graduates
4331. Geochemistry I. (3:3:0)
4332. Geochemistry II. ( $3: 3: 0$ )

For Graduates
533. Selected Topics in Geochemistry. ( $3: 3: 0$ )
534. Advanced Problems in Geochemistry. (3:1:6)

For Undergraduates and Graduates
4321. Earthquake Seismology. (3:2:3)
4322. The Earth's Gravity Field. ( $3: 3: 0$ )
4323. Applications in Geophysics. (3:1:6)

For Graduates
531. Wave Propagation in Layered Media. (3:3:0)
533. Selected Topics in Geophysics. (3:3:0)
534. Advanced Problems in Geophysics. (3:1:6)

MINOR CREDIT ONLY FOR THE MASTER'S DEGREE
3321. Geophysical Methods, Gravity and 3322. Geophysical Methods, Seismic and Magnetic. (3:3:0)

Electrical. (3:3:0)

## GEOGRAPHY

## MINOR CREDIT ONLY FOR THE MASTER'S DEGREE

4351. Land Use Planning. ( $3: 3: 0$ )
4352. Urban Geography. (3:3:0)
4353. Conservation of Natural Resources. (3:3:0)
4354. Geography of Texas. (3:3:0)
4355. Geography of the American Southwest. ( $3: 3: 0$ )
4356. Geography of Europe. (3:3:0)
4357. Geography of the Union of Soviet Socialist Republics. ( $3: 3: 0$ )
4358. Geography of South America. ( $3: 3: 0$ )
4359. Geography of Mexico and the Caribbean Lands. ( $3: 3: 0$ )

## Germanic and Slavonic Languages

## Professor Carl Hammer, Jr., Head of the Department

The departments of Classical and Romance Languages, English, and Germanic and Slavonic Languages offer interdepartmental programs in linguistics and comparative literature at the master's and doctor's levels. See section of the Department of English for information about these programs.

## MINORS ONLY FOR THE DOCTOR'S DEGREE

## GERMAN

## MAJORS AND MINORS FOR THE MASTER'S DEGREE

For Undergraduates and Graduates
431. Advanced Grammar, Composition, and Conversationt ( $3: 3: 0$ )
432. Structure of the German Language. (3:3:0)
433. Nineteenth Century Drama. ( $3: 3: 0$ )
434. Nineteenth Century Prose and Poctry. ( $3: 3: 0$ )
435. Readings in German Language and Literature I. $(3: 3: 0)$
436. Readings in German Language and Literature II. ( $3: 3: 0$ )
4311. Eighteenth Century Literature. ( $3: 3: 0$ )
4315. A Survey of German Literature I. (3:3:0)
4316. A Survey of German Literature II. (3:3:0)

For Graduates
5312. Studies in German Language and Literature I. $\quad(3: 3: 0)$ May be repeated for credit.
5313. Studies in German Language and Literature II. ( $3: 3: 0$ ) May be repeated for credit.
630. Master's Report. (3)
631. Master's Thesis. (3)

Enrollment required at least twice.
4312. Goethe. ( $3: 3: 0$ )

## RUSSIAN

MAJORS AND MINORS FOR THE MASTER'S DEGREE
For Undergraduates and Graduates
430. Individual Studies in Slavistics.
(3)

LINGUISTICS
For Undergraduates and Graduates
4311. Applied Linguistics for Modern Foreign Languages. ( $3: 3: 0$ )

## Government

## Professor Lynwood M. Holland, Head of the Department MAJORS AND MINORS FOR THE MASTER'S DEGREE AND THE DOCTOR'S DEGREE

Graduate study is offered in the following special fields: American government and politics, comparative government and politics, international relations, political theory, public administration, and public law.

All students seeking admission to the graduate program must submit at least three letters of recommendation, preferably from former teachers, to the Head of the Department. Graduate students in other departments who choose government as a minor must have had or must complete at least 18 hours of undergraduate work in government.

Additional information regarding requirements and procedures may be obtained from the department.

For Undergraduates and Graduates
4321. Local Government. (3:3:0)
4322. State Government. ( $3: 3: 0$ )
4323. Legislation. (3:3:0)
4324. Government and the Economy. (3:3:0)
4325. Political Parties. (3:3:0)
4326. Intergovernmental Relations. (3:3:0)
4331. Ancient and Medieval Political Theory. ( $3: 3: 0$ )
4332. Modern Political Theory. (3:3:0)
4333. Contemporary Political Theory. ( $3: 3: 0$ )
4334. American Political Theory. (3:3:0)
4341. Fiscal Administration. ( $3: 3: 0$ )
4342. Personnel Administration. (3:3:0)
4343. Local Administration. ( $3: 3: 0$ )
4344. The Government of Metropolitan Areas. (3:3:0)
4345. Administrative Organization and Management. ( $3: 3: 0$ )
4346. Policy and Administration. ( $3: 3: 0$ )
4351. Constitutional Law, Powers. (3:3:0)
4352. Constitutional Law, Limitations. ( $3: 3: 0$ )
4353. Administrative Law and Regulations. (3:3:0)
4354. Jurisprudence. (3:3:0)
4361. United States Foreign Policy. ( $3: 3: 0$ )
4362. Political Geography. ( $3: 3: 0$ )
4363. International Organization. ( $3: 3: 0$ )
4364. International Law. (3:3:0)
4365. Problems in National Security. ( $3: 3: 0$ )
4372. Government of the Union of Soviet Socialist Republics. ( $3: 3: 0$ )
4373. Governments of Western Europe. ( $3: 3: 0$ )
4374. Government of Mexico and the Caribbean. (3:3:0)
4375. Major South American Governments. (3:3:0)
4376. Major Governments of Asia. (3:3:0)
4377. African Governments and Politics. ( $3: 3: 0$ )
4378. Middle Eastern Governments and Politics. (3:3:0)
4379. British Government. ( $3: 3: 0$ )
4381. Teaching Social Science in the High School. (3:3:0)

## For Graduates

531. Readings and Research-Individual Study. (3:3:0)
May be repeated for credit.
532. Seminar in American Government and Politics. (3:3:0)
533. Seminar in Political Theory. (3:3:0)
534. Seminar in Public Administration. ( $3: 3: 0$ )
535. Seminar in Public Law. (3:3:0)
536. Seminar in International Relations. (3:3:0)
537. Seminar in Comparative Government and Institutions. (3:3:0)
538. Seminar in Parties and Politics. (3:3:0)
539. Serminar in National Security Affairs. (3:3:0)
540. Advanced American Government and Politics. ( $3: 3: 0$ )
5331 . Advanced Political Theory. (3:3:0)
541. Advanced Public Administration. (3:3:0)
542. Advanced Constitutional Law. ( $3: 3: 0$ )
543. Advanced International Relations.
$(3: 3: 0)$
544. Advanced Comparative Government and Politics. (3:3:0)
545. Master's Thesis. (3)

Enrollment required at least twice.

731, 732. Research. (3 each)
831. Doctor's Dissertation. (3)

Enrollment required at least four times.

## Health, Physical Education, and Recreation for Men

Professor R. W. Kireilis, Head of the Department<br>MAJORS AND MINORS FOR THE MASTER'S DEGREE AND MINORS ONLY FOR THE DOCTOR'S DEGREE

Unless otherwise specified, all courses are open to both men and women.

For Undergraduates and Graduates
431. Kinesiology. (3:3:0)
432. Physiology of Exercise. ( $3: 3: 0$ )
434. Principles of Physical Education. (3:3:0)
436. Physical Examinations and Corrective Physical Education. ( $3: 3: 0$ )
437. Measurements in Physical Education. (3:3:0)
438. Curriculum Development in Physical Education. ( $3: 3: 0$ )
439. Organization and Administration of Recreational Programs. ( $3: 3: 0$ )
4321. Methods and Techniques of Driver Instruction. (3:3:2) Special fee, $\$ 12.50$.
4323. Organization and Administration of Camps. ( $3: 3: 0$ )
4326. Safety Education. (3:3:2)
4331. Teacher Training in Gymnastics. (3:3:0)

## For Graduates

531. Administration of Physical Education. (3:3:0)
532. Supervision of Physical Education. (3:3:0)
533. Facilities for Physical Education. (3:3:0)
534. Administration of the School Health Program. (3:3:0)
535. Techniques of Research in Health, Physical Education, and Recreation. (3:3:0)
536. Problems in Health, Physical Education, and Recreation. (3:3:0)
537. Seminar in Health, Physical Education, and Recreation. (3:3:0)
538. Organization and Administration of Interscholastic and Intercollegiate Athletic Programs. (3:3:0)
539. Organization and Administration of Intramural Sports. ( $3: 3: 0$ )
540. Master's Report. (3)
541. Master's Thesis. (3)

Enrollment required at least twice.

## Health, Physical Education, and Recreation for Women

Professor Margaret E. Wilson, Head of the Department

MAJORS AND MINORS FOR THE MASTER'S DEGREE
All courses are open to both men and women.

For Undergraduates and Graduates
431. Kinesiology. ( $3: 3: 0$ )
432. Physiology of Exercise. ( $3: 3: 0$ )
433. Administration of Health, Physical Education, and Recreation for Women. (3:3:0)
436. Physical Examinations and Corrective Physical Education. (3:3:0)
437. Measurements in Physical Education. (3:3:0)
438. Curriculum Development in Physical Education. (3:3:0)
439. Organization and Administration of Recreation Programs. ( $3: 3: 0$ )
4311. Physical Education for the Junior and Senior High School. ( $3: 3: 0$ )
4323. Organization and Administration of Camps. (3:3:0)
4326. Safety Education. (3:3:2)

May be repeated for credit.

## For Graduates

531. Administration of Physical Education. (3:3:0)
532. Supervision of Physical Education. (3:3:0)
533. Facilities for Physical Education. (3:3:0)
s34. Administration of the School Health Program. ( $3: 3: 0$ )
534. Techniques of Research in Health, Physical Education, and Recreation. (3:3:0)
535. Problems in Health, Physical Education, and Recreation. (3:3:0) May be repeated for credit.
536. Seminar in Health, Physical Education, and Recreation. (3:3:0) May be repeated for credit.
537. Master's Report. (3)
538. Master's Thesis. (3)

Enrollment required at least twice.

## History

## Professor D. M. Vigness, Head of the Department <br> MAJORS AND MINORS FOR THE MASTER'S DEGREE AND THE DOCTOR'S DEGREE <br> Departmental Regulations Governing the Doctoral Program

In both preliminary and qualifying examinations the applicant will be examined in five fields, at least two of which shall be in fields other than American. At the discretion of the advisory committee, the qualifying examination in one field may be waived. Fields may be selected from the following:

Early American, Ninteenth Century American, Recent American, American Social and Cultural, American Constitutional, American Diplomatic, Southern United States, American West and Southwest, American Economic, Latin-American, Classical and Medieval Civilizations, Early Modern European to 1789, Modern European, England and the British Empire, and Afro-Asian.

Applicants for the doctorate in other departments who choose history as a minor must show proficiency in one or more of the above fields.

The applicant will be guided in his program by the graduate adviser of the department until the appointment of the advisory committee.

For Undergraduates and Graduates
430. English Colonial America to 1763. ( $3: 3: 0$ )
431. English Colonial America after 1763. (3:3:0)
432. Constitutional History of the United States to 1865. (3:3:0)
433. Constitutional History of the United States since 1865, (3:3:0)
434. Early National Period in the United States. (3:3:0)
435. The Jacksonian Era. (3:3:0)
436. Social and Cultural History of the United States to 1865 . ( $3: 3: 0$ )
437. Social and Cultural History of the United States since 1865. ( $3: 3: 0$ )
4311. The Old South. ( $3: 3: 0$ )
4312. The South since the Civil War. (3:3:0)
4313. Social and Cultural History of the Southwest. ( $3: 3: 0$ )
4321. South America before Independence. (3:3:0)
4322. South America since Independence. ( $3: 3: 0$ )
4323. Spanish North America. ( $3: 3: 0$ )
4324. Mexico since Independence. ( $3: 3: 0$ )
4325. History of Brazil. (3:3:0)
4327. The American Frontier to 1803. ( $3: 3: 0$ )
4328. The Trans-Mississippi West from 1803. (3:3:0)
4329. The Plains Indians. (3:3:0)
4331. History of American Science Policy. ( $3: 3: 0$ )
4332. History of Theology in America. ( $3: 3: 0$ )
4334. Economic History of the United States to 1865 . ( $3: 3: 0$ )
4335. Economic History of the United States since 1865. (3:3:0)
4336. The United States, 1900-1932. ( $3: 3: 0$ )
4337. The United States since 1932. ( $3: 3: 0$ )
4338. Diplomatic History of the U.S. to 1900. (3:3:0)
4339. Diplomatic History of the U.S. since 1900. (3:3:0)
4341. Modern Germany. ( $3: 3: 0$ )
4342. Central Europe to 1871 . ( $3: 3: 0$ )
4343. Central and Southeastern Europe since 1871. ( $3: 3: 0$ )
4344. Tudor England. ( $3: 3: 0$ )
4345. Stuart England. ( $3: 3: 0$ )
4346. Twentieth Century Britain. ( $3: 3: 0$ )
4347. Constitutional History of England to 1485 . ( $3: 3: 0$ )
4348. Constitutional History of England since 148s. (3:3:0)
4349. The British Empire. ( $3: 3: 0$ )

4351 . The Near East in Modern Times. ( $3: 3: 0$ )
4354. The Far East. ( $3: 3: 0$ )
4355. Africa to 1500 . ( $3: 3: 0$ )
4356. Africa since 1500 . ( $3: 3: 0$ )
4359. Czarist Russia. ( $3: 3: 0$ )
4361. Classical Civilizations: Greece and Rome. ( $3: 3: 0$ )
4362. Medieval Civilizations. ( $3: 3: 0$ )
4363. The Renaissance. ( $3: 3: 0$ )
4364. Europe, The Age of Absolutism and the OId Regime. ( $3: 3: 0$ )
4365 . The French Revolution and Napoleon. (3:3:0)
4366. Europe, $1815-1870$. ( $3: 3: 0$ )
4367. Europe, 1870-1918. (3:3:0)
4368. Europe between World Wars I and II. $(3: 3: 0)$
4369. Europe since 1939. (3:3:0)
4371. Teaching Social Studies in the High School. (3:3:0)
4372. The Reformation. ( $3: 3: 0$ )
4374. Modern Russia. ( $3: 3: 0$ )
4376. European Intellectual History in the Twentieth Century. (3:3:0)

## For Graduates

(Graduate courses may be repeated for credit as topics vary.)
531. Proseminar in Texas History. (3:3:0)
534. Historical Methods and Historiography. (3:3:0)
535. Historians and Historical Literature. ( $3: 3: 0$ )
Required of all doctoral candidates.
5311. Studies in Southern History. ( $3: 3: 0$ )
5312. Studies in Recent United States History. ( $3: 3: 0$ )
5313. Studies in United States Social and Cultural History. ( $3: 3: 0$ )
5314. Studies in the Frontier and Western American History. ( $3: 3: 0$ )
5315. Problems in American History. ( $3: 3: 0$ )
5316. Studies in Modern European History. (3:3:0)
5317. Studies in Medieval History. (3:3:0)
5318. Studies in the Renaissance and Reformation History. ( $3: 3: 0$ )
5319. Studies in Afro-Asian History. ( $3: 3: 0$ )
5321. Studies in British History. (3:3:0)
5322. Studies in United States Diplomatic History. ( $3: 3: 0$ )
5323. Studies in American Constitutional History. ( $3: 3: 0$ )
5324. Studies in English Colonial American History. (3:3:0)
5325. Studies in United States Economic History. (3:3:0)
5335 . History Appreciation for Teachers. ( $3: 3: 0$ )
631. Master's Thesis. (3) Enrollment required at least twice.
633. Seminar in Southwestern History. (3:3:0)
634. Seminar in American History. (3:3:0)
63 5. Seminar in European History. (3:3:0)
636. Seminar in Latin American History. (3:3:0)
731. Research. (3)
831. Doctor's Dissertation. (3)

Enrollment required at least four times.

## Journalism

# Professor Wallace E. Garets, Head of the Department MINORS ONLY FOR THE MASTER'S DEGREE 

For Undergraduates and Graduates
338, 339. Editing. (3:2:3 each)
411. Special Problems in Journalism. (1)

May be repeated for credit.
430. Law of the Press. ( $3: 3: 0$ )
432. Journalism for the High School Teacher. ( $3: 3: 0$ )
433. Public Opinion and Propaganda. (3:3:0)
436. Public Opinion and Public Issues. (3:3:0)
4311. The Press in a Democratic Society. (3:3:0)
4314. Seminar. ( $3: 3: 0$ )

For Graduates
330. Seminar in Education for Journalism. (3:3:0)
331. Seminar in Modern Editing. (3:3:0)
532. Seminar in Public Opinion and Propaganda. ( $3: 3: 0$ )
533. Seminar in Legal Problems of Mass Communications. (3:3:0)
534. Methods of Research. (3:3:0)
535. Administration of Communication Media. (3:3:0)
536. Problems in Investigative Reporting. ( $3: 3: 0$ )
537. Seminar in the Press and Society. (3:3:0)
538. Advanced Graphic Arts Design and Production Control. (3:3:0)
539. Studies in Latin American Journalism. ( $3: 3: 0$ )

Mathematics
Professor Patrick L. Odell, Head of the Department

## MAJORS AND MINORS FOR THE MASTER'S DEGREE AND THE DOCTOR'S DEGREE

The Mathematics Department participates with the School of Education in offering 2 Doctor of Education degree with emphasis in the areas of Mathematics Curriculum and Mathematics. A student interested in the Ed.D., with emphasis in Mathematics Curriculum and Mathematics, should confer with either the Head of the Department of Mathematics or the Dean of the School of Education.

For Undergraduates and Graduates
430. Synthetic Projective Geometry. (3:3:0)
431. Teaching of Mathematics in the

Secondary Schools. (3:3:0)
Only those students working toward teacher certification may use credit in this course toward minimum requirements for the mathematics major.
432. Differential Equations II. ( $3: 3: 0$ )

434, 435. Advanced Calculus. (3:3:0 each)
437. Theory of Numbers. ( $3: 3: 0$ )
438. Solid Analytic Geometry. ( $3: 3: 0$ )

4310, 4311. Introduction to Numerical Analysis I, II. ( $3: 3: 0 \mathrm{each}$ )
4313. Probability. ( $3: 3: 0$ )

4314, 4315. Mathematical Statistics. (3:3:0 each)
4316. Introductory Point-Set Topology. (3:3:0)
4317. Actuarial Mathematics. ( $3: 3: 0$ )
4319. Elementary Functions of Complex Variables. ( $3: 3: 0$ )
4321. Elementary Modern Algebra. ( $3: 3: 0$ )
4324. Matrix Theory. ( $3: 3: 0$ )

## 4325. Computational Methods of Linear Algebra. (3:3:0)

4327. Mathematical Programming. (3:3:0)
4328. Introduction to Difference Equations. (3:3:0)
4329. Selected Topics. ( $3: 3: 0$ )
4330. Vector Analysis. (3:3:0)
4331. Tensor Analysis. (3:3:0)

## For Graduates

S11, 512. Seminar. (1:1:0 each)
531. Advanced Problems. (3:3:0)

534, 53s. Theory of Numbers I, II. (3:3:0 each)
536, 537. Modern Algebra I, II. (3:3:0 each)
538 . Foundations of Mathematics. (3:3:0)
5312, 5313, Functions of a Complex Variable I, II. ( $3: 3: 0$ each)
5314, 5315. Functions of a Real Variable I, II. ( $3: 3: 0$ each)
5316, 5317. Topology I, II. ( $3: 3: 0$ each)
5318. Operational Calculus. ( $3: 3: 0$ )
5319. Fourier Analysis. (3:3:0)

5321, 5322. Methods of Applied Mathematics I, II. (3:3:0 each)

S323, s324. Theory of Ordinary Differential Equations I, II. ( $3: 3: 0$ each)
5325, 5326. Partial Differential Equations I, II. (3:3:0 each)
5329, 5330. Numerical Analysis I, II. (3:3:0 each)
5331, 5332. Advanced Topics in Analysis I, II. ( $3: 3: 0$ each)
5333, 5334. Functional Analysis I, II. (3:3:0 each)
5335,5336 . Advanced Mathematics for Teachers I, II. ( $3: 3: 0$ each)
5341, 5342. Advanced Topics in Algebra I, II. (3:3:0 each)
5351. Advanced Topics in Geometry. ( $3: 3: 0$ )

5361, 5362. Advanced Topics in Topology I, II. ( $3: 3: 0$ each)
5371. Design of Experiments. (3:3:0)
5372. Theory of Linear Statistical Models, (3:3:0)
5373. Stochastic Processes. (3:3:0)

5374, 5375 . Advanced Mathematical Statistics I, II. (3:3:0 each)
5376. 5377. Advanced Probability I, II. (3:3:0 each)
630. Master's Report. (3)
631. Master's Thesis. (3)

Enrollment required at least twice.
831. Doctor's Dissertation. (3)

Enrollment required at least four times.

## Music

## Professor Gene L. Hemmle, Head of the Department

## MAJORS AND MINORS FOR THE MASTER'S DEGREE

There is no foreign language requirement for graduate study in music except for the vocal applied major pursuing the Master of Music Degree. This major requires one year each of French, German, and Italian.

## APPLIED MUSIC

For Undergraduates and Graduates 425, 426. Instrument or Voice. (2:0:1)
435, 436. Instrument or Voice. $(3: 0: 1)$
445, 446. Instrument or Voice. (4:0:1)
For Graduates
530. Pedagogy of Applied Music.
( $3: 3: 0$ )
533. Applied Music Literature, Graduate Level. (3:3:0)
535 , 545 . Instrument or Voice.
(3:0:1) and $4: 0: 1$ )
660. Master's Recital and Report. (6)

## MUSIC EDUCATION

For Undergraduates and Graduates
433. Piano Pedagogy. ( $3: 3: 0$ )
437. Voice Pedagogy. ( $3: 3: 0$ )
4317. Choral Conducting. (3:2:2)
4318. Instrumental Conducting ( $3: 2: 2$ )

For Graduates
530, 531. Seminar in Music Education. (3:3:0 each)
532. Choral Music Workshop. (3:3:0)
533. Instrumental Music Workshop. (3:3:0)
534. Marching Band Direction. ( $3: 3: 0$ )
537. Instrumental Repertoire. (3:3:0)

533 . Music for Children. ( $3: 3: 0$ )
Enrollment limited to graduate students majoring in elementary education.
630. Master's Report. (3)
631. Master's Thesis. (3)

Enrollment required at least twice.

## MUSIC ENSEMBLE

510. Graduate Ensemble. ( $1: 0: 5$ )

Sec. 1. Chorus
Sec. 2. Orchestra

Sec. 3. Band
Sec. 4. Opera
Sec. 5. String Ensemble

## MUSIC LITERATURE

For Undergraduates and Graduates
330. Voice Repertoire. (3:3:0)

431, 432. History of Music. (3:3:0 each)
433. Piano Repertoire ( $3: 3: 0$ )
43)1. Music in the General Culture.

For Graduates
531. Seminar in Music Literature.
(3:3:0)
532. Choral Repertoire. $(3: 3: 0)$

## MUSIC THEORY

For Undergraduates and Graduates
321. Score-Reading. (2:2:0)
331. Arranging. (3:3:0)

333, 334. Form and Composition. ( $3: 3: 0$ each)
427. Instrumentation. (2:2:0)
428. Orchestration. (2:2:0)

430, 431. Pedagogy of Theory. (3:3:0 each)

432, 433. Fundamentals of Composition. (3:3:0 each)<br>435,436 . Modal Counterpoint.<br>(3:3:0 each)<br>For Graduates

531. Seminar in Music Theory. (3:3:0)

## Philosophy

## Professor Ivan L. Little, Head of the Department MINORS ONLY FOR THE MASTER'S DEGREE

For Undergraduates and Graduates
331. History of Ancient and Medieval Philosophy. (3:3:0)
332. History of Modern Philosophy. ( $3: 3: 0$ )
333. Development of American Philosophy. (3:3:0)
334. Contemporary Philosophy. ( $3: 3: 0$ )
335. Oriental Philosophies. ( $3: 3: 0$ )
336. Philosophy of Science. ( $3: 3: 0$ )
338. Intermediate Logic. (3:3:0)
431. Aesthetics. $(3: 3: 0)$
432. Philosophy of Value. $(3: 3: 0)$
433. Theories of Knowledge. ( $3: 3: 0$ )
434. Metaphysics. (3:3:0)
436. Philosophy of Religion. (3:3:0)
438. Seminar in Philosophical Problems. (3:3:0)

## For Graduates

531. Studies in Philosophical Classics. ( $3: 3: 0$ )
532. Basic Issues in Contemporary Philosophy. ( $3: 3: 0$ )

## Physics

Professor H. C. Thomas, Head of the Department

## MAJORS AND MINORS FOR THE MASTER'S DEGREE AND THE DOCTOR'S DEGREE

For Undergraduates and Graduates
422. Selected Topics. $(2: 2: 0)$

May be repeated for credit.
432. Thermodynamics. ( $3: 3: 0$ )

434, 43 s . Mechanics. (3:3:0 each)
436. Individual Study of Specified Fields. ( $3: 1: 4$ )
May be repeated for credit.
437, 438. Quantum Mechanics. (3:3:0
each)
439. Solid-State Physics. ( $3: 3: 0$ )
4121. Engineering Physics Seminar.
(1:1:0)
May be repeated for credit.

## For Graduates

511, 512. Seminar. (1:1:0 each)
Required of all graduate majors in physics.
513. Techniques of Experimental Physics. (1:0:3)
530. Advanced Topics. ( $3: 3: 0$ )

May be repeated for credit.

535 . Introduction to Statistical Physics. (3:3:0)
536. Advanced Dynamics. (3:3:0)

541, 542. Theoretical Physics. (4:4:0 each)
630. Master's Report. (3)
631. Master's Thesis. (3) Enrollment required at least twice.
633, 634. Quantum Mechanics.
(3:3:0 each)
635, 636. Electromagnetic Theory. (3:3:0 each)
637, 638. Structure of Matter. (3:3:0 each)
639. Advanced Statistical Physics. (3:3:0)
733, 734. Advanced Solid State Physics. (3:3:0 each)
735, 736. Atomic and Molecular Spectra. (3:3:0 each)
737, 738. Advanced. Topics in Theoretical Physics. ( $3: 3: 0$ each)
739. Individual Study. ( $3: 1: 4$ )

7311, 7312. Advanced Nuclear Physics. (3:3:0 each)
831. Doctor's Dissertation.

Enrollment required at least four times.

## Psychology

## Professor Theodore Andreychuk, Head of the Department

## MAJORS AND MINORS FOR THE MASTER'S DEGREE AND THE DOCTOR'S DEGREE

Prior to enrollment in a graduate program in psychology, students should consult the Head of the Department for advice and approval. Admission to the Graduate School does not imply admission to a degree program, for which the consent of the department is also necessary. Students who are not officially approved for a degree program may not enroll in any practicum-type courses or proseminars. Students majoring in departments other than education may not take practicum-type courses toward a minor in psychology.

## Master's Degree Programs

Applicants for the master's degree may pursue one of three courses of study: (1) general experimental psychology, (2) counseling psychology, or (3) clinical psychology.

In the area of counseling psychology the student has a choice of two programs: (a) general counseling and (b) rehabilitation counseling. The latter program is offered in cooperation with the Office of Vocational Rehabilitation of the United States Department of Health, Education, and Welfare. Traineeships are available for qualified students.

The master's degree program in counseling or clinical psychology requires a onesemester internship in an approved facility.

Conducted jointly with the School of Education is a program leading to certification as a counselor in the public schools. Students interested in this program are invited to write to the head of either department.

## Doctor's Degree Programs

A doctoral program is offered which may emphasize one of several areas of interest. Among the several options are general experimental, learning, physiological and comparative, psychometrics, industrial, counseling, rehabilitation counseling, and clinical psychology. Doctoral students who emphasize counseling or clinical psychology in their programs will be expected to complete a year of internship in an approved facility.

## For Undergraduates and Graduates

432. Personnel Testing. ( $3: 2: 3$ ) Fee $\$ 2$.
433. Intermediate Quantitative Methods in Psychology. ( $3: 3: 0$ )
434. Introduction to Social Psychology. (3:3:0)
435. Abnormal Psychology. ( $3: 3: 0$ )
436. Personality Development. ( $3: 3: 0$ )
437. Experimental Psychology. (3:2:3)
438. Industrial Psychology. ( $3: 3: 0$ )
439. The Human Element in Engineering. ( $3: 3: 0$ )
440. History of Psychology. ( $3: 3: 0$ )
441. The Psychology of Learning. (3:3:0)
442. Industrial Training ( $3: 3: 0$ )
443. Human Learning. (3:3:0)
444. Interviewing Principles and Practices. ( $3: 3: 0$ )
445. Motivation. (3:3:0)
446. Perception. $\quad(3: 3: 0)$
447. Individual Problems Course. (3)
448. Physiological Psychology. (3:3:0)

## For Graduates

532. Problems in Psychology. (3)
533. Practicum in Psychological Testing. (3)
534. Occupational Information and Ca reer Patterns. ( $3 ; 3: 0$ )
s61. Proseminar I. (6:6:0)
535. Proseminar II. (6:6:0)
536. Projective Techniques I. (3:3:0)
537. Projective Techniques II. ( $3: 3: 0$ )
s314. Tests and Measurements. (3:3:0)
s316. Introduction to Adjustment Counseling and Psychotherapy. ( $3: 3: 0$ )
s317. Techniques of Counseling: Career Guidance. ( $3: 3: 0$ )
538. Practicum in Techniques of Counseling. ( $3: 2: 3$ )
539. Group Counseling and Psychotherapy. $(3: 3: 0)$
540. Seminar in Personality Theory. (3:3:0)
541. Case Studies in Vocational Rehabilitation. ( $3: 3: 0$ )
542. Medical Aspects of Rehabilitation. (3:3:0)
543. The Psychology of Disability. (3:3:0)
544. Seminar in Social Psychology. (3:3:0)
545. Advanced Counseling Psychology. (3:3:0)
546. Advanced Child Psychology. (3:3:0)
547. Play Therapy. ( $3: 3: 0$ )
548. Seminar in Psychopathology. (3:3:0)
549. Seminar in Psychometrics. (3:3:0)
550. Research Seminar in Clinical and Counseling Psychology. ( $3: 3: 0$ )
551. Seminar in Human Factors. (3:3:0)
552. Advanced Correlational Methods and Factor Analysis. (3:3:0)
553. Advanced Statistical Methods and Experimental Design. ( $3: 3: 0$ )
554. Advanced Experimental Psychology and Psychodynamics. $(3: 3: 0)$
555. Seminar in Learning Theory. ( $3: 3: 0$ )
556. Seminar in Physiological Psychology. (3:3:0)
5354 . Seminar in Perception. ( $3: 3: 0$ )
5355 . Seminar in Comparative Psychology. (3:3:0)
557. Motivation. (3:3:0)
558. Seminar in Quantitative Learning Theory. (3:3:0)
559. Electrophysiological Techniques. (3:3:0)
560. Advanced General Psychology. (3:3:0)
5360 . Seminar in Verbal Behavior. (3:3:0)
561. Advanced Practicum in Counseling and Clinical Psychology. (3:1:3)
5362,5363. Internship in Counseling and Clinical Psychology. (3:3:0 each)
562. Master's Report. (3)
563. Master's Thesis. (3) Enrollment required at least twice.
731, 732. Research. (3 each)
564. Doctor's Dissertation. (3) Enrollment required at least four times.

## Sociology and Anthropology

Professor W. G. Steglich, Head of the Department

MAJORS AND MINORS FOR THE MASTER'S DEGREE
AND MINORS ONLY FOR THE DOCTOR'S DEGREE

For Undergraduates and Graduates
432. Introduction to Health and Welfare Services. (3:3:0)
433. Criminology. ( $3: 3: 0$ )
435. Collective Behavior and Social Movements. (3:3:0)
436. Contemporary Sociological Theories. ( $3: 3: 0$ )
437. Social Change. (3:3:0)
438. Population Problems. ( $3: 3: 0$ )
439. Methods of Sociological Research. (3:3:0)
4311. The Sociology of the Person. (3:3:0)
4312. The Urban Community. ( $3: 3: 0)$
4313. American Minority Problems. ( $3: 3: 0$ )
4314. Social Stratification. (3:3:0)
4315. Sociology of Religion. ( $3: 3: 0$ )
4316. Development of Sociological Theory. ( $3: 3: 0$ )

## For Graduates

531. Sociological Theory. (3:3:0) May be repeated once for credit.
532. Seminar in Contemporary Sociological Theory. ( $3: 3: 0$ )
533. Seminar in Sociological Research Methods. (3:3:0)
535 . Seminar in Social Disorganization. ( $3: 3: 0$ )
534. Seminar in the Sociological Uses of Historical Data. (3:3:0)
535. Seminar in Demography. ( $3: 3: 0$ )

5335 . Society and Its Institutions. ( $3: 3: 0$ )
631. Master's Thesis. (3)

Enrollment required at least twice.

## ANTHROPOLOGY

## MINORS ONLY FOR THE MASTER'S DEGREE

For Undergraduates and Graduates
430. Cultures and Pcoples of the Southwest. ( $3: 3: 0$ )
431. Field Archacology. ( $3: 3: 0$ )
432. Man and the Supernatural. ( $3: 3: 0$ )
438. Culture and Personality. $(3: 3: 0)$
439. Peoples and Cultures of Oceania. (3:3:0)
460. Introduction to Field Research in Prehistory. (6)
461. Archaeology of Mexico. (6)
4311. Anthropological Linguistics. ( $3: 3: 0$ )
4313. Peoples of North America. (3:3:0)
4314. Prehistory of Meso and South America. (3:3:0)
4315. Prehistory of North America. (3:3:0)
4316. Peoples of Meso and South America. $\quad(3: 3: 0)$
4321. Individual Problems in Anthropology. (3:3:0)
4322. Peoples of Africa. ( $3: 3: 0$ )

For Graduates
531. Anthropological Theory. (3:3:0)

5335 . Origins of Social Customs and Institutions. ( $3: 3: 0$ )

## Speech

Professor P. Merville Larson, Head of the Department

## MAJORS AND MINORS FOR THE MASTER'S DEGREE AND MINORS ONLY FOR THE DOCTOR'S IDEGREE

For Undergraduates and Graduates
430. Advanced Public Speaking. ( $3: 3: 0$ )
431. Creative Dramatics. ( $3: 3: 0$ )
433. Introduction to Hearing Problems. ( $3: 3: 0$ )
434. Principles of Audiometry. ( $3: 3: 0$ )
435. Interpretative Reading. ( $3: 3: 0$ )
436. Radio and Television Program Planning and Management. ( $3: 3: 0$ )
437. Persuasion. (3:3:0)
439. Methods in Teaching Speech and Theater. (3:3:0)
4311. Stage Directing Methods. (3:2:3)
4315. Speech for the Deaf. ( $3: 3: 0$ )
4316. Language Development for the Deaf. (3:3:0)
4317. Speech Reading and Auditory

Training Methods. (3:3:0)
4318. Speech Pathology. ( $3: 3: 0$ )
4319. Speech Correction Methods. ( $3: 3: 0$ )
4321, 4322. Supervised Clinical Practice in Spech Correction. ( 3 each)
4323, 4324. Supervised Clinical Practice in Audiology and Aural Rehabilitation. (3 each)
4325. Directing School Speech Activitics. (3:2:3)
4331. Television Program Direction. (3:2:3)
4351. History of Speech. ( $3: 3: 0)$

4352 . History of Theater. (3:3:0)

## For Graduates

531. Studies and Problems in Speech. (3:3:0)
532. Seminar in Audiology: Psychophysics of Audition. $(3: 3: 0)$
533. Seminar in Speech Pathology: Articulation and Voice Disorders. ( $3: 3: 0$ )
534. Educational Television. ( $3: 3: 0$ )
535. Seminar in Speech Pathology: Organic Speech Disorders. (3:3:0)
536. Seminar in Speech Pathology: Stuttering. ( $3: 3: 0$ )
537. Seminar in Audiology: Aural Rehabilitation. ( $3: 3: 0$ )
538. Seminar in Audiology: Clinical Audiology. (3:3:0)
s315. Advanced Discussion, Debate, and Conference Methods. (3:3:0)
539. Dramatic Criticism. (3:3:0)
540. Studies in Modern Theater. (3:3:0)
541. Studies in the Production of PreModern Drama. (3:3:0)
542. Theory and Practice of Scene Design. (3:2:3)
543. Theater Costume Design. (3:2:3)
544. Theory and Practice of Stage Lighting. ( $3: 2: 3$ )
545. Classical Rhetoric and Public Address. $(3: 3: 0)$
546. British and American Public Address. ( $3: 3: 0$ )
547. Contemporary Rhetorical Theory and Practice. (3:3:0)
548. Graduate Clinical Practice-Speech. (3:0:9)
549. Graduate Clinical Practice--Hearing. (3:0:9)
533 s. Basic Speech for Elementary Teachers. ( $3: 3: 0$ )
550. Seminar in Speech Pathology: Language Problems in Children. ( $3: 3: 0$ )
551. Seminar in Speech Pathology: Language Problems in Adults. ( $3: 3: 0$ )
552. Master's Thesis. (3)

Enrollment required at least twice.

## School of Business Administration

The Master of Business Administration degree is offered with a major in one of the departments of the School of Business Administration; students with an undergraduate degree from a school of business administration may expect to complete the requirements in one calendar year. The Master of Business Administration degree is offered as a professional, two-year, undifferentiated (no major) program for students with undergraduate degrees outside a school of business administration.

The degree of Master of Science in Accounting is offered especially for the practicing accountant and the recent undergraduate in liberal accounting study programs. The Master of Arts degree is offered with a major in Economics. The Master of Education degree is offered with a major in Business Education. The requirements for each of these degrees may normally be completed in one year.

The Doctor of Business Administration degree is planned to be offered in September 1967. The program will have three emphases for the student; to provide a broad, integrated knowledge of business; to develop specialized knowledge in two fields of concentration; and to develop research skills. The successful candidate can expect to complete requirements with about two years of full-time study beyond the master's degree.

## Business Administration

## For Graduates

5341. Research Methods in Business. ( $3: 3: 0$ )
5342. Business Policy. ( $3: 3: 0$ )
5343. Business and Its Environment. ( $3: 3: 0$ )
5344. Research Methods and Management. ( $3: 3: 0$ )
5345. Master's Report. (3)
5346. Master's Thesis. (3)

Enrollment required at least twice.
831. Doctor's Dissertation. (3)

Enrollment required at least four times.

## Accounting

## Professor Reginald Rushing, Head of the Department <br> MAJORS AND MINORS FOR THE MASTER'S DEGREE AND THE DOCTOR'S DEGREE

For Undergraduates and Graduates
430. Income Tax Accounting. ( $3: 3: 0$ )
431. Advanced Income Tax Accounting. (3:3:0)
432. Governmental Accounting. (3:3:0)
433. Petroleum Accounting. $(3: 3: 0)$
434. Advanced Accounting I. $(3: 3: 0)$

43 S. Advanced Accounting II. $(3: 3: 0)$
436. Accounting Systems. ( $3: 3: 0$ )
437. Principles of Auditing. ( $3: 3: 0$ )
438. Advanced Auditing. $(3: 3: 0)$
439. Budgeting. ( $3: 3: 0$ )
4313. Advanced Cost Accounting. ( $3: 3: 0$ )

For Graduates
531. Controllership (3:3:0)
532. Internship. (3:3:0)
533. Current Accounting Theory. (3:3:0)
535. Seminar in Accounting. ( $3: 3: 0$ )
536. CPA Review I. ( $3: 3: 0$ )
537. CPA Review II. ( $3: 3: 0$ )
538. Advanced Corporation Accounting. ( $3: 3: 0$ )
5311. Advanced Accounting Problems I. (3:3:0)
5312. Advanced Accounting Problems II. (3:3:0)
5314. Procedural Aspects of Federal Taxation. ( $3: 3: 0$ )
5315. Estate, Trust, and Gift Taxation. (3:3:0)
5316. Oil and Gas Taxation. ( $3: 3: 0$ )
5317. Accounting and Analytical Methods. $(3: 3: 0)$
5341. Managerial Accounting I. ( $3: 3: 0)$
5351. Advanced Accounting Theory and Practice. (3:3:0)
s531. Principles of Accounting. ( $s: 5: 1$ )
5s41. Managerial Accounting II. ( $5: 5: 0$ )

* Master's Report. (3)
*Master's Thesis. (3)
Enrollment required at least twice.
*Doctor's Dissertation. (3)
Enrollment required at least four times.

731. Research. (3)
732. Seminar in Federal Taxes. (3:3:0)

## Business Education and Secretarial Administration

Professor W. R. Pasewark, Head of the Department

## MAJORS AND MINORS FOR THE MASTER'S DEGREE AND THE DOCTOR'S DEGREE

For Undergraduates and Graduates
432. Methods of Teaching Busincss Subjects I. ( $3: 3: 0$ )
433. Methods of Teaching Business Subjects II. ( $3: 3: 0$ )

For Graduates
530. Foundations of Business Education. ( $3: 3: 0$ )
535. Seminar in Business Education. ( $3: 3: 0$ )
May be repeated for credit.
536. Research and Improvement of Instruction in Bookkeeping. ( $3: 3: 0$ )
537. Research and Improvement of Instruction in Office Procedures. ( $3: 3: 0$ )
538. Research and Improvement of Instruction in Shorthand. ( $3: 3: 0$ )
539. Research and Improvement of Instruction in Typewriting. ( $3: 3: 0$ )
5311. Organization and Administration of Vocational Education. ( $3: 3: 0$ )
s312. Cooperative Vocational Education Programs. ( $3: 3: 0$ )
5331. Problems in Business Education. ( $3: 3: 0$ )
5351 . Collegiate Education for Business. (3:3:0)
731. Research. (3)
*Master's Thesis. (3)
*Master's Report. (3)

* Doctor's Disscrtation. (3) Enrollment required at least four times.

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## Economics

## Professor R. L. Rouse, Head of the Department <br> MAJORS AND MINORS FOR THE MASTER'S DEGREE AND THE DOCTOR'S DEGREE

For Undergraduates and Graduates
430. Development of Economic Doctrines. (3:3:0)
431. Contemporary Economic Doctrines. (3:3:0)
433. International Economic Relations. ( $3: 3: 0$ )
435. The Economics of Transportation. ( $3: 3: 0$ )
437. Current Economic Problems. (3:3:0)
4311. Advanced Economic Theory. (3:3:0)
4312. Macrodynamic Economics. ( $3: 3: 0$ )
4321. Soviet Economics. ( $3: 3: 0$ )
4322. Regional Economics. (3:3:0)
4323. Monetary Theory. (3:3:0)

## For Graduates

531. Economic Research. ( $3: 3: 0$ )
532. Seminar in Economic Policy. ( $3: 3: 0$ )
533. Advanced International Economics. (3:3:0)
(3:3:0)
534. The Nature, Method, and Scope of Economics. ( $3: 3: 0$ )
535. Classical Economic Thought. ( $3: 3: 0$ )
536. Managerial Economics. (2:2:0)
537. Seminar in Mathematical Economics. (3:3:0)
538. Individual Study in Economics. (3:3:0)
5335 . Human Geography. (3:3:0)
539. Price and Income Theory. (3:3:0)
540. Advanced Micro-Economic Analysis. (3:3:0)
541. Advanced Macro-Economic Analysis. (3:3:0)
542. The Economic Environment. ( $3: 3: 0$ )
543. Master's Thesis. (3)

Enrollment required at least twice.
731. Research. (3)

* Master's Thesis. (3)
* Doctor's Dissertation. (3) Enrollment required at least four times.

537. Seminar in Public Finance.

## Finance

## Professor R. L. Rouse, Head of the Department <br> MAJORS AND MINORS FOR THE MASTER'S DEGREE AND THE DOCTOR'S DEGREE

For Undergraduates and Graduates
431. The Federal Reserve System. ( $3: 3: 0$ )
432. Real Estate. (3:3:0)
433. Corporate Financial Problems and Cases. (3:3:0)
434. Investments. (3:3:0)

43s. Property Insurance. (3:3:0)
437. Casualty Insurance. ( $3: 3: 0$ )
438. Bank Administration. $(3: 3: 0)$
439. Real Estate Appraisal. (3:3:0)
4311. Security Analysis. (3:3:0)
4312. International Finance. (3:3:0)

## For Graduates

531. Current Financial Problems. (3:3:0)
532. Seminar in Investment Analysis. (3:3:0)
533. Seminar in Current Banking Problems. ( $3: 3: 0$ )
534. The Money and Capital Markets. (3:3:0)
535. Risk Administration. (3:3:0)

5331 . Business Finance. (3:3:0)
5341. Current Business Financial Practices. (3:3:0)
5351 . Financial Policies of Business. ( $3: 3: 0$ )

[^10]731. Research. (3)

* Master's Report. (3)
*Master's Thesis. (3)
Enrollment required at least twice.
* Doctor's Dissertation. (3)

Enrollment required at least four times.

## BUSINESS LAW

For Undergraduates and Graduates 4311. CPA Law Review. ( $3: 3: 0$ )

For Graduates
5331. Legal Environment of Business. ( $3: 3: 0$ )

## Management

Professor Vincent P. Luchsinger, Acting Head of the Department majors and minors for the master's degree AND THE DOCTOR'S DEGREE

For Undergraduates and Graduates
430. Management of Small Business Enterprise. (3:3:0)
431. Job Evaluation and Wage Administration. ( $3: 3: 0$ )
432. Administrative Policy. ( $3: 3: 0)$
434. Personnel Administration II. (3:3:0)
435. Employee Supervision. ( $3: 3: 0$ )
436. Office Systems and Procedures. (3:3:0)
439. Production II. ( $3: 3: 0$ )
442. Industrial Management Problems. (4:3:2)
4331. Collective Bargaining. $\quad(3: 3: 0)$
4371. Regulation of Transportation. ( $3: 3: 0$ )
4381. Advanced Traffic Management. ( $3: 3: 0$ )

For Graduates
511. Individual Problems. ( $1: 1: 0$ )
530. Individual Research in Management. (3)
531. Current Problems in Management. (3:3:0)
533. Quantitative Analysis for Business. (3:3:0)
535. Human Behavior in Business. (3:3:0)
537. Seminar in Personnel Administration. (3:3:0)
538. Advanced Production Management. (3:3:0)
539. Seminar in Operations Management. (3:3:0)
5311 . International Business Management. ( $3: 3: 0$ )
5312. Administrative Policy and Strategy. ( $3: 3: 0$ )
5313. Business and Management Systems. ( $3: 3: 0$ )
5314. Philosophy and Thought in Management. ( $3: 3: 0$ )
5331. Organization and Human Behavior. ( $3: 3: 0$ )
5341. Management Decision Making. ( $3: 3: 0$ )
s342. Production Management. (3:3:0)
5351. Decision Theory and Management Science. $\quad(3: 3: 0)$
5352. Administrative Organization. ( $3: 3: 0$ )
731. Research. (3)

* Master's Report. (3)
*Master's Thesis. (3)
Enrollment required at least twice.
*Doctor's Dissertation. (3)
Enrollment required at least four times.

536. Management of Human Resources. (3:3:0)

## Marketing

Professor J. A. Ryan, Head of the Department

> MAJORS AND MINORS FOR THE MASTER'S DEGREE AND THE DOCTOR'S DEGREE

For Undergraduates and Graduates 431. Industrial Marketing. (3:3:0)
426. Index Numbers (2:2:0) 433. Marketing Problems. (3:3:0)

[^11]434. Wholesaling. (3:3:0)
435. Business Cycles and Forecasts. ( $3: 3: 0$ )
436. Marketing Research and Analysis. ( $3: 3: 0$ )
437. Advanced Business Statistics. (3:3:0)
439. Sales Management. (3:3:0)
4311. Advertising Practices. (3:2:2)
4312. Advertising Campaigns. (3:1:4)
4315. Retail Buying. (3:3:0)
4316. Advertising Administration. (3:3:0)
4319. Analysis of Retail Operations. (3:1:4)

For Graduates
s31. Advanced Marketing Problems. (3:3:0)
532. Advanced Marketing Research.
533. Marketing Theory. (3:3:0)
536. Individual Study in Marketing I. ( $3: 3: 0$ )
537. Individual Study in Marketing II. ( $3: 3: 0$ )
538. Trade Regulations. (3:3:0)
5331. Marketing Foundations. (3:3:0)
5332. Statistical Methods in Business. ( $3: 3: 0$ )
5334. Advertising in a Contemporary Society. (3:3:0)
5341. Marketing Administration. ( $3: 3: 0$ )
5342. Advanced Statistical Methods. (3:3:0)
5343. Seminar in Industrial Marketing. (3:3:0)
5351. Marketing Thought. (3:3:0)
5352. Statistical Decision Making. (3:3:0)
5353. Marketing Strategy I. (3:3:0)

5354 . Marketing Strategy II. (3:3:0)
5355 . Seminar in Current Marketing Problems. $(3: 3: 0)$
\$362. Advanced Experimental Statistics. (3:3:0)
5372. Advanced Inference Problems. (3:3:0)
5382. Advanced Multivariate Analysis. (3:3:0)
731. Research. (3)

* Master's Report. (3)
* Master's Thesis. (3) Enrollment required at least twice.
* Doctor's Dissertation. (3) Enrollment required at least four times.


## School of Education

The College offers a Master of Education degree and a Doctor of Education degree. Students may emphasize the various special areas of education in working toward these degrees and should consult the Graduate School and the office of the Dean of Education regarding the degree programs. A minor in education is available for the degree of Doctor of Philosophy.

The professional certification program requires work on the graduate level and may lead to certification in the following areas: elementary and secondary, health and physical education, music, speech-drama, special service (counselor, principal, superintendent, supervisor), vocational education (agricultural education, home economics education). The student should note that these programs are not necessarily coincidental with degree programs and should consult the Director of Teacher Certification.

## Education

For Undergraduates and Graduates
430. History and Philosophy of Education. ( $3: 3: 0$ )
438. Educational Measurement and
Evaluation. $(3: 3: 0)$
4331. Foundations of Educational Sociology. (3:3:0)

For Graduates
530. Advanced Educational Psychology. (3:3:0)
532. Philosophy of Education. ( $3: 3: 0$ )
533. General Public School Administration. $(3: 3: 0)$
534. Advanced Educational Sociology. (3:3:0)

[^12]536. Elementary School Administration. ( $3: 3: 0$ )
537. Secondary School Administration. ( $3: 3: 0$ )
538. Administration of Audio-Visual Services. $(3: 3: 0)$
539. Administration of School Business Services. ( $3: 3: 0$ )
5139. Advanced Education Workshops in Teaching and Administration. (1-6)
5312. Supervision in the Elementary School. (3:3:0)
5313. Supervision in the Secondary School. ( $3: 3: 0$ )
s321. Individual Study in Education. ( $3: 3: 0$ )
5322. Foundations of Educational Research. ( $3: 3: 0$ )
5323. Advanced Educational Statistics. (3:3:0)
5325. Legal Bases of Education. (3:3:0)
5331. Human Development in Education. (3:3:0)
5346. Advanced Curriculum Development. (3:3:0)
5349. Organizing and Administering the Instructional Improvement Program. ( $3: 3: 0$ )
5351. General Education Seminar. (3:3:0)
5353. Comparative Education. ( $3: 3: 0$ )

5354 . Seminar in Educational Sociology. ( $3: 3: 0$ )
5357. The Administration of the Junior College. ( $3: 3: 0$ )

## Elementary Education

For Undergraduates and Graduates 4344. Children's Literature. (3:3:0)

For Graduates
5326. Reading Development in the Elementary School. (3)
5341. Developing Arithmetic Programs in Elementary Education. ( $3: 3: 0$ )
5342. Developing Reading Programs in Elementary Education. ( $3: 3: 0$ )

## Secondary Education

## For Graduates

5311. Audio-Visual Education. (3:3:0)
5312. The Junior College. (3:3:0)
5313. The Junior High School. (3:3:0)
5314. Selection and Evaluation of AudioVisual Materials. ( $3: 3: 0$ )
5315. Audio-Visual Production. (3:3:0)
5316. Seminar in Supervision. ( $3: 3: 0$ )
5317. Seminar in Educational Psychology. ( $3: 3: 0$ )
5318. The Administration of School Staff Personnel. (3:3:0)
5319. School Finance. (3:3:0)
5320. School Housing. (3:3:0)
5321. School Public Relations. (3:3:0)
5322. General Supervision. (3:3:0)
5323. Organization and Administration of Guidance and Personnel Services. ( $3: 3: 0$ )
5324. Educational Evaluation. ( $3: 3: 0$ )
5325. Guidance and the Classroom Teacher. $\quad(3: 3: 0)$
5326. Information Services in Guidance. ( $3: 3: 0$ )
5327. Group Techniques in Guidance. (3:3:0)
5328. Guidance and Counseling in the Elementary School. (3:3:0)
5329. Student Personnel Services in Higher Education. (3:3:0)
5330. Master's Report. (3)
5331. Master's Thesis. (3)

Enrollment required at least twice.
635, 636. Internship in Education. (3:3:0 each)
731, 732. Research. (3 each)
831. Doctor's Dissertation. (3) Enrollment required at least four times.
5343. Developing Natural and Physical Environment Concepts in Elementary Education. (3:3:0)
5344. Developing Language Arts Programs in Elementary Education. ( $3: 3: 0$ )
5345. Developing Social Studies Programs in Elementary Education. (3:3:0)
5355. Seminar in Elementary Education. ( $3: 3: 0$ )
5334. Teaching Reading in the Secondary School. ( $3: 3: 0$ )
5356. Seminar in Secondary Education. ( $3: 3: 0$ )
5363. Problems in Audio-Visual Education. (3:3:0)

## Special Education

For Undergraduates and Graduates 4357 . Teaching Elementary School Sub-
4338. The Education of Exceptional Children. (3:3:0)
4339. Teaching the Mentally Retarded. (3:3:0)
4352. Teaching the Child with Minimal Brain Dysfunction. (3:3:0)
4353. Teaching the Physically Handicapped Child. ( $3: 3: 0$ )
4354. The Education of the Mentally Retarded Child. ( $3: 3: 0$ )
4355. Teaching the Gifted Child. (3:3:0)
4356. Education of the Deaf. (3:3:0)
jects to the Deaf. ( $3: 3: 0$ )

## For Graduates

5374. Teaching the Emotionally Distrubed. (3:3:0)
5375. Educational Appraisal of Exceptional Children. ( $3: 3: 0$ )
5376. Administration and Supervision of Special Education. (3:3:0)
5377. Seminar in Special Education. (3:3:0)
5378. Problems in Mental Retardation. (3:3:0)

## School of Engineering

The graduate courses offered by the School of Engineering are specifically designed for students interested in achieving the degree of Master of Science in Chemical, Civil, Electrical, Industrial, or Mechanical Engineering, and/or the Degree of Doctor of Philosophy, with a conventional major in any of the principal engineering disciplines. Also available is a complex of interdisciplinary courses leading to the doctorate. In the latter, a flexible variety of options is available, and permits a measure of specialization in one of the conventional engineering fields, as well as breadth achieved through pursuit of two additional interdisciplinary programs chosen from such areas as systems engineering, nuclear engineering, aerospace, electronics, transport phenomena, engineering mechanics, thermal science, materials science, operations research, computer science, mathematics, and biomedical and bioengineering studies.

## Architecture and Allied Arts

## Professor N. E. Barrick, Head of the Department

## MINORS ONLY FOR THE MASTER'S DEGREE

## ARCHITECTURE

For Undergraduates and Graduates
323. History of Architecture: 19th and 20th Centuries. (2:2:0)
330. History of Architecture: Ancient/ Medieval. ( $3: 3: 0$ )
420. Professional Practice. (2:2:0)
423. Life Drawing II. $(2: 0: 6)$
430. History of Early American Architecture. ( $3: 3: 0$ )
432. History of Renaissance Architecture. (3:3:0)
435. Building Technology. (3:1:6)
436. City Planning. (3:1:6)

4316, 4317. Architectural Sculpture. (3:1:6 each)
4321. History of Architecture and Art in the Arid Lands of the World. (3:3:0)
4331. Special Problems in Architecture and City Planning. (3:3:0)

## ALLIED ARTS

For Undergraduates and Graduates
421. Art Workshop. (2:0:6)

433, 434. Commercial Design II. (3:0:9 each)
4311, 4312. Ceramics. (3:0:9 each)

4318, 4319. History of Painting and Sculpture. (3:3:0 each)<br>For Graduates<br>5335. Art in the Modern World. (3:3:0)

## Chemical Engineering

Professor Arnold J. Gully, Head of the Department MAJORS AND MINORS FOR THE MASTER'S DEGREE
AND THE DOCTOR'S DEGREE

For Undergraduates and Graduates
4121. Chemical Engineering Seminar. ( $1: 1: 0$ )
4241, 4242. Unit Operations Laboratory. (2:0:6 each)
4311, 4312. Chemical Engineering III, IV. (3:3:0 each)

4321, 4322. Chemical Engineering Thermodynamics. (3:3:0 each)
4323. Chemical Reaction Engineering. ( $3: 3: 0$ )
4331. Special Problems in Chemical Engineering. ( $3: 3: 0$ )
4332. Special Experimental Problems in Chemical Engineering. ( $3: 0: 9$ )
4341. Unit Processes. ( $3: 3: 0$ )
4343. Engineering Experimentation. (3:3:0)
4352. Process Design. ( $3: 3: 0$ )
4353. Instrumentation. ( $3: 2: 3$ )
4354. Chemical Engineeering Plant Design. ( $3: 1: 6$ )
4371. Nuclear Engineering. ( $3: 3: 0$ )

For Graduates
5121. Graduate Seminar. (1:1:0)
5311. Transport Phenomena-Heat Transmission. ( $3: 3: 0$ )
5312. Transport Phenomena-Fluid Dynamics. ( $3: 3: 0$ )
5313. Transport Phenomena-Diffusion Processes. (3:3:0)
s314. Process Dynamics and Automatic Control. (3:3:0)
5321. Advanced Chemical Engineering Thermodynamics. ( $3: 3: 0$ )
5322. Equilibrium Systerns. ( $3: 3: 0$ )
5331. Special Problems in Chemical Engineering. ( $3: 3: 0$ )
May be repeated for credit.
5332. Experimental Studies in Chemical Engineering. ( $3: 0: 9$ ) May be repeated for credit.
5341. Distillation. ( $3: 3: 0$ )
5343. Reaction Kinetics. (3:3:0)

5348 . Organic Syntheses. (3:3:0)
5351. Chemical Engineering Design. (3:1:6)
5371, 5372 . Principles of Nuclear Engineering. (3:3:0 each)
5373, 5374. Nuclear Chemical Engineering. ( $3: 3: 0$ each)
5378. Reactor Shielding. ( $3: 3: 0$ )
5379. Nuclear Reactor Instrumentation and Control. ( $3: 3: 0$ )
5381, 5382. Nuclear Radiations Laboratory. (3:2:6 each)
630. Master's Report. (3)
631. Master's Thesis. (3) Enrollment required at least twice.
731. Research. (3)
732. Research. (3)
831. Doctor's Dissertation. (3) Enrollment required at least four times.

## Civil Engineering

## Professor K. R. Marmion, Head of the Department MAJORS AND MINORS FOR THE MASTER'S DEGREE AND THE DOCTOR'S DEGREE

For Undergraduates and Graduates
4121. Civil Engineering Seminar. ( $1: 1: 8$ )
4261. Traffic Engineering. (2:1:3)
4321. Soil Engineering. $(3: 3: 0)$
4331. Special Problems in Civil Engineering. ( $3: 3: 0$ )
4332. Special Experimental Problems in Civil Engineering. ( $3: 0: 9$ )
4337. Cost Estimating. ( $3: 3: 0$ )
4339. Law and Ethics in Engineering. ( $3: 3: 0$ )
4342. Structural Design II. ( $3: 2: 3$ )
4344. Reinforced Concrete Structures II. (3:3:0)
43 51. Intermediate Hydromechanics. (3:3:0)
4353. Elements of Hydraulic Engineering. (3:3:0)
4355. Ground Water Hydrology. ( $3: 3: 0$ )
4362. Highway Engineering II. ( $3: 3: 0$ )

## For Graduates

s121. Advanced Soil Engineering Laboratory. ( $1: 0: 3$ )
s237. Construction Management. (2:2:0)
s311. Advanced Mechanics of Solids. (3:3:0)
5313. Theory of Elastic Stability. (3:3:0)
5314. Theory of Plates and Shells. ( $3: 3: 0$ )
s316. Theory of Elasticity. ( $3: 3: 0$ )
5321. Advanced Soil Engineering. (3:3:0)
5331. Advanced Work in Specific Fields. (3:3:0)
S332. Advanced Work in Specific Fields. (3:0:9)
5342. Advanced Plastic Design. (3:3:0)
5343. Advanced Structural Analysis. (3:3:0)
S344. Advanced Reinforced Concrete Design. ( $3: 3: 0$ )
5346. Design of Structures for Dynamic Loads. ( $3: 3: 0$ )
5351. Open Channel Hydraulics. (3:3:0)

5353 . Water Resources Engineering. (3:3:0)
5355 . Flow in Porous Media. ( $3: 3: 0$ )
5356. Earth Dams. (3:3:0)
5371. Advanced Water and Waste Treatment. (3:2:3)
630. Master's Report. (3)
631. Master's Thesis. (3)

Enrollment required at least twice.
731, 732. Research. (3 each)
May be repeated for credit
831. Doctor's Dissertation. (3)

Enrollment required at least four times.

## Electrical Engineering

Professor R. H. Seacat, Acting Head of the Department

## MAJORS AND MINORS FOR THE MASTER'S DEGREE AND THE DOCTOR'S DEGREE

For Undergraduates and Graduates 4121. Electrical Engineering Seminar. ( $1: 1: 0$ )
4311. Analog and Digital Computation. (3:3:0)
4317. Electronics III. (3:3:0)
4318. Physical Electronics. ( $3: 3: 0$ )
4321. Passive Network Synthesis. ( $3: 3: 0$ )
4322. Topological Network Analysis. ( $3: 3: 0$ )
4331. Special Problems in Electrical Engineering. ( $3: 3: 0$ )
4333. Experimental Laboratory II. ( $3: 0: 9$ )
4341. Microwave Systems. (3:3:0)
4343. Energy Transmission. (3:3:0)
4351. Energy Conversion I. (3:3:0)
4352. Energy Conversion II. (3:3:0)
4353. Feedback Control Systems. (3:3:0)
4354. Acoustics. (3:3:0)

43SS. Nonlinear Feedback Systems. (3:3:0)
4361. Introduction to Information Theory and Noise. (3:3:0)

## For Graduates

5311. Stability of Nonlinear Systems. (3:3:0)
5312. Optimal and Adaptive Control Systems. ( $3: 3: 0$ )
5313,5314 . Solid-State Electronics $I$ and II. (3:3:0 each)
5313. Sampled Data and Digital Control Systems. ( $3: 3: 0$ )
5314. Advanced Transients. ( $3: 3: 0$ )
5315. Pulse and Timing Circuits. (3:3:0)
5316. Electronic Circuits and Systems. (3:3:0)
5317. Digital Systems. ( $3: 3: 0$ )

5322, 5323. Advanced Network Theory I and II. (3:3:0 each)
5324. Symmetrical Components. (3:3:0)

5325 . Information Theory. (3:3:0)
5326. Network Applications of Linear Graph Theory. (3:3:0)
5327. Multistage Decision Processes. (3:3:0)
5328. Statistical Theory of Communications. ( $3: 3: 0$ )
5331. Theoretical Investigations in Engineering Applications. $(3: 3: 0)$
5332. Experimental Investigations in Engineering Applications. $(3: 0: 9)$
5341, 5342. Advanced Electromagnetic Theory I and II. (3:3:0 each)
S343. Radio Propagation. (3:3:0)
5344. Antennas and Radiating Systems. (3:3:0)
5354. Direct Energy Conversion. (3:3:0)
630. Master's Report. (3)
631. Master's Thesis. (3)

Enrollment required at least twice.
731, 732. Research. (3 each)
831. Doctor's Dissertation. (3)

Enrollment required at least four times.

## Industrial Engineering

## Professor R. A. Dudek, Head of the Department <br> MAJORS AND MINORS FOR THE MASTER'S DEGREE AND THE DOCTOR'S DEGREE

For Undergraduates and Graduates
417. Industrial Statistics Problem Laboratory. (1:0:3)
421. Materials Handling. ( $2: 2: 0$ )
439. Analysis of Industrial Operations. ( $3: 3: 0$ )
4121. Industrial Engineering Seminar. (1:1:0)
4221. Special Problems in Industrial Engineering. ( $2: 2: 0$ )
4311. Automatic Data Processing Systems. ( $3: 3: 0$ )
4331. Individual Studies in Industrial Engineering. ( $3: 3: 0$ ) May be repeated for credit.
4332. Special Experimental Problems in Industrial Engineering. ( $3: 0: 9$ ) May be repeated for credit.
4334. Work Analysis and Design III. (3:2:3)
4341. Work Control II. $(3: 3: 0)$

43 1. Production Design II. ( $3: 2: 3$ )
4361. Industrial Engineering Design. (3:3:0)

## For Graduates

512, 513. Seminar. ( $1: 1: 0$ )
532. Standard Data Systems. ( $3: 2: 3$ )
535. Engineering Controls for Industrial Safety. ( $3: 3: 0$ )
538. Engineering Aspects of Wage Policies. (3:3:0)
5111, 5212, 5213, 5214. Industrial Engineering Case Analysis. (1, 2)
s301, 5302, 5303. Advanced Work Analysis and Design. (3:2:3 each)

S307, 5308. Advanced Production Control. (3:3:0 each)
5311, 5312. Analysis Techniques for Management. ( $3: 3: 0$ each)
s314, 5315. Analysis Techniques for Work Systems. (3:3:0 each)
5316. Statistical Reliability Analysis. (3:3:0)
5317. Advanced Industrial Statistics. (3:3:0)
5318. Selected Topics in Advanced Statistics. ( $3: 3: 0$ )
May be repeated for credit.
5321, 5322. Decision Theory and Management Science. (3:3:0 each)
5331. Theoretical Studies in Advanced Industrial Engineering Topics.
( $3: 3: 0$ )
May be repeated for credit.
5332. Experimental Investigation in Advanced Industrial Engineering Topics. ( $3: 0: 9$ )
May be repeated for credit.
5351 , 5352 . Advanced Production Design. (3:3:0 each)
5361, 5362 . Dynamics of Engineering Economy. (3:3:0 each)
630. Master's Report. (3)
631. Master's Thesis. (3)

Enrollment required at least twice.
731, 732. Research. (3 each)
831. Doctor's Dissertation. (3)

Enrollment required at least four times.

# ENGINEERING ANALYSIS AND DESIGN MINORS FOR THE MASTER'S AND THE DOCTOR'S DEGREE 

For Undergraduates and Graduates
4313. Variational Methods. ( $3: 3: 0$ )
4331. Special Problems in Engineering Analysis and Design. (3:3:0)
4333. Special Problems in Computer Science. ( $3: 3: 0$ )
4341, 4342. Digital Computations, I, II. (3:3:0 each)
4343. Analog Computations. (3:2:3)
4345. Process Simulation. (3:2:3)
4347. Engineering Applications of Linear Programming. (3:2:2)

## For Graduates

5312. Engineering Applications of Stochastic Processes. ( $3: 3: 0$ )
5313. Field Theory. ( $3: 3: 0$ )
5314. Special Problems in Advanced Engineering Analysis and Design. (3:3:0)
5315. Special Problems in Advanced Computer Science and Technology. (3:3:0)
5316. Dynamic Programming. (3:2:2)
5317. Application of Topological Methods. (3:2:3)

## Mechanical Engineering

## Professor L. J. Powers, Head of the Department

## MAJORS AND MINORS FOR THE MASTER'S DEGREE AND THE DOCTOR'S DEGREE

For Undergraduates and Graduates
4121. Mechanical Engineering Seminar. (1)

May be repeated for credit.
4312, 4313. Mechanical Engineering Laboratory I, II. (3:2:3 each)
4314. Fluid Dynamics. ( $3: 3: 0$ )
4315. Heat and Mass Transfer. (3:3:0)
4316. Dynamics. ( $3: 3: 0$ )
4321. Engineering Thermodynamics II. (3:3:0)
4331. Special Problems in Mechanical Engineering. (3)
May be repeated for credit.
4332. Special Experimental Problems in Mechanical Engineering. (3:0:9)
4333, 4334. Thermal Systems I, II. (3:3:0 each)
4335, 4336. Design I, II. (3:3:0 each)
4341. Materials III. ( $3: 3: 0$ )

For Graduates
5313. Dynamics III. (3:3:0)
5314. Stress Analysis I. (3:2:3)
5316. Mechanical Vibrations I. ( $3: 3: 0$ )
5317. Mechanical Vibrations II. (3:3:0)
5321. Thermodynamics I. (3:3:0)
5322. Thermodynamics II. (3:3:0)
5323. Thermodynamics III. (3:3:0)
5324. Heat Transmission I. $\quad(3: 3: 0)$
5325. Heat Transmission II. (3:3:0)
5326. Heat Transmission III. ( $3: 3: 0$ )
5327. Aerodynamics I. (3:3:0)
5328. Aerodynamics II. ( $3: 3: 0$ )
5329. Aerodynamics III. (3:3:0)
5331. Theoretical Studies in Advanced Topics. (3)
May be repeated for credit.
5332. Experimental Studies in Advanced Topics. (3:1:6)
5333. Design I. (3:3:0)
5341. Metallurgy I. (3:3:0)
5342. Merallurgy II. (3:3:0)
5343. Thermodynamics of Solids. (3:3:0)
5351. Boiling Heat Transfer. (3:3:0)
630. Master's Report. (3)
631. Master's Thesis. (3)

Enrollment required at least twice.
731, 732. Research. (3 each)
May be repeated for credit.
831. Doctor's Dissertation. (3)

Enrollment required at least four times.

# Petroleum Engineering 

Professor W. L. Ducker, Head of the Department

## MINORS ONLY FOR THE MASTER'S DEGREE

For Undergraduates and Graduates<br>413. Natural Gas Laboratory. ( $1: 0: 3$ )<br>416. Reservoir Engineering Laboratory. (1:0:3)<br>420. Petroleum Property Evaluation and Management. (2:1:3)

430. Special Natural Gas and Production Problems. ( $3: 3: 0$ )
431. Reservoir Engineering. ( $3: 3: 0$ )
432. Natural Gas Engineering. ( $3: 3: 0$ )
433. Advanced Natural Gas Engineering. (3:3:0)
434. Advanced Reservoir Engineering. (3:3:0)
435. Petroleum Engineering Seminar. ( $1: 1: 0$ )
436. Special Problems in Petroleum Engineering. ( $3: 3: 0$ )
437. Special Experimental Problems in Petroleum Engineering. ( $3: 0: 9$ )

## School of Home Economics

The School of Home Economics offers majors and minors for the master's degree as indicated, and a general minor for the Doctor of Education Degree.

## Applied Arts

Professor B. C. Lockhart, Head of the Department MINORS ONLY FOR THE MASTER'S DEGREE

For Undergraduates and Graduates
411. Special Problems in Applied Arts. ( $1: 0: 2$ )
May be repeated for credit.
431. Silk Screen. (3:1:4)
432. Sculpture. ( $3: 1: 4$ )
434. Metalwork. (3:1:4)

43 s . Jewelry. ( $3: 1: 4$ )
436. Art in Secondary Education. (3:1:4)
437. Current Practices in Secondary Art Education. (3:1:4)
439. Experience Training in Applied Arts. (3:1:6)
4311. Textile Design. (3:1:4)
4313. Exploration of Ceramics. ( $3: 1: 4$ )
4314. Advanced Treatments of Interior Residential Space. (3:1:4)
4315. Advanced Treatments of Interior Commercial Space. ( $3: 1: 4$ )
4316. Research in Dynamics of Interior Space. (3:1:4)
4321. Sculpture Problems. ( $3: 1: 4$ )
4351. Jewelry Problems. ( $3: 1: 4$ )

For Graduates
s11. Advanced Applied Arts Unit. ( $1: 0: 2$ )
May be repeated for credit.
518. Seminar in Applied Arts. (1:1:0)
531. Special Problems in Applied Arts. (3:1:4)
May be repeated for credit.
532. Research Methods in Applied Arts. (3:3:0)
533. Philosophy of Aesthetics. (3:3:0)
534. Advanced Studio: Two-Dimensional Design. (3:1:4)
535. Advanced Studio: Threc-Dimensional Design. (3:1:4)
537. Art for Exceptional Children. (3:1:4)
538. Vocational Art Orientation and Evaluation in Rehabilitation Counseling. ( $3: 1: 4$ )
5335. Theory and Practice of Art for Elementary Teachers. (3:1:4)

## Clothing and Textiles

## Professor Martha Gene Shelden, Head of the Department

 MAJORS AND MINORS FOR THE MASTER'S DEGREEFor Undergraduates and Graduates
411. Special Problems in Clothing and Textiles. ( $1: 0: 3$ )
May be repeated for 2 or 3 hours' credit.
431. Textile Testing and Analysis. (3:1:4)
432. Dress Design through Draping. (3:1:4)
433. History and Philosophy of Dress. (3:3:0)
434. Fashion Fundamentals. ( $3: 3: 0$ )
436. Flat Pattern Design. ( $3: 1: 4$ )
437. Demonstration Techniques in Clothing. (3:3:0)
438. Historic Textiles. (3:3:0)

For Graduates
511. Advanced Clothing Problems. (1:0:3)
May be repeated for credit.
518. Seminar in Clothing and Textiles. (1:1:0)
531. Special Problems in Clothing and Textiles. ( $3: 1: 4$ )
May be repeated for credit.
534. Custom Tailoring. (3:1:4)

535 . Advanced Problems in Upholstery, Draperies, and Other Household Fabrics. (3:1:4)
5335. Textiles for Elementary Teachers. (3:3:0)
630. Master's Report. (3)
631. Master's Thesis. (3)

Enrollment required at least twice.

## Food and Nutrition

Professor Mina W. Lamb, Head of the Department MAJORS AND MINORS FOR THE MASTER'S DEGREE

For Undergraduates and Graduates
411. Problems in Food and Nutrition. (1:1:0)
May be repeated for credit.
412. Field Work in Nutrition. ( $1: 0: 3$ )
421. Advanced Food Production Management. (2:1:3)
422. Food and the Consumer. (2:2:0)
423. Community Nutrition. (2:2:0)
424. Diet Therapy. (2:2:0)
425. Food Demonstrations. (2:1:2)
432. Advanced Human Nutrition. ( $3: 3: 0$ )
436. Experimental Methods with Food. (3:1:6)
439. Food Purchasing (3:2:2)

For Graduates
s1s. Special Aspects of Food and Nutrition. (1:0:3)
531. Research in Food and Nutrition. (3:1:6)
May be repeated for credit.
533. Seminar in Food and Nutrition. (3:3:0)
May be repeated for credit.
534. Advanced Problems in Human Nutrition and Foods. ( $3: 3: 0$ ) May be repeated for credit.
5335 . Principles and Applications of Nu trition for Elementary Teachers.
( $3: 3: 0$ )
630. Master's Report. (3)
631. Master's Thesis. (3)

Enrollment required at least twice.

## Home Economics Education

Professor L. Ann Buntin, Head of the Department
MAJORS AND MINORS FOR THE MASTER'S DEGREE

For Undergraduates and Graduates
414. Problems in Home Economics Education. (1:1:0)
426. Problems in Student Teaching. (2:0:4)
432. Methods of Teaching Home Economics. (3:3:0)
433. Introduction to Research in Home Economics. (3:3:0)
434. Current Issues and Developments in Home Economics Education. (3:3:0)
436. Home, School, and Community Experiences in Home Economics Education. (3:3:0)
461. Student Teaching in Home Economics. (6:0:18)

## For Graduates

514. Specific Problems in Teaching Home Economics. (1:1:0) May be repeated for credit.
s18. Seminar in Home Economics. ( $1: 1: 0$ ) May be repeated for credit.
515. Administration and Supervision of Home Economics Education. ( $3: 3: 0$ )
516. Curriculum Development in Home Economics. ( $3: 3: 0$ )
517. Evaluation in Home Economics. (3:3:0)
518. Techniques of Research in Home Economics. ( $3: 3: 0$ )
519. Problems in Home Economics Education. ( $3: 3: 0$ )
May be repeated for credit.
520. Techniques of Supervision in Home Economics. (3:3:0)
521. Master's Report. (3)
522. Master's Thesis. (3)

Enrollment required at least twice.

## Home and Family Life

Associate Professor Estelle H. Wallace, Head of the Department MINORS ONLY FOR THE MASTER'S DEGREE

## CHILD DEVELOPMENT AND FAMILY RELATIONS

For Undergraduates and Graduates
331. Later Childhood. ( $3: 2: 3$ )
332. Organization, Methods, and Materials in the Preschool Program. ( $3: 2: 3$ )
333. Early Years of Marriage. (3:3:0)
335. The Adolescent in the Family. ( $3: 3: 0$ )
433. Family Relations. ( $3: 3: 0$ )
436. Community and Professional Responsibilities to Children and Families. (3:3:0)
438. Exceptional Children in the Family. (3:2:3)
439. Family Life in the Middle and Later Years. (3:3:0)
461. Student Teaching in the Preschool. (6)

For Graduates
518. Seminar in Child Development and Family Relations. ( $1: 1: 0$ ) May be repeated for credit.
534. Special Topics in Child Development. (3:3:0)
5336. Advanced Interpersonal and Family Relations. ( $3: 3: 0$ )

## HOME MANAGEMENT

For Undergraduates and Graduates
431. Advanced Housing for the Family. (3:1:4)
432. Home Management Living. (3)
433. Advanced Household Equipment. (3:1:4)
435 . Advanced Consumer Problems. ( $3: 3: 0$ )

For Graduates
s11. Studies in Home Management. ( $1: 1: 0$ )
518. Seminar in Home Management. ( $1: 1: 0$ )
May be repeated for credit.
531. Advanced Home Management. ( $3: 3: 0$ )


[^0]:    * Appointed December 15, 1966.

[^1]:    * Appointed December 15, 1966.
    ** Deceased January 28, 1967.

[^2]:    * Resigned effective August 18, 1967.
    ** Appointed member.

[^3]:    - Resigned as Head of Department, September 1, 1967.

[^4]:    *Appointed Head of Department, September 1, 1967.

[^5]:    * A program leading to this degree is planned for initiation in the fall of 1967.

[^6]:    * Can be used by graduate students for minor credit only.
    ** Normally for graduate minor credit only.

[^7]:    * Normally credit for graduate minors only.

[^8]:    * Graduate courses that are studies or seminars may be repeated for credit with permission of department as topics vary.

[^9]:    * See courses in Business Administration for course numbers.

[^10]:    * See courses in Business Administration for course numbers.

[^11]:    * See courses in Business Administration for course numbers.

[^12]:    * See courses in Business Administration for course numbers.

